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Role of the Reader's Schema in Comprehension, Learning, and Memory

Richard C. Anderson

The past several years have witnessed the articulation of a largely new theory of reading, a theory already accepted by the majority of scholars in the field. According to the theory, a reader's *schema*, or organized knowledge of the world, provides much of the basis for comprehending, learning, and remembering the ideas in stories and texts. In this paper I will attempt to explain schema theory, give illustrations of the supporting evidence, and suggest applications to classroom teaching and the design of instructional materials.

A Schema-Theoretic Interpretation of Comprehension

In schema-theoretic terms, a reader comprehends a message when he is able to bring to mind a schema that gives a good account of the objects and events described in the message. Ordinarily, comprehension proceeds so smoothly that we are unaware of the process of "cutting and fitting" a schema in order to achieve a satisfactory account of a message. It is instructive, therefore, to try to understand material that gives us pause, so that we can reflect upon our own minds at work. Consider the following sentence, drawn from the work of Bransford and McCarrell (1974):

> The notes were sour because the seam split.

Notice that all of the words are familiar and that the syntax is straightforward, yet the sentence does not "make sense" to most people. Now notice what happens when the additional clue, "bagpipe," is provided. At this point the sentence does make sense because one is able to interpret all the words in the sentence in terms of certain specific objects and events and their interrelations.

From Anderson, R.C., Osborn, J., & Tierney, R.J. (Eds.), *Learning to Read in American Schools: Basal Readers and Content Texts* (pp. 243–257).

Let us examine another sentence:

> The big number 37 smashed the ball over the fence.

This sentence is easy to interpret. *Big Number 37* is a baseball player. The sense of *smash the ball* is to propel it rapidly by hitting it strongly with a bat. The fence is at the boundary of a playing field. The ball was hit hard enough that it flew over the fence.

Suppose a person with absolutely no knowledge of baseball read the Big Number 37 sentence. Such as person could not easily construct an interpretation of the sentence, but with enough mental effort might be able to conceive of large numerals, perhaps made of metal, attached to the front of an apartment building. Further, the person might imagine that the numerals come loose and fall, striking a ball resting on top of, or lodged above, a fence, causing the ball to break. Most people regard this as an improbable interpretation, certainly one that never would have occurred to them, but they readily acknowledge that it is a "good" interpretation. What makes it good? The answer is that the interpretation is complete and consistent. It is complete in the sense that every element in the sentence is interpreted; there are no loose ends left unexplained. The interpretation is consistent in that no part of it does serious violence to knowledge about the physical and social world.

Both interpretations of the Big Number 37 sentence assume a real world. Criteria of consistency are relaxed in fictional worlds in which animals talk or men wearing capes leap tall buildings in a single bound. But there are conventions about what is possible in fictional worlds as well. The knowledgeable reader will be annoyed if these conventions are violated. The less-knowledgeable reader simply will be confused.

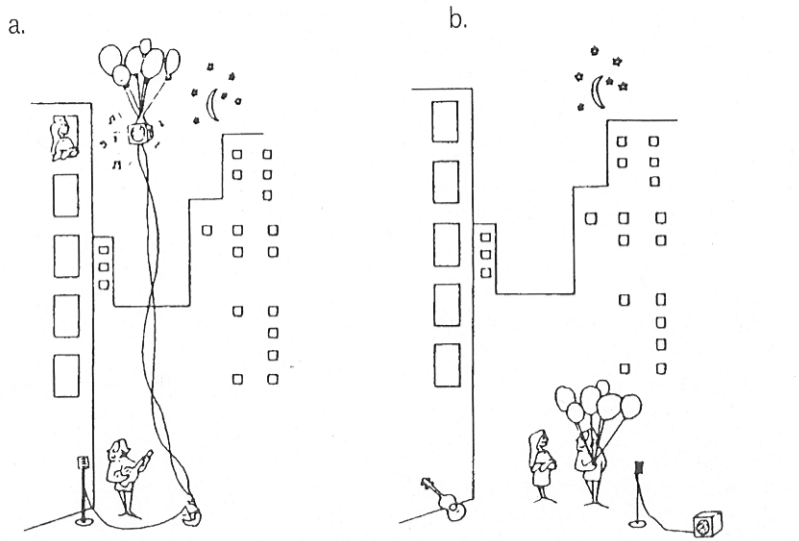
It should not be imagined that there is some simple, literal level of comprehension of stories and texts that does not require coming up with a schema. This important point is illustrated in a classic study by Bransford and Johnson (1972) in which subjects read paragraphs, such as the following, written so that most people are unable to construct a schema that will account for the material:

