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ABSTRACT

A study examined the relative merits of characteristics of general modeling when applied to cognitive modeling of reading comprehension processes and whether the characteristics of modeling, when applied to cognitive modeling of reading processes, influence comprehension and comprehension monitoring. Subjects, 100 eighth grade students who could adequately read material at a seventh to eighth grade level, but who were unable to detect inconsistencies in passages, were selected and randomly assigned to one of the four treatment groups representing different modeling characteristics: (1) passive cognitive modeling; (2) active cognitive modeling; (3) fullrange cognitive modeling; and (4) control. Data consisted of students' verbal protocols, oral retellings, and responses to a comprehension assessment. Results revealed significant differences among groups for reading comprehension based on oral retellings, and significant differences among groups for use of reading comprehension monitoring strategies. There were no significant differences among groups for performance on comprehension questions. Results add credible support to the application of a Social Cognitive Theory of Learning and to its usefulness to reading education. (Seven tables of data are included; 26 references and 1 appendix detailing strategies are attached.) (RAE)

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The Relative Merits of Characteristics of Teacher Verbal Modeling In Influencing Comprehension and Comprehension Monitoring Of Eighth Grade Readers

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Abstract

Theory and research suggest that cognitive modeling (verbalizing thought processes) is an effective instructional tool to teach reading comprehension processes. However, despite evidence suggesting the effectiveness of such an approach, little is known about how teachers most effectively model these processes and how students are influenced by modeled strategies. This study addressed two questions related to this problem: (1) What are the relative merits of characteristics of general modeling when applied to cognitive modeling of reading comprehension processes? (2) How do the characteristics of modeling, when applied to cognitive modeling of reading processes, influence comprehension and comprehension monitoring?

One hundred subjects were randomly assigned to one of four conditions representing different modeling characteristics: (1) Passive Cognitive Modeling, (2) Active Cognitive Modeling, (3) Fullrange Cognitive Modeling, and (4) Control. Data consisted of students' verbal protocols, oral retellings, and responses to a comprehension assessment. Results revealed: (1) significant differences among groups for reading comprehension ($p < .05$) based on oral retellings, and (2) significant differences among groups for use of reading comprehension monitoring strategies ($p < .05$). (3) There were no significant differences among groups for performance on comprehension questions.

Theory and research in comprehension and reading strategies suggest that cognitive modeling by teachers is an effective instructional tool that can be used to teach reading comprehension processes. However, despite evidence that suggests the effectiveness of modeling reading comprehension processes, little is known about how teachers most effectively model these processes and how students are influenced by modeled strategies. If cognitive modeling is to become an accepted and justifiable strategy to teach reading comprehension processes, there is a need for more information about its use with students and a need for practical instructional procedures for modeling reading comprehension processes.

This study was designed to address two major questions:

1. What are the relative merits of characteristics of general modeling when applied to cognitive modeling of reading comprehension processes?

2. How do the characteristics of modeling, when applied to cognitive modeling of reading processes, influence comprehension and comprehension monitoring.

The ability of humans to learn observationally through example has been documented by psychological research (Meichenbaum, 1971; Revels and Gutkin, 1983; Shunk and Gunn, 1985). A Social Cognitive Theory of Learning (Bandura, 1986) which acknowledges that much of human thought and action is socially as well as cognitively derived, was used to identify characteristics of modeling. The characteristics of good modeling used in this investigation were to (1) focus attention of the learner by promoting the "functional value" for the task being modeled, (2) instill self-efficacy in the learner, and (3) provide feedback in relation to the modeled process. As

characteristics of good modeling, they were applied to the modeling of reading comprehension processes. The treatment conditions were:

1. Control: No modeling

2. Passive Cognitive Modeling:
   Cognitive modeling only

3. Active Cognitive Modeling:
   Cognitive modeling
   Instill self-efficacy
   Promote functional value

4. Fullrange Cognitive Modeling:
   Cognitive Modeling
   Instill self-efficacy
   Promote functional value
   Give feedback

Since research in reading had only suggested that cognitive modeling was an effective instructional tool to use in teaching reading processes (Davey, 1983: Bereiter and Bird, 1985; Palincsar and Brown, 1984), it was necessary to look elsewhere for what constituted good modeling. Psychological research had documented that people can learn by observing others and had utilized modeling characteristics that were applicable to modeling of reading processes (Bandura, 1986; Revels and Gutkin, 1983; Meichenbaum, 1971). By linking psychological theory with modeling of reading processes, components from each discipline that could be utilized in this investigation were identified. Those components were:

Type of Modeling:	Intentional Active Verbal
Form of Modeling:	Cognitive Coping
Processes/ Behaviors:	Cognitive Metacognitive
Characteristics:	Focus Attention Instill Self-Efficacy Provide Feedback

For this study, cognitive modeling was defined to be, " Making visible the invisible mental processes" of reading by verbalizing and performing the processes for the learner (Roehler, Duffy, Meloth, 1984).

METHOD

Subjects

A sample of 100 eighth grade students who could adequately read material at a seventh to eighth grade level, but who were unable to detect inconsistencies in passages were selected and randomly assigned to one of the four treatment groups representing differenct modeling characteristics (passive cognitive modeling, active cognitive modeling, fullrange cognitive modeling, control). Students enrolled in exceptional educational or bilingual programs were excluded from the study.

Reading proficiency was determined by administering a cloze test to all students in their regular classrooms. Subjects with a score of 40 to 60 percent were selected first using Bormuth's (1968) instructional level. In order to obtain a sample of 100 subjects, the instructional level for this study was extended from 30-60 percent. Reading comprehension monitoring proficiency

was determined by administering four expository passages to all students in their classrooms in order to tap their facility to detect informational inconsistencies. This followed a procedure used by Garner (Garner and Krause, 1981-82; Garner and Taylor, 1982). Informational inconsistencies have been defined by Baker (1979) as "ideas in one sentence [that] conflict with those of another" (p.366).

