

## UTILIZATION OF IMPOSED STRUCTURE: THE IMPACT OF READING COMPETENCE AND GRADE LEVEL<sup>1</sup>

Mark Grabe  
*University of North Dakota*

*Abstract.* Fourth and sixth grade students grouped as good or poor readers were asked to read a story from a certain perspective or with instructions to read carefully. The ability to take a perspective, as measured by skill in differentiating important material on a highlighting task or in reproducing it on a later recall test, was present in both age groups. Reading skill was found to produce significant differences on both types of dependent measures. Further analysis indicated that reading ability differences in recall were related to, but could not be totally accounted for, by the ability to identify important material. A model is proposed claiming that poor readers are too overburdened by lower level reading skills to engage in this type of cognitive processing.

A substantial literature has recently accumulated demonstrating that retention of a specific item of information from a prose passage is at least partly a function of the place that item holds in the cognitive organizational structure the reader applies in attempting to comprehend the passage. Although the same basic principles are probably operating in each case, the nature of cognitive structure varies to some extent across several areas of research. It may represent the idealized structure of a common prose form (Kintsch, 1977; Mandler & Johnson, 1977), the unique logical structure of a given passage (Meyer & McConkie, 1973) or an externally imposed schema (Pichert & Anderson, 1977). While the exact mechanism by which a structure influences retention in any of these areas of research is not well understood, it has been argued that a structure either aids storage, retrieval or the distribution of a reader's attention (Pichert & Anderson, 1977).

Given the demonstrated relationship between structure and retention, the ability to utilize structure becomes a skill warranting closer scrutiny. Perhaps the development of this skill is important in attaining a mature reader's approach to prose comprehension. Of special interest would be a careful examination of potential age or reading competence differences in the use of an available organizational structure. Most previous developmental studies of prose retention (Brown, 1975; Brown & Smiley, 1977a; Christie & Schumacher, 1975; Mandler & Johnson, 1977; Dent &

Thorndyke, Note 1) seem to indicate that children from even the early elementary grades are sensitive to prose structure. These studies do show that retention of prose material improves with age. However, the research also demonstrates superior recall of information high in structural importance to be a constant effect across age levels. Studies demonstrating an age difference in sensitivity to structure have adopted procedures emphasizing some outcome measure other than immediate recall. Brown and Smiley (1977a) were able to demonstrate that age was related to the ability to separate prose idea units by level of structural importance. Brown and Smiley (Note 3) found that mature readers differentially increase their recall across different levels of rated importance when given extra study time. Material of greatest structural significance showed the greatest gains. This response pattern was not observed among a group of fifth graders. An adequate reconciliation of the results from this entire group of studies is not obvious.

In comparison to the developmental research, studies relating reading competence to the ability to utilize structure have been much less prevalent. Smiley, Oakley, Worthen, Campione and Brown (1977) have shown that good and poor readers differ not only in total recall, but in the pattern of recall across level of idea unit importance. Using basically the same methodology that was previously shown to demonstrate the lack of an age difference in sensitivity to structure, these researchers found that good readers were particularly adept at recalling information judged to be of high importance to the story. Grabe and Prentice (1979) have essentially demonstrated the same effect using the Pichert and Anderson (1977) imposed perspective technique with sixth graders. In this study, students grouped as good or poor readers were asked to read a story from a certain perspective or with instructions to just read carefully. The perspective involved imagining that the student was interested in buying the home described in the story and wanted to know as much as possible before making the purchase. Not only did the good readers recall more information from the story, but when asked to take the homebuyer perspective, proportionally more of the total information they recalled was related to this topic. It is unclear from these studies exactly what deficiency the poor readers possess. The students may have been less able to discriminate the important material when it was first encountered or may have been less adept at using the structure provided in storing or retrieving structure-related information.

In order to interpret individual differences in the ability to utilize structure, one must first have some understanding of how cognitive structure influences reading. The model being proposed is that structure provides the reader with a decision making mechanism for distributing the reader's attentional resources. Studies demonstrating that viewing time (Reynolds, Staniford & Anderson, Note 4; Rothkopf & Billington, 1979) and the pattern of eye movements (Rothkopf & Billington, 1979) vary within a prose passage according to the importance of the material being read may provide tangible evidence of the reader's allocation of attention. Perhaps these external indicators also provide evidence of what Craik and Lockhart (1972) refer to as differences in the depth of processing. The reader's structure therefore may differentiate certain material for special attention resulting in deeper processing.