> If the balloons popped the sound wouldn't be able to carry since everything would be too far away from the correct floor. A closed window would also prevent the sound from carrying, since most buildings tend to be well insulated. Since the whole operation depends upon a steady flow of electricity, a break in the middle of the wire would also cause problems. Of course, the fellow could shout, but the human voice is not loud enough to carry that far. An additional problem is that a string could break on the instrument. Then there could be no accompaniment to the message. It is clear that the best situation would involve less distance. Then there would be fewer potential problems. With face to face contact, the least number of things could go wrong. (p. 719)

Subjects rated this passage as very difficult to understand, and they were unable to remember much of it. In contrast, subjects shown the drawing on the left side of Figure 1 found the passage more comprehensible and were able to remember a great deal of it. Another group saw the drawing on the right in Figure 1. This group remembered no more than the group that did not receive a drawing. The experiment demonstrates that what is critical for comprehension is a schema accounting for the *relationships* among elements; it is not enough for the elements to be concrete and imageable.

Trick passages, such as the foregoing one about the communication problems of a modern-day Romeo, are useful for illustrating what happens when a reader is completely unable to discover a schema that will fit a passage and, therefore, finds the passage entirely incomprehensible. More typical is the situation in which a reader knows something about a topic, but falls far short of being an expert. Chiesi, Spilich, and Voss (1979) asked people high and low in knowledge of baseball to read and recall a report of a half-inning from a fictitious baseball game. Knowledge of baseball had both qualitative and quantitative effects on performance. High-knowledge subjects were more likely to recall and

FIGURE 1



Version "a" represents the appropriate context and version "b" represents the inappropriate context. See text for accompanying passage.

embellish upon aspects of strategic significance to the game. Low-knowledge subjects, in contrast, were more likely to include information incidental to the play of the game.

Schema theory highlights the fact that often more than one interpretation of a text is possible. The schema that will be brought to bear on a text depends upon the reader's age, sex, race, religion, nationality, occupation—in short, it depends upon the reader's culture. This point was illustrated in an experiment completed by Anderson, Reynolds, Schallert, and Goetz (1977), who asked people to read the following passage:

> Tony slowly got up from the mat, planning his escape. He hesitated a moment and thought. Things were not going well. What bothered him most was being held, especially since the charge against him had been weak. He considered his present situation. The lock that held him was strong but he thought he could break it. He knew, however, that his timing would have to be perfect. Tony was aware that it was because of his early roughness that he had been penalized so severely—much too severely from his point of view. The situation was becoming frustrating; the pressure had been grinding on him for too long. He was being ridden unmercifully. Tony was getting angry now. He felt he was ready to make his move. He knew that his success or failure would depend on what he did in the next few seconds.

Most people think the foregoing passage is about a convict planning his escape from prison. A special group of people, however, see the passage an entirely different way; these are men who have been involved in the sport of wrestling. They think the passage is about a wrestler caught in the hold of an opponent. Notice how the interpretation of *lock* varies according to perspective. In the one case, it is a piece of hardware that holds a cell door shut; in the other it may be a sweaty arm around a neck. Males enrolled in a weightlifting class and females enrolled in a music education class read the foregoing passage and another passage which most people interpret as about several people playing cards, but which can be interpreted as about a rehearsal session of a woodwind ensemble. The results were as expected. Scores on a multiple-choice test designed to reveal interpretations of the passages showed striking relationships to the subjects' background. Physical education students usually gave a wrestling interpretation to the prison/wrestling passage and a card-playing interpretation to the card/music passage, whereas the reverse was true of the music education students. Similarly, when subjects were asked to recall the passages, theme-revealing distortions appeared, even though the instructions emphasized reproducing the exact words of the original text. For example, a physical education student stated, "Rocky was penalized early in the match for roughness or a dangerous hold," while a music education student wrote, "he was angry that he had been caught and arrested."