There were no significant differences among the four groups for gender, reading proficiency, or ability to monitor comprehension based on the passage inconsistencies assessment.

Materials and Instruments

The materials for this study consisted of those used directly with subjects during the modeling interactions and those used for assessment of subjects' comprehension.

Passages

Six expository passages of approximately 350 words in length, which were similar in discourse structure, and were taken from language arts and social studies materials were used with students. So that students would not be familiar with the passages, they were taken from materials that were not used in their present eighth grade language arts or social studies curriculum. Passages covered a variety of topics and fell within a 7th to 8th grade readability range (Fry, 1977). Three passages were used to model the reading comprehension monitoring think-aloud strategy to the students and three were used by them to apply the modeled strategy.

Passages used by the students were determined to have an

equivalent level of difficulty since each had (1) a readability score at a seventh to eighth grade level (Fry, 1977), (2) a similar number of propositions as defined by Mandel and Johnson (1984), and (3) concepts determined to be unfamiliar to students at this level. Propositions were verified using two independent judges with 94% agreement for passage 1, 98% for passage 2, and 100% for passage 3. Concept difficulty was verified by six eighth grade teachers whose students would be involved in this study. According to the teachers, the students familiarity with the topics ranged from "somewhat familiar" to "no familiarity".

Think-Aloud Strategy Signposts

A "Think Aloud Strategy Signposts" form was developed for use with subjects in the passive, active, and fullrange cognitive modeling groups upon completing their own think aloud procedure. The form simply asked the subjects if they had performed each step and gave them space to write what they had done. The signposts provided checkpoints where each subject was given the opportunity to reflect upon the steps used in the think-aloud strategy, to review their own thinking process, and to check whether or not they had actually completed all the steps in the strategy.

Oral Retelling Scoring Procedure

A scoring procedure for passage 3 oral retellings was modified from a procedure by Smith and Jackson (1985). Their procedure allows for the assessment of three variables within each retelling - major generalization, correct and relevant details, and the coherence of the expression. However, since

retellings may also show what readers infer and distort from the original text, the Smith and Jackson scoring procedure was adapted to include inferences and distortions. McConaughy's (1985) definitions for distortions and inferences were used and modified slightly to reflect expository rather than narrative text discourse.

The validity of the scoring procedure was checked by a graduate student and a professor in reading education who identified what they thought to be major and minor generalizations in passage 3. There was 100% agreement on major generalizations and 92% agreement on minor generalizations. The disagreement was resolved through discussion and the list of generalizations was finalized.

Since the reliablity of the retelling scoring procedure was of utmost importance to this study, the interrater reliability was checked in the pilot study by two independent raters who were trained in the scoring procedure, and by one trained rater throughout the course of the study. Acceptable interrater reliabilities were obtained for all but one of the individual variables that comprised the retelling total score. The interrater reliabilities for the scorings were:

	r
Generalizations	.97
Details	.93
Text Structure	.86
Inferences	.74
Total Score	.97
Distortions	.64

Since the interrater reliability of the distortion ratings was low (r =.64) and the number of distortions actually made by

subjects minimal (mean = 1.77), distortion ratings were not included in the final analysis.

Sentence Verification Technique

Comprehension assessment questions for the passages were developed following the Sentence Verification Technique (SVT) (Royer, Greene, and Sinatra, 1987). The assessment consists of four types of sentences developed from each sentence in the passage - originals, paraphrases, meaning changes, and distractors. Students must identify them as "old" (original, paraphrase) or "new" (meaning changes, distortions).

Sentence types used in the assessment, were verified by two independent raters (graduate student and professor of reading). There was agreement on all but two items. After these items were rewritten, there was 100% agreement. The reliability of the test items for the SVT was determined by applying the Kuder-Richardson formula 20 (Ferguson, 1971) to the SVT assessments of all subjects. The reliability coefficient was .501.

Pilot Study

A pilot study was designed to determine the validity and reliability of procedures developed for use in this investigation. The specific questions addressed were:

1. Were the directions for the informational inconsistencies test clear enough for the subjects to follow?

2. Were the passages appropriate for the subjects in terms of readability and subjects' background knowledge of the topics?

3. Were the data collection procedures appropriate?

4. Was the researcher's verbal modeling of the think aloud strategy procedurally reliable?

5. Was the scoring procedure for retellings reliable?

Twenty-four eighth grade students participated in the pilot. and were randomly assigned to one of the four treatment groups.

Data Collection Procedures

The data for this study consisted of the readers' verbal protocols as to how they applied the modeled think-aloud strategy during their reading of the third passage, the readers' oral retellings of the passage read while applying the modeled strategy, and responses to the SVT assessment. Each subject was randomly assigned to a treatment group and met with the researcher for three sessions of approximately forty-five minutes in lieu of their language arts or social studies class.

Data were collected in the following manner for each group for the three sessions. The first session was a practice session to familiarize the subjects with the research situation, procedures, and the researcher and consisted of teacher cognitive modeling to a group of twelve, followed by each subject practicing the modeled techniques while reading aloud to another subject, concluding with each subject using the techniques and thinking aloud while reading silently (Collins and Smith, 1980). The second and third sessions consisted of teacher cognitive modeling to groups of two, followed by each subject individually using the modeled strategy and thinking aloud while reading silently, followed by a buffer task to control for short term memory, an oral retelling of the passage read, and the SVT assessment.