This study uses the imposed structure methodology developed by Anderson and his colleagues (Anderson, Reynolds, Schallert & Goetz, 1977; Pichert & Anderson, 1977). Anderson has conceptualized the reader's knowledge structure in a manner

similar to Bartlett's (1932) use of the term schema: an abstract and general structure with placeholders for specific items of relevant information. As an example from this research, a subject's burglary schema might contain general categories related to entering the premises, avoiding detection, finding loot and making a getaway. Anderson was able to demonstrate that factual information which could logically be related to some aspect of the reader's perspective (schema) was more likely than irrelevant material to be retained. The present study seeks both to replicate the basic age and reading ability results using the imposed structure methodology and to examine possible group differences in the ability to apply structure while reading. Two aspects of the ability to apply structure will be examined. The first concerns the amount of detail that must be provided readers in order for them to successfully apply the desired perspective. Readers were given a general perspective (what a burglar would want to know) or a more detailed perspective (how a burglar would get into the house, what things he would take, and how he would avoid getting caught). It was predicted that the more specific perspective would be especially helpful to younger and less able readers. The second issue involved an examination of possible group differences in the awareness of an idea unit's structural importance during the reading process. The reader's ability to highlight relevant material was employed as the measure of structural awareness. Like study time and eye movements, highlighting behavior provides a direct look at reading processes unattainable through analysis of the information retained. The highlighting data can be used to determine whether the presence of structure facilitates a child's detection of idea unit relevance or simply the retrieval of previously detected idea units.

## METHOD

### *Subjects*

The 176 students involved in this study were fourth and sixth graders from three elementary schools. Two of the schools were located in small rural communities and the other in a small city. The vast majority of students attending each school were white and of middle socioeconomic status. The experiment was conducted during the final month of the school year.

Because the experimental treatments required rather unusual instructions and the experimenter wanted to be able to respond verbally to any questions, intact classes were subjected to the different treatments. Differences in class size and possible differences in class ability (no systematic attempt had been employed to group the classes by ability) necessitated the following procedure for assigning students to the good and poor reader groups for the experimental comparisons. First, the smallest class was identified within each grade level and designated as the control group. Subjects were randomly eliminated from the larger of these classes to attain groups of equal size. Subjects from the other classes within a grade level were then selected to closely match the ability level of individual subjects within the smallest classes. Finally, a median split was employed to identify 10 good and poor readers within each grade and treatment combination (class). Students were classified using scores from the vocabulary subtest of the *Iowa Silent Reading Tests, Level 1 Form E*. The vocabulary subtest correlates .84 with the comprehension subtest (Farr, 1973) and was selected for use in this research because of its brevity. The good and poor

sixth grade students averaged 32.4 and 17.6. The average scores for the fourth graders were 23.2 and 13.6. Within a given grade and reading ability level, the treatments were not found to differ significantly and were, in fact, nearly identical.

### *Materials*

The reading passage was a modified and expanded version of the Pichert and Anderson (1977) story describing the experiences of two boys as they skip choir practice and visit one of the boy's homes. The story was originally constructed to contain equal amounts of information of interest to a reader asked to take either a burglar or homebuyer perspective. Although the burglar perspective was the only schema readers were asked to adopt in this experiment, the story in its expanded form still reflects at least two general areas of information. The story used in this study contained 660 words. Readability was computed to be at the fourth grade level (Gilliland, 1974), but this method may slightly underestimate the difficulty level because much of the passage contains dialogue. The passage was divided into 80 idea units by the author and an associate. Twenty college students then rated the importance of each idea unit to the burglar perspective on a five point scale. A median split on average rated importance was used to label an idea unit as high or low in importance.

### *Procedure*

All material was presented to the students in the form of a self-contained booklet. A preliminary task was utilized to familiarize students with highlighting. Each reader was presented a four sentence paragraph. Readers in the control groups were asked to mark any material they thought to be important. Readers in the perspective groups were asked to mark the material related to a prescribed topic. The experimenter then spent a few minutes asking about and discussing what the students marked.

Students next spent seven minutes reading and highlighting the story. Students assigned to the control condition were told to read the following story carefully, underline what you think is important and try to remember as much as you can. The general perspective group was instructed to read the following story paying special attention to and highlighting information that would be important to a burglar. To ensure that each reader understood the instructions they were asked to list three things a burglar would want to know before the student was allowed to read the passage. The specific perspective group was asked to pay special attention to and highlight information which described what a burglar might take, how the burglar would get into the house and how the burglar would keep from getting caught. Again, the reader was asked to list one example for each area of interest before reading. Following the reading task, seven minutes were allowed for the vocabulary test. Finally, the subjects were instructed to write down everything they could remember about the story. Perspective subjects were told very clearly that all material in the passage was to be recalled. Subjects were told to provide as much specific information as possible and that they did not have to worry about the order in which the information was written down.