The thesis of this section is that comprehension is a matter of activating or constructing a schema that provides a coherent explanation of objects and events

mentioned in a discourse. In sharp contrast is the conventional view that comprehension consists of aggregating the meanings of words to form the meanings of clauses, aggregating the meanings of clauses to form the meanings of sentences, aggregating the meaning of sentences to form the meanings of paragraphs, and so on. The illustrations in this section were intended to demonstrate the insufficiency of this conventional view. The meanings of the words cannot be "added up" to give the meaning of the whole. The click of comprehension occurs only when the reader evolves a schema that explains the whole message.

Schema-Based Processes in Learning and Remembering

According to schema theory, reading involves more or less simultaneous analysis at many different levels. The levels include graphophonemic, morphemic, semantic, syntactic, pragmatic, and interpretive. Reading is conceived to be an interactive process. This means that analysis does not proceed in a strict order from the visual information in letters to the overall interpretation of a text. Instead, as a person reads, an interpretation of what a segment of a text might mean is theorized to depend both on analysis of the print and on hypotheses in the person's mind. Processes that flow from the print are called "bottom-up" or "data driven" whereas processes that flow in the other direction are called "top-down" or "hypothesis driven," following Bobrow and Norman (1975). In the passage about Tony, who is either a wrestler or a prisoner, processing the word *lock* has the potential to activate either a piece-of-hardware meaning or a wrestling-hold meaning. The hypothesis the reader has already formulated about the text will tip the scales in the direction of one of the two meanings, usually without the reader's being aware that an alternative meaning is possible. Psychologists are at work developing detailed models of the mechanisms by which information from different levels of analysis is combined during reading (see Just & Carpenter, 1980; Rumelhart & McClelland, 1980).

The reader's schema affects both learning and remembering of the information and ideas in a text. Six functions of schemata that have been proposed (Anderson, 1978; Anderson & Pichert, 1978) are briefly explained.

A schema provides ideational scaffolding for assimilating text information. The idea is that a schema provides a niche, or slot, for certain text information. For instance, there is a slot for the main entree in a dining-at-a-fine-restaurant schema and a slot for the murder weapon in a who-done-it schema. Information that fits slots in the reader's schema is readily learned, perhaps with little mental effort.

A schema facilitates selective allocation of attention. A schema provides part of the basis for determining the important aspects of a text. It is hypothesized that skilled readers use importance as one basis for allocating cognitive resources—that is, for deciding where to pay close attention.

A schema enables inferential elaboration. No text is completely explicit. A reader's schema provides the basis for making inferences that go beyond the information literally stated in a text.

A schema allows orderly searches of memory. A schema can provide the reader with a guide to the types of information that need to be recalled. For instance, a person attempting to recall the food served at a fine meal can review the categories of food typically included in a fine meal: What was the appetizer? What was the soup? Was there a salad? And so on. In other words, by tracing through the schema used to structure the text, the reader is helped to gain access to the particular information learned when the text was read.

A schema facilitates editing and summarizing. Since a schema contains within itself criteria of importance, it enables the reader to produce summaries that include significant propositions and omit trivial ones.

A schema permits inferential reconstruction. When there are gaps in memory, a rememberer's schema, along with the specific text information that can be recalled, helps generate hypotheses about the missing information. For example, suppose a person cannot recall what beverage was served with a fine meal. If he can recall that the entree was fish, he will be able to infer that the beverage may have been white wine.

The foregoing are tentative hypotheses about the functions of a schema in text processing, conceived to provide the broadest possible interpretation of available data. Several of the hypotheses can be regarded as rivals—for instance, the ideational scaffolding hypothesis and the selective attention hypothesis—and it may be that not all of them will turn out to be viable. Researchers are now actively at work developing precise models of schema-based processes and subjecting these models to experimental test.