The cognitive modeling for all three sessions included two aspects of reading comprehension monitoring (problem identification and fix-up strategies) and utilized four of the steps from Davey's (1983) "Think Aloud" strategy: 1) make a prediction, 2) share an analogy, 3) verbalize confusions, and 4) demonstrate fix-up strategies that could be used to help clear up the confusion. The fix-up strategies followed those identified by Alessi, Anderson and Goetz (1979): 1) store the problem in memory as a pending question; 2) reread the text; 3) read ahead in the text; 4) consult another source. A listing of think-aloud steps and fix-up strategies was typed and available for subjects to refer to. They were also posted in the room on large sheets of construction paper.

Specific characteristics of modeling varied by group and were used in all three session.

1. Passive Cognitive Modeling

The researcher cognitively modeled the steps in the think-aloud strategy while reading a text passage for the subjects. The subjects then performed the strategy to themselves while silently reading another text passage. This was followed by a probed oral retelling of the passage and a sentence verification technique for comprehension assessment.

2. Active Cognitive Modeling

Cognitive modeling was conducted as above with an added statement by the researcher to explain the functional value of the modeled strategy and to foster self-efficacy in the subjects This was followed by a subject probed oral retelling of the

passage and the sentence verification technique for comprehension assessment.

3. Fullrange Cognitive Modeling.

Cognitive modeling was conducted the same as in the Active Cognitive Modeling group. In addition, the subjects received feedback in the form of self-assessment and encouragement from the researcher while performing the modeled strategy. This was followed by the same subject probed oral retelling and sentence verification technique as the other two groups.

4. Control (no modeling).

Each subject in this group was asked by the researcher to read the text passage and note when and where their comprehension broke down and to tell what they could do to fix it up, followed by a probed oral retelling and the sentence verification technique

The resulting data were analyzed to note differences among groups in terms of reading comprehension monitoring and reading comprehension, and to relate those differences to cognitive modeling treatments.

Data Analysis Procedures

Data from session three were analyzed to determine significant differences among groups for reading comprehension and reading comprehension monitoring. An analysis of the subjects' verbal think-aloud protocols was conducted to determine if they monitored their comprehension in the manner of the modeled strategy. An analysis of the subjects' oral retellings and SVT assessments was conducted to determine whether the

cognitive modeling of the reading comprehension monitoring strategy had an effect on their comprehension of the passage read. Working hypotheses are presented separately along with statistical and/or analytical procedures used to address the hypotheses.

> Hypothesis 1: There will be significant differences among students in treatment groups for frequency and type of think-aloud strategy use by students.

Verbal think-aloud protocols were transcribed and definitions for the four steps in the reading comprehension monitoring think-aloud strategy (make a prediction, share an analogy, verbalize confusions, use fix-ups) were developed based on Davey (1983) and Collins and Smith (1980).

Use of the steps was coded for each subject's think-aloud protocol and the frequency of occurrence for each was tabulated. Due to the low frequency of strategy use (i.e. 0-5 times per reading), data were coded for analysis as strategy use or no strategy use. To determine other unmodeled strategies used by students, a post hoc analysis was performed following Guba and Lincoln's (1981, pp.243-44) "canons of good category construction." Six additional strategies of reading comprehension monitoring used by the students emerged from the data (hypothesis, retelling, verification, evaluation, form pictures, progress monitoring). A chi-square analysis was performed to determine if the groups differed significantly in use of the modeled and unmodeled strategies.

Types of confusions noted and fix-up strategies used were analyzed in the same manner. The predetermined categories used for identified comprehension confusions were Davey and Porter's

(1982) "sources of errors" (word level, idea level). For fix-up strategies, Alessi, Anderson, and Goetz's (1979) categories were used (store in memory, reread, read ahead, consult another source). Again keeping in mind "canons of good category construction" (Guba and Lincoln, 1981), post hoc analysis was conducted and two additional categories for comprehension confusions and fix-up strategies emerged (continued confusions, other confusions, author focused fix-ups, use context). A chi-square analysis was used with this data to determine if treatment groups differed significantly in their use of different types of fix-up strategies and their noting of different types of comprehension confusions.

The validity of the strategy categories, both predetermined and emergent was tested following a procedure used by Powell (1986). There were no disagreements between the reviewer and the researcher on any categories and definitions, although names and definitions may have differed slightly. The reliability of the coding procedure for strategy use was determined by using an independent rater who was trained in the procedure using five uncoded protocols from the pilot study. There was 85% agreement between the reviewer and the researcher across all categories for think-aloud strategy use and 98% agreement for types of confusions noted and fix-up strategies used.

> Hypothesis 2: There will be significant differences among groups for reading comprehension in terms of scores received on retellings of passages read while performing the modeled strategy.

The transcribed retellings were examined using a modification of a procedure developed by Smith and Jackson (1985)

for scoring retellings. This procedure allowed for assessment of six variables. They were generalizations, correct and relevant details, coherence of text structure, inferences drawn, distortions made, and a total comprehension score. A total comprehension score was obtained for each retelling by summing the points for all the variables, excluding the distortions score. Retelling scores were analyzed using a one-way analysis of variance ($p < .05$). If significant differences among groups were indicated, this procedure was followed by the Student-Newman-Keuls Procedure ($p < .05$) to determine significant differences among treatment groups for each retelling variable.

> Hypothesis 3: There will be significant differences among treatment groups for reading comprehension in terms of scores received on the sentence verification assessment.

The sentence verification assessment data were scored by computing a percentage score for items answered correctly. A one-way analysis of variance, followed when appropriate by the Student-Newman-Keuls Procedure, was performed to determine significant differences among groups for performance on the sentence verification technique.

RESULTS

Results are discussed in terms of the three hypotheses.

