ABSTRACT
        Forty first-grade children and 40 fourth-grade
children participated in a study that sought to determine if
age-related increases in memory for prose are due, in part, to
deliberate mnemonic strategies and if older children use the
higher-order relations in prose more efficiently than do younger
children. Each child listened to a tape-recorded passage. To induce
deliberate mnemonic strategies, half of the children were informed
that there would be a memory task; the rest were not told. Without
contextual information, high-order relations in the passage could not
be discerned. Half of the children were presented contextual
information; the remaining were not. After passage presentation, each
child was asked to reconstruct the story. Results indicated that
age-related increases in memory for prose were, in part, due to the
development of deliberate mnemonic strategies. Furthermore, if
contextual information were available, older and younger children
efficiently retained the analysis of the high-order relations
extracted from prose. (Author/AA)

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AND USE OF HIGH ORDER RELATIONS

Daniel J. Christie

Department of Psychology

Ohio State University

Marion, Ohio 43302

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Ohio State University

The American literature on memory development is replete with studies indicating that memory development is, in part, due to the development of deliberate mnemonic strategies (Meacham, 1972). While this conception of memory has been useful in accounting for developmental differences in memory for a variety of materials, it has not been applied extensively to memory for meaningful materials. Accordingly, the present study was designed to explore the possibility that deliberate mnemonic strategies are involved in children's retention of meaningful prose passages.

Additionally, it should be noted that although mnemonic strategies may enhance memory for meaningful materials, these strategies would not seem to be an essential prerequisite for memory to occur. Clearly, there is some evidence suggesting that children as young as five years of age retain the essential features of meaningful prose materials. In a study conducted by Gary Schumacher and myself (Christie & Schumacher, 1975), for example, kindergarten, second, and fifth grade children were presented a passage consisting of sentences that were relevant or logically related to the main theme. In addition, the passage contained an equal number of thematically irrelevant sentences which were interspersed randomly among relevant sentences. The results indicated that children at each grade level recalled a significantly greater number of relevant than irrelevant sentences. Apparently even kindergarten children are capable of using the high order relations of sentences which are thematically relevant.

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In the present study, the availability of high order relations in prose passages was manipulated by presenting or withholding relevant contextual information. Without this information, the sentences within a passage were semantically ambiguous. On the other hand, if relevant contextual information was presented, the sentences formed a meaningful sequence of events. Using this procedure it was possible to determine if older children use the high order relations in prose more efficiently than younger children.

Method

Subjects

The subjects were 80 children randomly selected from an elementary school. An equal number of children from first and fourth grade were tested. The median age for the two grade levels was 6.8 and 9.8 years, respectively.

Passages

Two passages, each of which contained 20 idea units, were employed. Each idea unit consisted of a nonredundant piece of information concerning either (a) an event or (b) a characteristic of an object or person referred to in the passage. The idea units within the passages were grammatically well-formed but difficult to comprehend without the children's knowledge of the context within which the story took place. To illustrate, the following are the first four idea units from one of the passages:

> A crowd of about 100 people saw the big explosion. Firetrucks surrounded the bottom of the narrow tube-like building. Inside, Joe knew that right now he was supposed to sit still. Later Joe noticed that the firetrucks looked like tiny matchbox toys.

Children presented relevant contextual information for this passage were told that the story would be about an astronaut named Joe who blasts off in his rocketship.

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From previous research conducted by Gary Schumacher and myself
(Christie & Schumacher, 1976), it was found that if children are not
aware of the context, they actively search for and attempt to generate
their own context during passage presentation. To insure that children
in the present study could not generate the contexts for the passages,
an exploratory study was carried out with 10 fifth grade children.
Half of the children heard one of the passages and the remaining children
heard the other passage. In both conditions, the passages were tape
recorded and presented without their corresponding contextual statements.
After the presentation of a passage, each child was asked if he or she
knew or had figured out what the story was about. Two judges determined
independently whether or not each child generated a substantively
equivalent form of the context. The judges agreed that none of the children
was able to generate the context.