Evidence for Schema Theory

There is now a really good case that schemata incorporating knowledge of the world play an important role in language comprehension. We are beginning to see research on differentiated functions. In a few years it should be possible to speak in more detail about the specific processing mechanisms in which schemata are involved.

Many of the claims of schema theory are nicely illustrated in a cross-cultural experiment, completed by Steffensen, Joag-Dev, and Anderson (1979), in which Indians (natives of India) and Americans read letters about an Indian and an American wedding. Of course, every adult member of a society has a well-developed marriage schema. There are substantial differences between Indian and American cultures in the nature of marriages. As a consequence, large differences in comprehension, learning, and memory for the letters were expected.

Table 1 summarizes analyses of the recall of the letters by Indian and American subjects. The first row in the table indicates the amount of time subjects spent reading the letters. As can be seen, subjects spent less time reading what for them was the native passage. This was as expected since a familiar schema should speed up and expedite a reader's processing.

The second row in Table 1 presents the number of idea units recalled. The gist measure includes not only propositions recalled verbatim but also acceptable paraphrases. The finding was precisely as expected. Americans recalled more of the American text, whereas Indians recalled more of the Indian passage. Within current formulations of schema theory, there are a couple of reasons for predicting that people would learn and remember more of a text about a marriage in their own culture: a culturally appropriate schema may provide the ideational scaffolding that makes it easy to learn information that fits into that schema, or, it may be that the information, once learned, is more accessible because the schema is a structure that makes it easy to search memory.

The row labeled *Elaborations* in Table 1 contains the frequency of culturally appropriate extensions of the text. The row labeled *Distortions* contains the frequency of culturally inappropriate modifications of the text. Ever since Bartlett's day, elaborations and distortions have provided the intuitively most compelling evidence for the role of schemata. Many fascinating instances appeared in the protocols collected in the present study. A section of the American passage upon which interesting cultural differences surfaced read as follows:

> Did you know that Pam was going to wear her grandmother's wedding dress? That gave her something that was old, and borrowed, too. It was made of lace over satin, with very large puff sleeves and looked absolutely charming on her.

TABLE 1
Mean Performance on Various Measures

Measure	Nationality			
	Americans		Indians	
	American Passage	Indian Passage	American Passage	Indian Passage
Time (Seconds)	168	213	304	276
Gist Recall	52.4	37.9	27.3	37.6
Elaborations	5.7	.1	.2	5.4
Distortions	.1	7.6	5.5	.3
Other Overt Errors	7.5	5.2	8.0	5.9
Omissions	76.2	76.6	95.5	83.3

From Steffensen, Joag-Dev, and Anderson (1979).

One Indian had this to say about the American bride's dress: "She was looking all right except the dress was too old and out of fashion." Wearing an heirloom wedding dress is a completely acceptable aspect of the pageantry of the American marriage ceremony. This Indian appears to have completely missed this and has inferred that the dress was out of fashion, on the basis that Indians attach importance to displays of social status, manifested in such details as wearing an up-to-date, fashionable sari.

The gifts described in the Indian passage that were given to the groom's family by the bride's, the dowry, and the reference to the concern of the bride's family that a scooter might be requested were a source of confusion for our American subjects. First of all, the "agreement about the gifts to be given to the in-laws" was changed to "the exchange of gifts," a wording which suggests that gifts are flowing in two directions, not one. Another subject identified the gifts given to the in-laws as favors, which are often given in American weddings to the attendants by the bride and groom.

In another facet of the study, different groups of Indians and Americans read the letters and rated the significance of each of the propositions. It was expected that Americans would regard as important propositions conveying information about ritual and ceremony whereas Indians would see as important propositions dealing with financial and social status. Table 2 contains examples of text units that received contrasting ratings of importance from Indians and Americans. Schema theory predicts that text units that are important in the light of the schema are more likely to be learned and, once learned, are more likely to be remembered. This prediction was confirmed. Subjects did recall more text information rated as important by their cultural cohorts, whether recalling what for them was the native or the foreign text.