Hypothesis 1 -- Strategy Use

There were significant differences among groups for use of reading comprehension monitoring strategies, both modeled and unmodeled. Students in the modeling conditions did significantly more monitoring of their comprehension by applying the modeled

strategies and by using their own un-modeled strategies. (See Appendix.)

The results of the chi-square analysis revealed significant differences among groups in usage for prediction (.000), analogy (.000), fix-ups (.000), hypothesis (.000), retelling (.008), and verification (.002). There were no significant differences among groups for confusions noted (.519) and progress monitoring (.057). (See Table 1.). Due to low frequency of strategy use (i.e. 0-5 times per reading), data were coded as strategy use or no strategy use.

Table 1

Chi-Square Analysis for Major Strategies

Strategies	Chi-square	D.F.	P level
Predict	71.573	3	.000
Analogy	40.040	3	.000
Confusions	2.262	3	.519
Fix-ups	41.477	3	.000
Hypothesis	18.244	3	.000
Retell	11.583	3	.008
Verification	14.247	3	.002
Progress Monitoring	7.509	3	.057

Further analysis revealed that the control group used all the strategies significantly less than the other groups. Specifically, they used prediction, fix-ups, analogy, and

verification significantly less than the passive, active and fullrange modeling groups; and hypothesis significantly less than passive and fullrange. In addition, the active and fullrange modeling groups did significantly more retelling of the passage than did either the control or passive modeling groups. (See Table 2.)

Table 2

Summary Table of Major Reading Comprehension Monitoring Strategies: Significant Differences Between Pairs of Groups Using Chi-square with Continuity Correction Factor

Strategy	Significant Differences (<.05)
Prediction:	control < passive, active, fullrange
Analogy:	control < passive, active, fullrange passive < active
Fix-ups:	control < passive, active, fullrange
Hypothesis:	control < passive, fullrange active < fullrange
Retell:	control, passive < active, fullrange
Verification:	control < passive, active, fullrange

Of these strategies, noting of comprehension confusions was most used by students as a total group (94.8%) with fix-up strategies next (73.2%), followed by prediction (69.1%), progress monitoring (61.8%), and hypothesis (58.8%).

For types of confusions noted and fix-up strategies used, the results of the chi-square analysis revealed significant differences among groups for use of the fix-up strategies, reread

(.000), read ahead (.000), and read ahead + store in memory (.000), but not for the word level (.980) nor idea level (.497) confusions. (See Table 3.)

Table 3

Chi-Square Analysis for Major Categories Of Confusions and Fix-ups

Categories	Chi-square	D.F.	p
Word Level Confusion	.179	3	.9808
Idea Level Confusion	2.380	3	.4973
Reread	17.495	3	.0006
Read Ahead	24.389	3	.0000
Read Ahead + Store in Memory	35.964	3	.0000

Further chi-square analysis performed on pairs of treatment groups revealed that the passive, active, and fullrange modeling groups reread and read ahead to fix-up their comprehension confusions significantly more than did the control group. No differences between other groups were revealed by this analysis. (See Table 4.)

Table 4

Chi-square With Continuity Correction Factor For Reading Comprehension Monitoring Categories by Pairs of Treatment Groups

	Pairs of Groups					
Strategies:	Control Passive	Control Active	Control Full R.	Passive Active	Passive Full R.	Active Full R.
Reread	11.000*	4.504*	8.465*	1.063	.012	.365
Read Ahead	14.556*	13.714*	13.554*	.015	.029	.065
Read Ahead + Store in Memory	16.806	8.481	12.998	.276	.000	.042

* denotes significant differences between pairs at $p < .05$

Of these categories, students noted types of confusions (word level = 80.4%, idea level = 53.5%) more than they used fix-up strategies to alleviate confusions (reread = 47.4%, read ahead = 43.3%). For types of confusions noted, all four groups were very similar in frequency of use for both word level (79.2% - 83.3%) and idea level (41.7% - 62.5%) confusions. For types of fix-ups used, all groups seldom used store in memory (0% - 20.8%) and consult another source (0% - 12.5%). The passive, active, and fullrange modeling groups used reread and read ahead, more frequently than did the control group (12.5% vs 48% - 66.7% and 0% vs 56% - 58.3%)

Hypothesis 2 -- Comprehension Measured by Oral Retellings

A quantitative analysis of each subject's transcribed and

scored oral retelling followed by a one-way analysis of variance of the scores revealed significant differences among groups. F ratios were found to be significant at $p < .05$ level for correct and relevant details (.000), coherence of text structure (.000), inferences drawn (.012), and total score (.000) which was comprised of the sum of generalizations, details, text structure, and inferences. Generalizations were not significant among the groups (.171). (See Tables 5.)

Table 5

Retellings: One-Way Analysis of Variance for Between Groups

Retelling Variables	DF	SS	Mean	F ratio	F prob.
Generalizations	3	44.1065	14.7022	1.7056	.1713
Details	3	96.5211	32.1737	6.8739	.0003
Text Structure	3	253.1735	84.3912	7.4170	.0002
Inferences	3	25.5984	8.5328	3.7976	.0128
Total Score	3	1210.3081	403.4360	7.1734	.0002

Post hoc analysis revealed that both the active and fullrange groups recalled significantly more details than did the control and passive groups. For coherence of text structure, the active and fullrange modeling groups both received significantly higher ratings than did the control group, with the fullrange group also having significantly better ratings on the text structure of their retellings than the passive modeling group.

For inferences made while retelling the passage, the active group made significantly more of them in their retellings than did the control group. For the total retelling score, the results indicated that both the active and fullrange modeling groups had significantly higher total reading scores than did the control and passive modeling groups. (See Table 6.)