Design

A 2X2X2 factorial design with two dependent measures was employed.
The factors were: (a) context - presented vs. withheld; (b) instructions -
intentional (children who were informed about the subsequent memory task)
vs. incidental (children who were not informed); and (c) grade - first
vs. fourth graders. Dependent measures consisted of a reconstruction
and recognition test.

Procedure

The children were tested individually. Within each grade level,
assignment to conditions was on a random basis. Prior to the presentation
of a passage, half of the children from each grade level were informed
that they would hear a story and later be asked to tell the experimenter
the story (intentional instructions); the remaining children were simply
told that they would hear a story (incidental instructions). Then, one

of the two passages was presented to each child via a tape recorder. Subsequently, the children were asked to tell the experimenter everything they could remember about the story. Each child's reconstruction of the story was tape recorded and later given to two judges who determined independently the number of idea units reconstructed. Judges considered an idea unit correctly recalled if it appeared in the child's reconstruction without substantial alteration of meaning. Accordingly, synonyms and changes in tense were acceptable. The interjudge reliability coefficient for the number of idea units reconstructed was .95.

Immediately following each child's reconstruction of the story, he or she was administered an oral recognition test. The test consisted of 40 sentences. Half of the sentences were from the original passage (original sentences); the remaining sentences were semantically different from the original sentences (distractor sentences). The sentences were presented in random order and the child's task was to indicate whether or not each sentence came from the originally presented passage. Each child's recognition score consisted of the total number of correctly identified original and distractor sentences.

Results

Reconstruction Scores

Figure 1 shows graphically the effects of grade, context, and instructions on reconstruction scores. The analysis of variance on reconstruction scores yielded significant main effects for grade (F (1,72) = 23.82, $p<.01$) and context (F (1,72) = 5.23, $p<.05$). As expected, older children reconstructed a greater number of idea units than younger children. For the contextual manipulation, children who received the context reconstructed a greater number of idea units than

children who did not receive the context. Additionally, the instructional factor interacted with grade so that the relative impact of the instructional manipulation was greater for older than younger children (F (1,72) = 4.24, p<.05).

Recognition Scores

(Slide of figure 2) The analysis of variance on recognition scores yielded a significant main effect for grade (F (1,72) = 33.01, p<.01). Older children correctly identified a greater number of original and distractor sentences than younger children. A significant main effect for the contextual manipulation (F (1,72) = 31.72, p<.01) indicated that children who received the context correctly identified a greater number of original and distractor sentences than children who did not receive the context. No significant interactions were obtained.

Discussion

The results of the present study are consistent with those of previous studies yielding age-related increases in the retention of prose (Christie & Schumacher, 1975, 1976). Clearly, older children exhibited higher re-construction and recognition scores than younger children.

The availability of contextual information also affected retention measures. Children who were given contextual information prior to passage presentation exhibited higher reconstruction and recognition scores than children who were unaware of the context. This finding is quite reasonable since contextual information serves an important role in clarifying the nature of the high order relations among the sentences. Without contextual information, each sentence is a discrete event or episode which does not relate semantically to other sentences. Clearly, if the memory task is a semantic one, retention readily results.

It is interesting to note that the contextual manipulation did not interact with age. In line with previous research, it appears that older as well as younger children very efficiently use their semantic memory system to retain the essential features of prose (Brown, 1975, 1976; Christie & Schumacher, 1975; Jenkins, 1973). Apparently children are well adapted to the task of remembering meaningful materials.

In reference to the instructional manipulation, it was thought that if strategies were involved in the retention of prose, intentional instructions would be sufficient to induce older children to engage in these strategies. The significant grade by instruction interaction for reconstruction scores provided evidence consistent with these expectations. Older but not younger children exhibited higher reconstruction scores under intentional versus incidental instructions.

Further evidence indicating that deliberate strategies were involved in older children's performance on the reconstruction task can be found by comparing reconstruction with recognition test score results. As mentioned previously, a significant grade by instruction interaction was obtained for reconstruction scores. For recognition scores, no significant interaction was obtained. Since recognition tests are sensitive to the amount of information stored in memory (Kintsch, 1968), the superior retention of older children who were given intentional versus incidental instructions cannot be attributed to differences in the amount of information stored. Rather, it is more likely that differences in reconstruction scores as a function of the instructional manipulation were due to differences in what older versus younger children were doing with the information they had stored.