### Analyses

The author, blind to the assigned treatment of each subject, scored the recall protocols leniently for gist. A random sample of 10 protocols when scored by a second individual produced a reliability coefficient in excess of .90. The number of perspective relevant and irrelevant idea units recalled was analyzed using a  $2 \times 2 \times 2 \times 3$  mixed design analysis of variance. The specific factors were Grade (4 or 6), Reading Ability (high or low), Idea Unit Importance (relevant or irrelevant) and Instructions (general perspective, specific perspective or control). Grade, Instructions and Reading Ability were between-subject factors. Although unrelated to the instructions they were given, the protocols of control subjects were evaluated according to the same categories of relevance employed with perspective subjects. With the exception of the Instructions condition (no control group was included), the same analysis of variance model was applied to the highlighting scores. In this case, an idea unit was judged to be highlighted if any portion of the idea unit had been marked by the subject.

A second type of analysis was performed to determine if age or reading ability differences in recall could be accounted for by the student's ability to identify relevant material while reading. In order to accomplish this analysis, the number of high relevance idea units that were both recalled and highlighted were summed for each reader. A proportion was then calculated relating the total just described to the total number of high importance idea units highlighted. This value was analyzed using a  $2 \times 2 \times 2$  analysis of variance with the specific factors being Grade (4 or 6), Reading Ability (high or low) and Instructions (general perspective or specific perspective).

Finally, an  $R^2$  improvement technique (Kerlinger & Pedhazur, 1973) was used to determine the variability in perspective relevant recall accounted for by highlighting skill after the impact of vocabulary was removed. Highlighting skill was assessed as the number of highlighted irrelevant idea units subtracted from the number of highlighted relevant idea units. To ensure an adequate sample size within each grade level, all subjects from both perspective treatments were pooled. The fourth grade sample numbered 70 and the sixth grade sample 63.

## RESULTS

The analysis of recall results demonstrated significant<sup>2</sup> main effects for grade,  $F(1, 108) = 12.17$ , reading ability,  $F(1, 108) = 19.19$ , and idea unit importance,  $F(1, 108) = 67.28$ . The older and more competent readers were able to recall more information. In addition, the information strongly related to the burglar perspective was found to be easier to recall.

All significant interactions involved idea unit importance. Instructions interacted with idea unit importance,  $F(2, 108) = 14.60$ . Tukey tests indicated significant differences between high and low idea unit recall for the two perspective groups, but not the control group. Reading ability interacted with idea unit importance,  $F(1, 108) = 3.94$ . Tukey tests indicated that good and poor readers differed significantly in the recall of perspective relevant, but not irrelevant idea units. As shown in Table 1, the three way interaction of ability, instructions and idea unit importance was also significant,  $F(2, 108) = 3.03$ . Tukey tests comparing the recall of high and low relevant idea units within each group indicated significant dif-

ferences within all perspective groups. However, the size of the difference varied with the ability of the reader. The recall differences for the good readers in the general and specific groups were 5.25 and 4.65 respectively. The same differences for the poor readers were 3.50 and 1.75.

TABLE 1

Mean Number of Relevant and Irrelevant Idea Units  
Recalled by Treatment Groups

Instructions	Ability	Idea Unit Type	
		Relevant	Irrelevant
Control	Low	5.00	4.30
	High	6.75	6.90
General	Low	6.85	3.35
	High	9.25	4.00
Specific	Low	5.00	3.25
	High	8.40	3.75

The highlighting analysis demonstrated significant main effects for reading ability,  $F(1, 72) = 4.14$ , instructions,  $F(1, 72) = 22.10$ , and idea unit importance,  $F(1, 72) = 1115.90$ . High ability readers and students given the general perspective instructions highlighted more idea units. As might be expected, relevant idea units were highlighted much more frequently than irrelevant idea units. Again, both significant interactions involved idea unit importance. Instructions interacted significantly with idea unit importance,  $F(1, 72) = 11.06$ . Tukey post hoc comparisons showed that the general instruction groups highlighted significantly more idea units of high relevance than the specific perspective groups, but that this comparison was not significant for idea units of low perspective relevance. The interaction of reading ability and idea unit importance is shown in Table 2. Again, Tukey tests indicated significant differences on the material of relevance to the burglar perspective, but not on the other material.

The analysis examining the proportion of the relevant information recalled to the relevant information highlighted produced significant effects for grade,  $F(1, 72) = 5.16$ , and reading ability,  $F(1, 72) = 7.50$ . Surprisingly, the fourth graders recalled a higher proportion of the highlighted material (39% vs. 30%). Good readers also recalled a higher proportion (39%) than poor readers (29%). There were no significant interactions.