Table 6

Summary Table Retelling Variables: Significant Differences Between Pairs of Groups Using Student-Newman-Keuls Procedure

Retelling Variables	Significant Differences ($p < .05$)
Details:	control, passive < active, fullrange
Text Structure:	control < active, fullrange passive < fullrange
Inference:	control < active
Total:	control, passive < active, fullrange

Hypothesis 3 -- Comprehension Measured by SVT

There were no significant differences among groups for the SVT comprehension assessment. A one-way analysis of variance was conducted on the SVT scores, and the F ratio was not significant (.748). (See Tables 7.)

Table 7

Sentence Verification Technique: Means, Standard Deviations and Range Scores

Group	n	Mean	S.D.	Range
Control	24	15.583	2.244	9 - 20
Passive	24	15.125	2.559	11 - 19
Active	25	14.920	2.782	11 - 20
Fullrange	24	15.500	2.043	11 - 18
Total	97	15.278	2.405	9 - 20

DISCUSSION

Hypothesis 1 -- Strategy Use

The results for hypothesis 1, revealed that students in this investigation were able to apply and utilize the comprehension monitoring strategies modeled for them, and more. The modeled strategies, when combined with instilling self-efficacy in students and promoting the functional value of the modeled task, evoked more proficient monitoring in students. When these characteristics of modeling were added, the students regularly took cognitive risks and went beyond the modeled strategies to hypothesize, retell, verify, and evaluate information while reading. When supportive feedback was given to students in the fullrange group, they more readily took these cognitive risks and verbalized their thought processes. Each strategy will be discussed in terms of its relationship to the

treatment groups and modeling characteristics.

Making predictions was used only by students in groups receiving modeling conditions (passive, active, fullrange). The ability to predict, or form good hypotheses, about the text's meaning before beginning to read is a useful reading strategy that can be learned by students. This has been documented by Palincsar and Brown (1984) who successfully included it in their "reciprocal teaching" activity with low proficiency readers. The results of the present investigation indicate that average proficiency readers also do not make predictions unless taught to do so. Those students in the control group who did not observe the modeled strategy were not able to do this on their own. The results also indicate that students can clearly learn to predict, however, even with passive modeling.

Hypothesizing was not specifically modeled for students as a step in the think-aloud strategy, yet it emerged as the most used of the six emergent strategies. Modeling created more benefits for the students than simply the strategies modeled. By having the strategy of predicting modeled for them, the students were able to continue that mode of thinking into hypothesizing while monitoring their comprehension through the rest of the text. Of the sixty-seven students who made predictions in their think-alouds, forty-seven (70%) followed through with additional hypotheses and speculations on meanings and interpretations. The fullrange modeling group had a larger percentage of follow through from predicting to hypothesizing (86.9%) than did the active (54.5%) and passive (68.1%) modeling groups.

Share an analogy

In essence, the types of responses coded as analogies were in fact more than that. Students again went beyond the basic modeled strategy, this time drawing upon their background knowledge to seek relationships between what they were reading and their own lives. As schema theory suggests, we use words as referent points for larger categories of meaning that exist in our memories. The activating of images, experiences, recollections, and abstract thoughts are crucial in order for the reader to move beyond rote reading. Students who had analogies modeled for them were able to do this. In fact, when characteristics of modeling (self-efficacy, functional value, feedback) were added to the modeling process, they were able to draw upon their background knowledge more frequently than those students who did not have the benefit of these additional characteristics.

Verbalizing confusions was clearly the most used of all the strategies, modeled or emergent, with 22 control group students using it, 24 from the passive modeling group, 23 from the active group, and 23 from the fullrange modeling group. Even though students in the control group received no modeling of how to verbalize confusions, they still noted nearly as many as the other groups that had the modeling treatments. Some possible reasons for this are: 1) Directions specifically asked the students in the control group to verbalize confusions by telling "anything that's confusing to you -- anything at all that doesn't make sense," and "to fix-up or think about the reading differently so it makes more sense to you." 2) Eighth graders

appear to be more familiar with "confusions" as a term and concept than with "fix-ups," which the control group students seldom used, even though asked to do so.

The verbalizing of confusions, by all groups alike, is explainable when comprehension breakdowns are viewed as "dissatisfactions" with the fit between information read and the meaning of the text as a whole (Baker and Brown, 1984). The eighth graders in this study, across all treatment conditions, appeared to be aware of dissatisfactions in their comprehension. They were not, however, as adept at using fix-ups to alleviate the dissatisfaction, without having benefit of the modeled strategy. Since eighth graders seem to readily be able to recognize when their comprehension breaks down, educators would be wise to put less emphasis on identifying confusions in comprehension and more on how to correct or compensate for the breakdowns.

The passive, active, and fullrange modeling groups used <u>fix-up strategies</u> more than the control group. It is curious that the control group noted confusions which were asked of them, but not fix-up strategies which were also requested. Their unfamiliarity with the term "fix-ups" no doubt had some bearing on this, but it is actually more than that.

Taking the view that comprehension failures are really "dissatisfactions", then one becomes "satisfied" when the information read connects to make sense of the text. "Monitoring is one's awareness of the extent of satisfaction. Compensation [fix-ups] is 'fitting' or 'connecting' over again because there is dissatisfaction" (Barr, et.al., 1987, p. 219). Students in

the control group were aware that they were dissatisfied, but they did not know how to compensate or fix-up for that dissatisfaction in comprehension. All of the groups that had fix-up strategies modeled for them, were able to use them to alleviate comprehension breakdowns. Specifically, the fullrange modeling group was the only group in which every student used fix-up strategies at least once.