Of course, it is one thing to show, as Steffensen, Joag-Dev, and Anderson did, that readers from distinctly different national cultures give different interpretations to culturally sensitive materials, and quite another to find the same phenomenon among readers from different but overlapping subcultures within the same country. A critical issue is whether cultural variation within the United States could be a factor in differential reading comprehension. Minority children could have a handicap if stories, texts, and test items presuppose a cultural perspective that the children do not share. An initial exploration of this issue has been completed by Reynolds, Taylor, Steffensen, Shirey, and Anderson (1981), who wrote a passage around an episode involving "sounding." Sounding is an activity predominantly found in the black community in which the participants try to outdo each other in an exchange of insults (Labov, 1972). In two group studies, and one in which subjects were individually interviewed, black teenagers tended to see the episode as involving friendly give-and-take, whereas white teenagers interpreted it as an ugly confrontation, sometimes one involving physical violence. For example, when attempting to recall the incident, a black male

TABLE 2
Examples of Idea Units of Contrasting Importance to Americans and Indians

American Passage		Indian Passage	
Idea Units More Important to Americans	Idea Units More Important to Indians	Idea Units More Important to Americans	Idea Units More Important to Indians
Then on Friday night *they had the rehearsal* at the church *and the rehearsal dinner*, which lasted until almost midnight.	*She'll be lucky if she can even get her daughter married, the way things are going.*	Prema's husband had to wear a dhoti *for that ceremony and for the wedding the next day.*	*Prema's in-laws seem to be nice enough people.* They did not create any problem in the wedding, *even though Prema's husband is their only son.*
All the attendants wore dresses that were specially designed to go with Pam's.	Her mother wore yellow, which looks great on her *with her bleached hair*, and George's mother wore pale green.	*There were only the usual essential rituals:* the curtain removal, the parents giving the daughter away, walking seven steps together, etc., *and plenty of smoke from the sacred fire.*	*Since they did not ask for any dowry*, Prema's parents were a little worried about their asking for a scooter before the wedding, *but they didn't ask for one.*
Her mother wore yellow, which looks great on her with her bleached hair, *and George's mother wore pale green.*	Have you seen the diamond she has? *It must have cost George a fortune because it's almost two carats.*	There must have been about five hundred people *at the wedding feast. Since only fifty people could be seated at one time, it went on for a long time.*	*Prema's parents were very sad when she left.*

Important idea units are in italics.

wrote, "Then everybody tried to get on the person side that joke were the best." A white male wrote, "Soon there was a riot. All the kids were fighting." This research established that when written material has an identifiable cultural loading there is a pronounced effect on comprehension. It remains to be seen how much school reading material is culturally loaded.

In the foregoing research, schemata were manipulated by selecting subjects with different backgrounds. Another approach for getting people to bring different schemata to bear is by selecting different passages. Anderson, Spiro, and Anderson (1978) wrote two closely comparable passages, one about dining at a fancy restaurant, the other about a trip to a supermarket. The same 18 items of food and beverage were mentioned in the two texts, in the same order, and attributed to the same characters. The first hypothesis was that subjects who received the restaurant passage would learn and recall more food and beverage

information than subjects who received the supermarket passage. The reasoning was that a dining-at-a-fine-restaurant schema has a more constrained structure than a trip-to-a-supermarket schema. That is to say, fewer food and beverage items will fit the former schema; one could choose soda pop and hot dogs at a supermarket, but these items would not be ordered at a fine restaurant. Moreover there are more cross-connections among items in a restaurant schema. For example, a steak will be accompanied by a baked potato, or maybe french fries. In two experiments, subjects who read the restaurant text recalled more food and beverage items than subjects who read the supermarket text.

The second prediction was that students who read the restaurant text would more often attribute the food and drink items to the correct characters. In a supermarket it does not matter, for instance, who throws the Brussels sprouts into the shopping cart, but in a restaurant it does matter who orders which item. This prediction was confirmed in two experiments.