TABLE 2  
 Mean Number of Relevant and Irrelevant Idea Units  
 Highlighted by Ability Groups

Ability Level	Idea Unit Type	
	Relevant	Irrelevant
Low	15.68	2.58
High	18.43	2.65

The final analysis involved an  $R^2$  improvement regression procedure. Among the older readers, highlighting accuracy was found to significantly augment the variability accounted for by vocabulary differences,  $F(1, 59) = 12.03, p \leq .01$ . The highlighting variable increased the variability of relevant recall accounted for by 13% to a total value of 36%. Among the younger readers, highlighting added only 2% bringing the total variability accounted for to 39%. Zero-order correlation coefficients calculated between vocabulary, highlighting skill and the dependent variable indicated correlations of .61 and .47 (4th and 6th graders) for the vocabulary score and .40 and .52 for highlighting. Neither of these grade differences was found to be significant (Snedecor & Cochran, 1967).

## DISCUSSION

The results of this experiment clearly both replicate and extend earlier work. The recall data, which demonstrates that both fourth and sixth graders recall more perspective related material when given a perspective, support the developmental research claiming that even younger children are able to use structure in retaining prose. The unique aspect of this particular developmental comparison was that structure in this case involved an imposed perspective rather than a common story format or the internal structure of the passage. The ability to use an external structure independently of and probably in addition to the internal structure of the passage demonstrates that a tremendous flexibility in cognitive processing exists at these grade levels. This ability to control cognitive processing seems very close to the metacognitive skills discussed by Flavell (1977). The three way interaction of reading ability, type of instructions and idea unit importance also clearly supports the work of Grabe and Prentice (1979). While it seemed that all groups asked to take a perspective were able to some extent to do so, the more able readers did show a stronger reaction to the perspective instructions.

The highlighting procedure was different from earlier attempts to measure structural awareness (e.g., Brown & Smiley, 1977a) because the task required simultaneous attention to the highlighting task and reading for retention. While this

procedure may obscure the investigation of structural awareness as an independent issue, the procedure does provide a more realistic view of structural awareness while reading. The highlighting results clearly demonstrated that young readers were able to discriminate between perspective relevant and irrelevant material. While this skill did not vary with grade level, it did depend to some degree on reading ability. One plausible explanation might be that poor readers are overburdened by the processing demands of the highlighting and reading tasks and are unable to attend as carefully to the highlighting requirements. Processing demands do not refer to the time constraints on the total reading task, but rather to the efficient use of short term memory (Perfetti & Lesgold, 1977; Dent & Thorndyke, Note 1) in performing the various cognitive tasks associated with reading. When processing capacity is being overloaded, the poor reader may be found to be attending to more basic requirements than those produced by the external perspective task. This is not to claim, as Perfetti and Lesgold (1977) have argued, that structural utilization is not a skill differentiating good and poor readers. Obviously, reading ability was an important factor in both the recall and highlighting results.

An unexpected finding in the highlighting analysis and to a lesser extent in the recall analysis involved the comparison of the general and specific perspective treatments. The general perspective proved superior in its effect on both dependent measures. While this author believes that all relevant idea units could be associated with one of the specific perspective components, the younger readers may not have responded in the same manner. A second explanation for these results may be that the specific perspective is more complex than the general perspective and in some cases may override the processing capacity of the reader.

The final analyses involved attempts to determine the impact of the awareness of structural relevance on retention. The first approach simply involved group comparisons of the retention rates for information previously identified by individual readers as related to their perspective. If retention was solely determined by the awareness of structural importance, one would expect the retention rates for good and poor readers to be similar. The basis for such an expectation lies in the assumed importance of the ability to devote attention to important material. If the reader were unaware of what was important, then there would be no basis for differential attention. The results show that once an item has been identified as relevant by both good and poor readers, the good readers are still more likely to retain it.

The regression and correlation procedures represent slightly different approaches to analyzing the importance of structural knowledge. Structural awareness was shown to be moderately related to retention and among the older students accounted for a significant proportion of retention beyond that accounted for by vocabulary. Evidently, the use of vocabulary as an indicator of general reading competence is less valid with the older subjects.