The active and fullrange modeling groups did more retelling than did the control and passive modeling groups. The active and fullrange groups appeared to more freely verbalize their thoughts with double checks on their comprehension by retelling to themselves as they read along in the passage. Retelling or summarizing, as a strategy for self-review, is a method of testing one's comprehension that is commonly used by proficient readers (Brown and Day, 1983). As Baker and Brown (1984) noted, "If a reader cannot produce an adequate synopsis of what he is reading, this is a clear sign that comprehension is not proceeding smoothly and that remedial action is called for" (p. 384).

Here again, modeling evoked more than just the modeled strategies from the students. Students in the active and fullrange modeling groups expanded the modeled comprehension monitoring strategies to include retelling as a self-check on their comprehension progress. These were the students who were encouraged to believe that they could succeed at an activity by giving it their best effort (self-efficacy), and were told that the activity had a functional value for them, which was better

understanding of what they read.

Verification was used more by the three groups that received some form of modeling than by the control group that received none. In addition, the fullrange group did more verifying (62.5%) than did the passive and active groups (54.2% and 48%). It also had the most students who made more than two verifications in their think-alouds (16.7% compared to 8% for active and 4.2% for passive). The modeling groups, particularly the fullrange group, went a step further than the modeled strategies by seeking verification for their hypothesizing and solutions to their comprehension confusions. This could be due in part to the neutral yet supportive feedback that students in the fullrange group received from the researcher. With this supportive feedback, the students appeared more willing to verbalize their thoughts without fear or undue risk.

Progress Monitoring (commenting on one's progress of comprehension while reading) was a utilitarian strategy used by students in what appeared to be an effort to merely keep track of what was going on with their comprehension (i.e. "I understand this part" and "In the fifth paragraph I don't find anything confusing"). It required little cognitive processing of their thoughts while reading, compared to the other emergent strategies such as hypothesizing and verifying.

Progress monitoring was the only strategy, modeled or emergent, that was used more frequently by the control and passive modeling groups (70.8% - 79.1%) than by the active and fullrange modeling groups (52% - 45.8%), although not statistically significant. It is curious that the control and

passive groups would use this strategy so much more than the other groups. A reason for this may be that the active and fullrange groups were encouraged, through the modeling characteristics of self-efficacy and functional value, to take cognitive risks and verbalize their thinking processes by making hypotheses, verifying information, and retelling. They did not rely upon the restrained and limited "progress monitoring" statements used frequently by the control and passive modeling groups (i.e. "That's good....I understand that so far....I don't find anything I don't understand.") The control and passive modeling groups seemed to have more difficulty getting into the swing of the the think-aloud strategy and breaking out of their restrained verbalizing. Neither group had benefit of the modeling characteristics, self-efficacy and functional value.

The strategy of progress monitoring did not appear to be beneficial to the control and passive modeling groups since their retelling scores for comprehension were lower statistically than those for the other modeling groups. Here again, it is clear that passive modeling alone is not enough to engage students in effective monitoring of their comprehension.

Evaluation was used by students when they ascertained the value or worth of something while performing their think-alouds. As with the non-modeled strategy "verification" the students in the fullrange group again seemed more willing to monitor their comprehension beyond those strategies modeled for them. In this instance, they monitored their comprehension by making evaluative comments as they proceeded through their reading.

With their more frequent use of word level confusions, the control and passive groups appeared to continue their pattern of more restrained comprehension monitoring that was closely tied to the text. This was in contrast to students in the active and fullrange groups who frequently took risks to take their thinking beyond the printed page, though not statistically significant.

Idea Level and Continued confusions were also verbalized by all groups (53.6% for idea level, 10.3% for continued), but less so than word level confusions (80.4%). Word level confusions seemed easier for the students to recognize and verbalize, no doubt because by eighth grade, recognizing and defining unfamiliar words is a familiar task for them.

Unlike confusions, there were statistically significant differences among groups for use of fix-up strategies. Fix-up strategies were used more by the modeling groups than by the control group. Specifically, the fix-ups "reread" and "read ahead," were used more by the three modeling groups by the control group.

The fix-up strategy, reread, was used more by the three modeling groups than by the control group. When comprehension breaks down, proficient readers are aware of this dissatisfaction with their understanding of the text, and will often reread to seek a level of satisfaction with the meaning of the text as a whole (Bereiter and Bird, 1985). Students in the modeling conditions for this study, would frequently "backtrack" and reread to clear up confusions (66.7% for passive, 48% for active, 62.5% for fullrange). Yet, only three students from the control group (12.5%) were able to utilize rereading as a fix-up strategy

without the benefit of the modeled strategy. Rereading was the only fix-up strategy used by students in the control group throughout the entire study. The results support the conclusion that average proficiency readers in this investigation do not use rereading as a fix-up strategy unless taught to do so, but can learn it even with passive modeling.

The fix-up strategy, read ahead, was used more by the three modeling groups than by the control group. In fact, students in the control group did not use it at all. Students in the modeling treatments appeared to be more comfortable about reading ahead as a strategy to clear up problems and willingly verbalized this strategy. As with rereading, students can learn to read ahead to compensate for their comprehension problems, even with the more minimal passive modeling.

As a fix-up strategy, store in memory is similar in some respects to the fix-up read ahead. With both strategies, readers must be able to identify the problem in their comprehension, realize that the immediate text is not adequate to resolve it, and store that problem in their memory as they read on in anticipation that it will be cleared up. In actuality, a readers must continue reading on while storing a comprehension problem in their memory, or abandon the text.

Consult another source was used infrequently by all groups (8.2% for total group). Logistically, "consulting another source" was not able to be modeled as frequently or as completely as other fix-up strategies. It is also possible that the social setting may not have allowed for students to do this as easily.