A third prediction was that order of recall of food and beverages would correspond more closely to order of mention in the text for subjects who read the restaurant story. There is not, or need not be, a prescribed sequence for selecting items in a grocery store, but there is a characteristic order in which items are served in a restaurant. This hypothesis was supported in one experiment and the trend of the data favored it in a second.

Another technique for manipulating readers' schemata is by assigning them different perspectives. Pichert and Anderson (1977) asked people to pretend that they were either burglars or home buyers before reading a story about what two boys did at one of the boys' homes while they were skipping school. The finding was that people learned more of the information to their assigned perspective. For instance, burglars were more likely to learn that three 10-speed bikes were parked in the garage, whereas home buyers were more likely to learn that the house had a leaky roof. Anderson and Pichert (1978; see also Anderson, Pichert, & Shirey, 1979) went on to show that the reader's perspective has independent effects on learning and recall. Subjects who switch perspectives and then recall the story for a second time recall additional, previously unrecalled, information important to their new perspective but unimportant to their original perspective. For example, a person who begins as a home buyer may fail to remember that the story says the side door is kept unlocked, but may later remember this information when told to assume the role of a burglar. Subjects report that previously unrecalled information significant in the light of the new perspective "pops" into their heads.

Recent unpublished research in my laboratory, completed in collaboration with Ralph Reynolds and Paul Wilson, suggests selective allocation of attention to text elements that are important in the light of the reader's schema. We have employed two measures of attention. The first is the amount of time a subject spends reading schema-relevant sentences. The second is time to respond to a probe presented during schema-relevant sentences. The probe is a tone sounded

through earphones; the subject responds by pushing a button as fast as possible. The logic of the probe task is that if the mind is occupied with reading, there will be a slight delay in responding to the probe. Our results indicate that people assigned a burglar perspective, for instance, have slightly longer reading times and slightly longer probe times when reading burglar-relevant sentences. Comparable results have been obtained by other investigators (Cirilo & Foss, 1980; Haberlandt, Berian, & Sandson, 1980; Just & Carpenter, 1980).

Implications of Schema Theory for Design of Materials and Classroom Instruction

First, I urge publishers to include teaching suggestions in manuals designed to help children activate relevant knowledge before reading. Children do not spontaneously integrate what they are reading with what they already know (cf. Paris & Lindauer, 1976). This means that special attention should be paid to preparation for reading. Questions should be asked that remind children of relevant experiences of their own and orient them toward the problems faced by story characters.

Second, the teachers' manuals accompanying basal programs and content area texts ought to include suggestions for building prerequisite knowledge when it cannot be safely presupposed. According to schema theory, this practice should promote comprehension. There is direct evidence to support knowledge-building activities. Hayes and Tierney (1980) asked American high school students to read and recall newspaper reports of cricket matches. Performance improved sharply when the students received instruction on the nature of the game of cricket before reading the newspaper reports.

Third, I call for publishers to feature lesson activities that will lead children to meaningfully integrate what they already know with what is presented on the printed page. From the perspective of schema theory, prediction techniques such as the Directed Reading-Thinking Activity (Stauffer, 1969) can be recommended. The DRTA would appear to cause readers to search their store of knowledge and integrate what they already know with what is stated. It must be acknowledged, however, that the empirical evidence for the efficacy of the DRTA is flimsy at present (Tierney & Cunningham, 1984). Recently, Anderson, Mason, and Shirey (1984) have illustrated that under optimum conditions strong benefits can be obtained using a prediction technique. A heterogeneous sample of third graders read sentences such as, "The stupid child ran into the street after the ball." Children in the prediction group read each sentence aloud and then indicated what might happen next. In the case of the sentence above, a frequent prediction was that the child might get hit by a car. A second group read the sentences aloud with an emphasis on accurate decoding. A third and a fourth group listened to the sentences and read them silently. The finding was that the prediction group recalled 72% of the sentences, whereas the average for the other three groups was 43%.