Finally, while it is unclear what the nature of these strategies

might have been, it is clear, based on the exploratory study reported earlier, that older children's superior performance was not due to their generation of the context during passage presentation. It appears that other deliberate strategies beyond the level of context generation are involved in age-related increases in children's retention of prose.
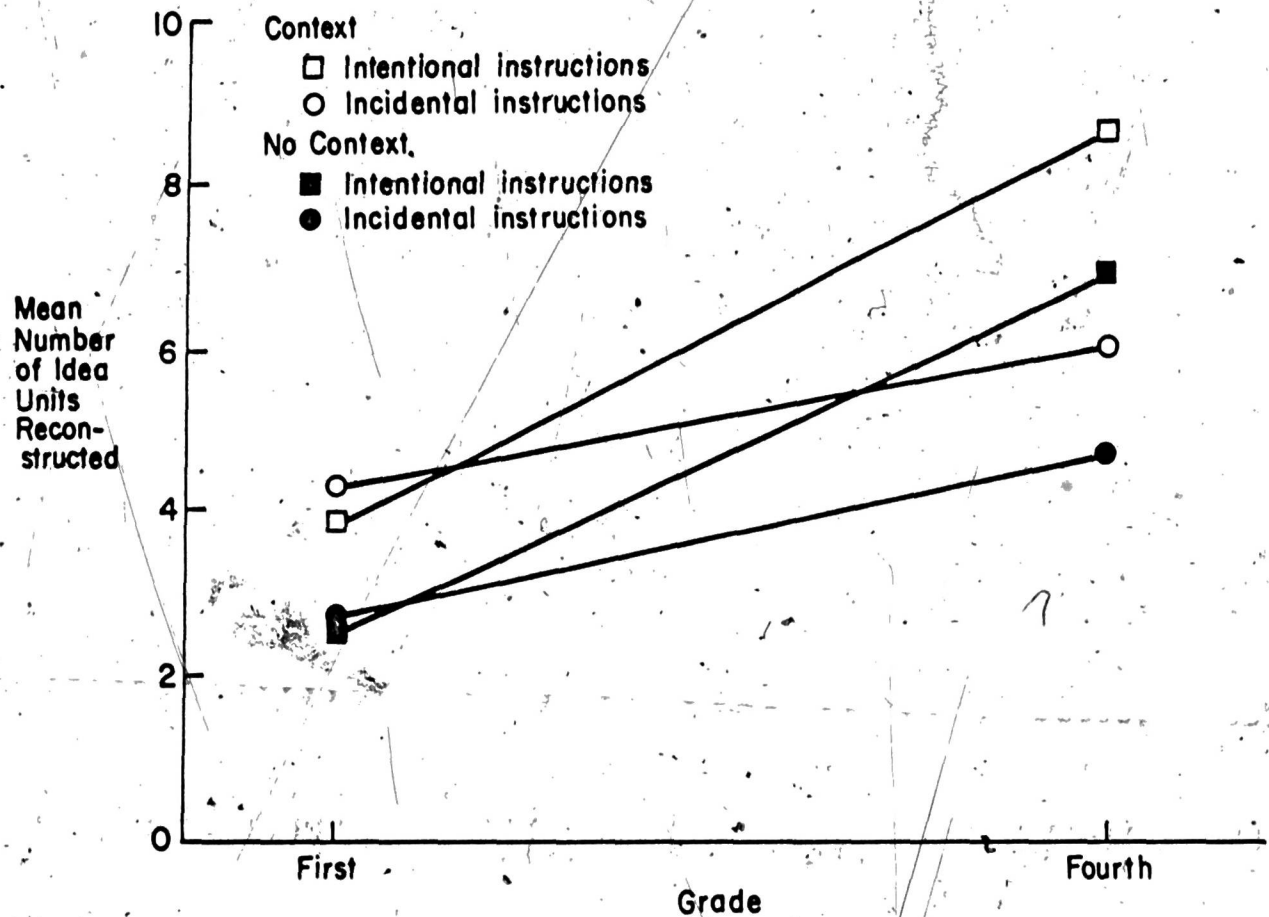
(figure 1. the effects of grade, context, and instructions on reconstruction scores)
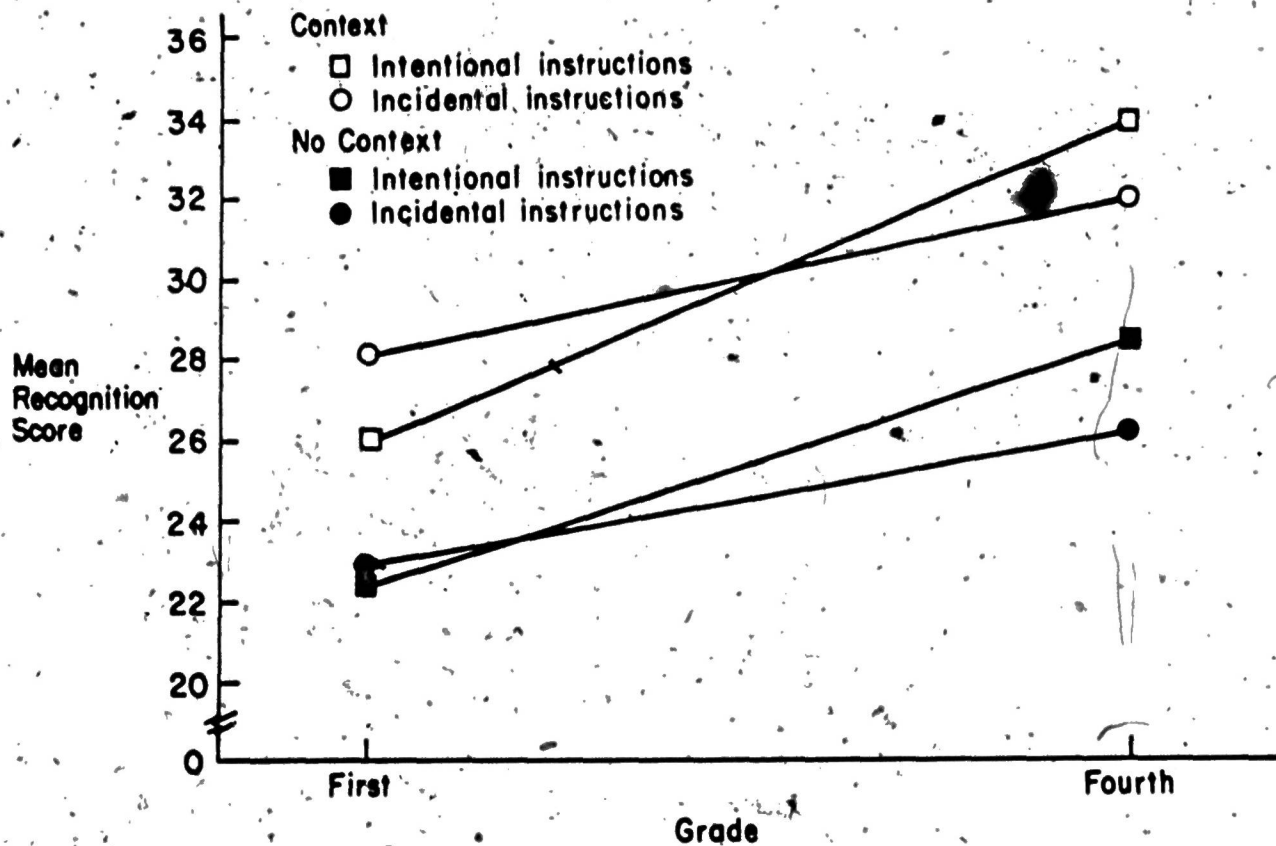
(figure 2. the effects of grade, context, and instructions on recognition scores)

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