The emergent fix-up strategy, author focused though used infrequently among groups (< 8.0% total group), did offer insight into the students' use of a non-modeled fix-up strategy. Author focused fix-ups were used only by the control group (25%), with the exception of one other student in the fullrange group. Control group students were asked to "fix-up or think about the reading differently so it makes more sense to you." With this definition guiding them, the students were more likely to talk about what an author could do to help with their comprehension confusion (i.e. rewrite, expand, clarify) than what they as readers could do. These students assumed the role of passive participants in handling their comprehension problems. Rather than taking some direct action on their own, they suggested that some impersonal third party handle it. Without the benefit of modeling, they were not aware of other approaches to fix-up comprehension problems.

Use Context was also used very infrequently by all groups (4.1% total group). As a fix-up strategy, it has value for those individuals who are able to integrate text information that is understood with that which is unclear. Successful integration of the known with the unknown helps satisfy a reader's desire to comprehend the text as a whole, and serves as another method to monitor comprehension.

The only strategies used frequently by the control group were "noting confusions" and "progress monitoring." They did not use fix-up strategies. This suggests that the student were aware of when and where their comprehension breaks down, but without the modeling used in this study, they did not know how to correct

or fix-up those problems.

From these results, it can be concluded that (1) students can indeed apply comprehension modeling strategies that are modeled for them even with passive modeling, and (2) students are more proficient in their comprehension monitoring when they have a sense of their own self-efficacy and know the functional value of the modeled task.

Hypothesis 2 --Comprehension Measured by Oral Retellings

Active and fullrange groups had significantly better retellings than the control and passive modeling groups on the retelling variables of "correct and relevant details," "coherence of text structure," "drawing inferences," and "total score."

For recall of correct and relevant details, the active and fullrange groups scored higher than did the control and passive cognitive modeling groups. They consistently recalled more details (mean = 5.0 for active, 5.7 for fullrange) throughout their retellings than did the control and passive groups (mean = 3.5 for control, 3.4 for passive).

Even with the benefit of modeling, students in the passive group did not recall as many details as the groups that experienced the additional modeling characteristics of instilling self-efficacy and promoting the functional value of the modeled task. Students who received these characteristics used modeled and non-modeled strategies more frequently. This more frequent use of strategies resulted in more extensive and proficient monitoring of their comprehension with strategies such as "retelling" in which they double-checked their understanding of

the passage as they proceeded through it.

Coherence of text structure was judged as having either no structure, weak structure, adequate structure, or good structure. Scores for "good" text structure were received only by students in the active and fullrange groups. Reasons for the higher text structure scores follow the same line of thinking as was begun with the discussion on use of "details." These students believed in the value of the task and their ability to perform it, and consequently interacted more with the text by using strategies more frequently and proceeding beyond the modeled strategies to more proficient monitoring (i.e. hypothesizing, verifying, evaluating). As a result, they came away from the text with a greater sense of its structure and meaning than did the passive and control groups.

Drawing inferences appears to be closely tied to the strategy of making analogies, as defined in this study. With use of analogies, both the active and fullrange groups did more frequent (88% and 75%) and proficient monitoring of their comprehension, by going beyond the text and drawing upon new information from their experiential backgrounds.

Generalizations which are a component of the total reading score, were not found to be significantly different statistically among the treatment groups. The active and fullrange groups did, nevertheless, have higher maximum ratings (12 and 10) compared to the control and passive modeling groups (9 and 8). Although generalization ratings were not statistically significant among the groups, the types of generalizations made were slightly different. The control group tended to make straightforward,

simple generalizations, whereas the active and fullrange groups were more likely to elaborate on their generalizations. Examples are given for the generalization, "Mermaids don't really exist."

> Well, mermaids don't exist. (#3 - no elaboration)
> And it told how -- obviously, mermaids aren't real because -- I don't know, people don't live under water. (#68 - elaboration)

The fullrange and active cognitive modeling groups had better comprehension of the passage read while performing the think-aloud strategy than did the control and passive cognitive modeling groups as measured by oral retellings. Active and fullrange groups received the same cognitive modeling as the passive group. The only difference was that the active and fullrange groups received additional modeling characteristics in the form of statements to (1) instill self-efficacy in learners, and (2) promote the functional value of the modeled think-aloud strategy. In addition, the fullrange group received neutral, supportive feedback on their progress. With all other variables being equal (i.e. student characteristics, setting, materials, the model, modeling procedure), the additional modeling characteristics were the only differences in the treatments.

Clearly, passive modeling alone is not enough to influence reading comprehension on oral retellings when compared to the performance of the students in the active and fullrange cognitive modeling groups. Students in the fullrange and active modeling groups, with the aid of the modeling characteristics of instilling self-efficacy in learners and promoting the functional value of the task, used more comprehension monitoring strategies which led to better understanding of the passage as measured by

oral retellings. This conclusion is evident from the results of the quantitative analysis performed on the retelling variables.

Hypothesis 3 -- Comprehension Measured by SVT

Quantitative analysis of the SVT produced no statistically significant differences among the treatment groups for this comprehension measure. In examining the SVT results, one might argue that the modeling characteristics may have had no influence on reading comprehension. An argument can be made that the students in the treatment modeling groups did better on the oral retelling than the control group because they were exposed to more verbalization and encouraged to verbalize more. This more extensive verbalization would then lead to more verbalization on the part of the treatment subjects, and hence more generalizations, correct and relevant details, inferences, and a better text structure in their oral retellings.