Taken together the results of this experiment make it clear that the poor reader must do more than detect relevant material to be able to remember it as well as the good reader. A critical link in the interpretive model still seems to be missing. While the present research cannot supply the missing information, this researcher would like to speculate that both the highlighting and retention results stem from a common source. This source concerns the reader's ability to complete basic reading functions (e.g., Perfetti & Lesgold, 1977) without jeopardizing the processing capacity

necessary to engage in the metacognitive skills necessary for structure utilization. A reader may fail to differentially process information for several reasons. First, the reader may be unaware of the structural relevance of the material. This difficulty may stem from the lack of an appropriate structure or a failure in using an existing structure. One reason for failing in the use of an existing structure would be the prior commitment of cognitive resources to more rudimentary reading skills. Secondly, even when priority material has been identified there is no guarantee that the reader will process it in any special manner. Again, limited cognitive capacity may restrict the special attention this material receives. Perhaps future research could utilize the imposed perspective technique to compare good and poor readers presented a passage either visually or aurally. The present explanation would predict larger ability group differences with the material the student would have to read.

## FOOTNOTES

<sup>1</sup>The author would like to thank the administration, teachers and students of the Kelly, Midway and Northwood elementary schools for their participation. The research was supported in part by a Faculty Research Grant. Reprint requests should be addressed: Mark Grabe, Department of Psychology, University of North Dakota, Grand Forks, ND 58202.

<sup>2</sup>Results will be reported as significant when  $p \leq .05$ .

## REFERENCE NOTES

1. DENT, C., & THORNDYKE, P. *Children's use of schemata in comprehension and recall of narrative texts*. Paper presented at the 86th Annual Convention of the American Psychological Association, Toronto, 1978.
2. BROWN, A., & SMILEY, S. *The development of strategies for studying prose passages*. Technical report #66. Champaign, IL: Center for the Study of Reading, University of Illinois, 1977b.
3. REYNOLDS, R., STANDIFORD, S., & ANDERSON, R. *Distribution of reading time when questions are asked about a restricted category of text information*. Technical Report #83. Champaign, IL: Center for the Study of Reading, University of Illinois, 1978.

## REFERENCES

- ANDERSON, R., REYNOLDS, R., SCHALLERT, D., & GOETZ, E. Frameworks for comprehending discourse. *American Educational Research Journal*, 1977, 14, 367-381.
- BARTLETT, F. *Remembering*. London: Cambridge University Press, 1932.
- BROWN, A. Recognition, reconstruction and recall of narrative sequences by preoperational children. *Child Development*, 1975, 46, 156-166.
- BROWN, A., & SMILEY, S. Rating the importance of structural units of prose: A problem of metacognitive development. *Child Development*, 1977a, 48, 1-8.
- CHRISTIE, D. & SCHUMACHER, G. Developmental trends in the abstraction and recall of relevant and irrelevant thematic information from connected verbal materials. *Child Development*, 1975, 46, 598-602.
- CRAIK, F., & LOCKHART, R. Level of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 1972, 11, 671-684.
- FARR, R. *Manual of Directions: Iowa Silent Reading Tests*. New York: Harcourt, Brace and Jovanovich, 1973.
- FLAVELL, J. *Cognitive development*. Englewood Cliffs, NJ: Prentice Hall, 1977.

- GILLILAND, H. *A practical guide to remedial reading*. Columbus, OH: Charles Merrill, 1974.
- GRABE, M., & PRENTICE, W. The impact of reading competence on the ability to take a perspective. *Journal of Reading Behavior*, 1979, 11, 21-25.
- KERLINGER, F., & PEDHAZUR, E. *Multiple regression in behavioral research*. New York: Holt, Rinehart & Winston, 1973.
- KINTSCH, W. On comprehending stories. In P. Carpenter & M. Just (Eds.), *Cognitive processes in comprehension*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1977.
- MANDLER, J., & JOHNSON, N. Remembrance of things parsed: Story structure and recall. *Cognitive Psychology*, 1977, 9, 111-151.
- MEYER, B., & MCCONKIE, G. What is recalled after hearing a passage? *Journal of Educational Psychology*, 1973, 65, 109-117.
- PERFETTI, C., & LESGOLD, A. Discourse comprehension and sources of individual differences. In P. Carpenter & M. Just (Eds.), *Cognitive processes in comprehension*. New York: Lawrence Erlbaum Associates, 1977.
- PICHERT, J., & ANDERSON, R. Taking different perspectives on a story. *Journal of Educational Psychology*, 1977, 69, 309-315.
- ROTHKOPF, E., & BILLINGTON, M. Goal-guided learning from text: Inferring a descriptive processing model from inspection times and eye movements. *Journal of Educational Psychology*, 1979, 71, 310-327.
- SNEDECOR, G., & COCHRAN, W. *Statistical methods*. Ames, IA: Iowa State University Press, 1967.