Fourth, I urge publishers to employ devices that will highlight the structure of text material. Schema theory inclines one to endorse the practice of providing advance organizers or structured overviews, along the lines proposed by Ausubel (1968) and Herber (1978). Ausubel, who can be regarded as one of the pioneer schema theorists, has stated that "the principal function of the organizer is to bridge the gap between what the learner already knows and what he needs to know before he can successfully learn the task at hand" (1968, p. 148). There have been dozens of empirical studies of advance organizers over the past 20 years. Thorough reviews of this bulky literature by Mayer (1979) and Luiten, Ames, and Ackerson (1980) point to the conclusion that organizers generally have a facilitative effect. Nevertheless, from within current formulations of schema theory, there is room for reservations about advance organizers. Notably, Ausubel's insistence (cf. 1968, pp. 148, 333) that organizers must be stated at a high level of generality, abstractness, and inclusiveness is puzzling. The problem is that general, abstract language often is difficult to understand. Children, in particular, are more easily reminded of what they know when concrete language is used. As Ausubel himself has acknowledged (e.g., 1968, p. 149), "To be useful...organizers themselves must obviously be learnable and must be stated in familiar terms."

A final implication of schema theory is that minority children may sometimes be counted as failing to comprehend school reading material because their schemata do not match those of the majority culture. Basal reading programs, content area texts, and standardized tests lean heavily on the conventional assumption that meaning is inherent in the words and structure of a text. When prior knowledge is required, it is assumed to be knowledge common to children from every subculture. When new ideas are introduced, these are assumed to be equally accessible to every child. Considering the strong effects that culture has on reading comprehension, the question that naturally arises is whether children from different subcultures can so confidently be assumed to bring a common schema to written material. To be sure, subcultures within the United States do overlap. But is it safe simply to *assume* that when reading the same story, children from every subculture will have the same experience with the setting, ascribe the same goals and motives to characters, imagine the same sequence of actions, predict the same emotional reactions, or expect the same outcomes? This is a question that the research community and the school publishing industry ought to address with renewed vigor.

References

Anderson, R.C. (1978). Schema-directed processes in language comprehension. In A. Lesgold, J. Pellegrino, S. Fokkema, & R. Glaser (Eds.), *Cognitive psychology and instruction*. New York: Plenum.

Anderson, R.C., Mason, J., & Shirey, L.L. (1984). The reading group: An experimental investigation of a labyrinth. *Reading Research Quarterly, 20*, 6–38.

Anderson, R.C., & Pichert, J.W. (1978). Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior, 17*, 1–12.

Anderson, R.C., Pichert, J.W., & Shirey, L.L. (1979, April). *Effects of the reader's schema at different points in time* (Tech. Rep. No. 119). Urbana: University of Illinois, Center for the Study of Reading. (ERIC Document Reproduction Service No. ED169523)

Anderson, R.C., Reynolds, R.E., Schallert, D.L., & Goetz, E.T. (1977). Frameworks for comprehending discourse. *American Educational Research Journal, 14*, 367–382.

Anderson, R.C., Spiro, R.J., & Anderson, M.C. (1978). Schemata as scaffolding for the representation of information in connected discourse: *American Educational Research Journal, 15*, 433–440.

Ausubel, D.P. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart.

Bobrow, D.G., & Norman, D.A. (1975). Some principles of memory schemata. In D.G. Bobrow & A.M. Collins (Eds.), *Representation and understanding: Studies in cognitive science*. New York: Academic.

Bransford, J.D., & Johnson, M.K. (1972). Contextual prerequisites for understanding: Some investigations of comprehension and recall. *Journal of Verbal Learning and Verbal Behavior, 11*, 717–726.

Bransford, J.D., & McCarrell, N.S. (1974). A sketch of a cognitive approach to comprehension. In W.B. Weimer & D.S. Palermo (Eds.), *Cognition and the symbolic process*. Hillsdale, NJ: Erlbaum.

Chiesi, H.L., Spilich, G.J., & Voss, J.F. (1979). Acquisition of domain-related information in relation to high- and low-domain knowledge. *Journal of Verbal Learning and Verbal Behavior, 18*, 257–274.