This interpretation, however, is limited when the treatment conditions and retelling variables are examined closely. On the surface it may appear that the active and fullrange modeling groups were exposed to more verbalization from the model. Examination of the treatments indicates that the amount of verbalization for the active and fullrange groups was not much different than for the passive cognitive modeling group, yet the passive group performed more like the control group on retellings. The additional verbalization to the active and fullrange groups was merely a statement to promote the functional value of the modeled task and to instill self-efficacy in the learner. The fullrange group also received some supportive

feedback, but this did not appear to influence their oral retellings since there were no significant difference between them and the active group on the oral retelling variables. With everything else being equal, except for the functional value and self-efficacy statement, the passive group performed poorer than the active and fullrange groups for noting "correct and relevant details" and "total score," and poorer than the fullrange group for "text structure". For use of strategies, the passive group also did less "retelling" as they performed their think-alouds than did the active and fullrange groups. This suggests that results should be attributed to more than simply encouraging subject verbalization in the treatment groups. Significant differences among the treatment groups suggest the efficacy of the functional value and self-efficacy modeling characteristics.

The oral retellings, when analyzed specifically for generalizations, details, inferences, text structure, and total score, appeared to more clearly reflect the reading processes that were emphasized with students in this study, than did the SVT assessment. In performing the think-aloud strategy, the students in all groups needed to draw upon their background knowledge and activate a schema for the passage they were reading. All groups were able to do this to some extent by making analogies, and drawing inferences. Nevertheless, the modeling groups were able to it more frequently and also go beyond the modeled strategies to hypothesize, verify, and retell information. Use of these strategies appeared to be more easily reflected in the retelling variables than in the "old" and "new" information designations of the SVT.

Modeling clearly affected the behavior of the students, as is evident from the analysis of their verbal think-aloud protocols. It also had some influence on their comprehension as indicated by their performance on oral retellings. How much influence and of what duration is for further research.

Students learn to apply comprehension monitoring strategies when they are modeled for them, even with the basic passive modeling. It is when additional characteristics of modeling are included that students not only learn the modeled strategies but go beyond them to monitor themselves at a more proficient level. The characteristics that evoked this in students were (1) instill self-efficacy in students, and (2) promote the functional value of the task being modeled. The results of students' more proficient monitoring paid off in improved comprehension for active and fullrange modeling groups, as measured by oral retellings. "Any attempt to comprehend must involve comprehension monitoring" (Baker and Brown, 1984, p.355).

Limitations

Even with care taken in the design of this study, there were some limitations that should be addressed. One limitation was in the area of subject selection. Subjects were selected in such a manner that the passages used in the study should not have been overly difficult, nor overly easy for them. Each passage contained concepts determined by the researcher and teacher judges to be unfamiliar for eighth graders. However, since screening for the ability to monitor comprehension is a difficult task, the potential did exist that some students would have

little or no problems with a passage, and hence the data collected from them would not be a true representation of their reading comprehension monitoring ability. No formal procedure was built into this study to check for this.

Another limitation centered on the potential for researcher bias in terms of data collection and analysis. Although monitoring of procedures and assessments occurred throughout the study and indicated strong reliabilities, it is possible that the researcher, who worked as a reading specialist in the school where the study took place and performed the treatment conditions, may have had undetected biases which might have unconsciously influenced subject responses.

There were several limitations in this study concerning collection and analysis of data. First, the validity of the verbal reports is important since conclusions about subject comprehension and monitoring ability are based on that data. It is always difficult to guarantee that subjects say everything they know or are capable of saying. For this reason, precaution was taken to maintain the validity of the data in terms of the subjects' willingness to verbalize and, the model's ability to reliably perform the modeled strategy. The fact that every student attempted a minimum of over 100 words of think-aloud protocol, suggests subjects were involved and trying. It is not possible to determine if they were trying to their utmost ability.

Finally, subjects were asked to stop at predetermined places in the text to verbalize their thoughts. This stopping to verbalize interrupted the natural process of reading and may have

resulted in an incorrect representation of their thought processes.

Despite some limitations, the results of this investigation add credible support to the application of a Social Cognitive Theory of Learning and its usefulness to reading education. Having taken characteristics of modeling from this theory and having applied them to modeling of reading comprehension processes in an instructional study, their value has been enhanced for reading researchers and practitioners.

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APPENDIX

Predetermined Strategies

1) Make a prediction - The reader predicts what he/she thinks the passage will be about.

2) Share an analogy - The reader notes similarities and/or relationships between what is being read and other things.

3) Verbalize confusions - The reader notes when his/her comprehension breaks down.

4) Apply fix-ups - The reader takes some kind of remedial action when his/her comprehension breaks down.

Emergent Strategies

* Hypothesis - The reader formulates a tentative explanation of something that is not clear or unknown.

* Retelling - The reader simply retells what was read.

* Verify - The reader verifies/confirms an hypothesis or confusion by being able to "figure out" what it now means.

* Evaluative Comment - The reader makes an evaluative statement about what is being read.

* Form Pictures - The reader relates and explains a picture that has formed in his//her mind while reading the passage.

* Progress Monitoring - The reader simply makes comments on the progress of his/her comprehension without much explanation or thought.

Predetermined Confusion Types

1) Word level confusion - The reader's confusion is focused on a word that is unknown or unclear in meaning.

2) Idea level confusion - The reader's confusion is focused on an idea that is unclear or confusing.

Emergent Confusion Types

* Continued confusion - The reader notes that a previous confusion has not yet been cleared up and is still a comprehension problem.

* Other confusions - Miscellaneous confusions that are not word level, idea level, or continued.

Predetermined Fix-ups

1) Store problem in memory - The reader holds the problem in memory in anticipation that it may be cleared up later.

2) Reread - The reader rereads part of the text to help clear up the confusion.

3) Read ahead - The reader reads on in anticipation of clearing up the confusion.

4) Consult another source - The reader chooses to consult another source (i.e. person, book) to clear up the confusion.

Emergent fix-ups

* Author focused - The reader states what the author could do in terms of rewriting the text to clear up the confusion.

* Use context - The reader uses the context of the text to help clear up the confusion.