Cirilo, R.K., & Foss, D.J. (1980). Text structure and reading time for sentences. *Journal of Verbal Learning and Verbal Behavior, 19*, 96–109.

Haberlandt, K., Berian, C., & Sandson, J. (1980). The episode schema in story processing. *Journal of Verbal Learning and Verbal Behavior, 19*, 635–650.

Hayes, D.A., & Tierney, R.J. (1980, October). *Increasing background knowledge through analogy: Its effects upon comprehension and learning* (Tech. Rep. No. 186). Urbana: University of Illinois, Center for the Study of Reading. (ERIC Document Reproduction Service No. ED195953)

Herber, H.L. (1978). *Teaching reading in content areas* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Just, M.A., & Carpenter, P.A. (1980). A theory of reading: From eye fixation to comprehension. *Psychological Review, 87*, 329–354.

Labov, W. (1972). *Language in the inner city: Studies in the black English vernacular*. Washington, DC: Center for Applied Linguistics.

Luiten, J., Ames, W., & Ackerson, G. (1980). A meta-analysis of the effects of advance organizers on learning and retention. *American Educational Research Journal, 17*, 211–218.

Mayer, R.E. (1979). Can advance organizers influence meaningful learning? *Review of Educational Research, 49*, 371–383.

Paris, S.G., & Lindauer, B.K. (1976). The role of inference in children's comprehension and memory. *Cognitive Psychology, 8*, 217–227.

Pichert, J.W., & Anderson, R.C. (1977). Taking different perspectives on a story. *Journal of Educational Psychology, 69*, 309–315.

Reynolds, R.E., Taylor, M.A., Steffensen, M.S., Shirey, L.L., & Anderson, R.C. (1981, April). *Cultural schemata and reading comprehension* (Tech. Rep. No. 201). Urbana: University of Illinois, Center for the Study of Reading.

Rumelhart, D.E., & McClelland, J.L. (1980). *An interactive activation model of the effect of context in perception* (Part 2; CHIP Tech. Rep.). La Jolla, CA: University of California, Center for Human Information Processing.

Stauffer, R.G. (1969). *Teaching reading as a thinking process*. New York: Harper & Row.

Steffensen, M.S., Joag-Dev, C., & Anderson, R.C. (1979). A cross-cultural perspective on reading comprehension. *Reading Research Quarterly, 15*, 10–29.

Tierney, R.J., & Cunningham, J.W. (1984). Research on teaching reading comprehension. In P.D. Pearson, R. Barr, M.L. Kamil, & P. Mosenthal (Eds.), *Handbook of reading research* (pp. 609–655). New York: Longman.

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Schema Activation and Schema Acquisition: Comments on Richard C. Anderson's Remarks

John D. Bransford

Professor Anderson has done an excellent job of presenting the essentials of schema theory and of highlighting a number of its implications. My comments on his paper are divided into two points. First, I want to reemphasize some of Anderson's major arguments and elaborate on several of their implications. I shall then discuss some potential shortcomings of many versions of schema theory and suggest some modifications that seem relevant to the issue of understanding how people learn from texts.

Several of Anderson's points about schema theory can be reviewed by considering the processes involved in understanding, and later remembering, a simple statement such as the following: "Jane decided not to wear her matching silver necklace, earrings, and belt because she was going to the airport." In order to comprehend this statement, one must go beyond the information that was given and postulate a reason for the connection between airports and Jane's style of dress. People who are familiar with airports—who have a well-developed "airport schema"—might assume that Jane decided not to wear her silver jewelry because of the metal detectors in airports. In Anderson's terminology, their schemata provide a basis for interpreting and elaborating on the information they heard.

Anderson also argued that schemata affect processes at the time of output as well as at input. For example, adults who attempt to recall the original "airport" statement three days later may rely on their knowledge of airports for a selective search of memory and then state that "Jane decided not to wear some metal jewelry because it could cause unnecessary delays at the airport." Note that this type of response reveals the comprehender's assumptions about important elements. It is the fact that the jewelry was metal that was most important and not, for example, that it was expensive or pretty. Anderson also emphasized this

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