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AUTHOR Brown, Ann L.; Smiley, Sandra S.
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ABSTRACT

The strategies of children and college students were examined as they attempted to study texts. College students, under various intentional learning instructions, displayed a repetitive diagnostic pattern. Following extended study they improved recall of important, but not unimportant, elements of texts. Eleventh and twelfth graders conformed to the adult pattern, but fifth through eighth graders were not as efficient. Older students benefited from increased study time because they possessed the necessary knowledge concerning the importance of text segments to enable them to concentrate on the essential. Younger students, not so prescient, did not concentrate exclusively on the important units, for they did not know what they were. Age was not the sole determinant of performance, for some students at each age spontaneously adopted the strategies of underlining or notetaking. Those who did concentrated on the important elements and subsequently approached the adult-like pattern in recall; those who did not displayed the immature pattern, even if induced to adopt one of the strategies. The interplay of knowledge concerning texts, study strategies, and effective recall was described. (Author)

CENTER FOR THE STUDY OF READING

Technical Report No. 66

The Development of Strategies for Studying Prose Passages[1]

Ann L. Brown and Sandra S. Smiley
University of Illinois at Urbana-Champaign

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University of Illinois
at Urbana-Champaign
51 Gerty Drive
Champaign, Illinois 61820

Bolt Beranek and Newman Inc.
50 Moulton Street
Cambridge, Massachusetts 02138

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Abstract

The strategies of children and college students were examined as they attempted to study texts. College students, under various intentional learning instructions, displayed a repetitive diagnostic pattern. Following extended study they improved recall of important, but not unimportant, elements of texts. Eleventh and twelfth graders conformed to the adult pattern, but fifth through eighth graders were not as efficient. Older students benefitted from increased study time because they possessed the necessary knowledge concerning the importance of text segments to enable them to concentrate on the essential. Younger students, not so prescient, do not concentrate exclusively on the important units, for they did not know what they were.

Age was not the sole determinant of performance for some students at each age spontaneously adopted the strategies of underlining or note-taking. Those who did, concentrated on the important elements and subsequently approached the adult-like pattern in recall; those who did not, displayed the immature pattern, even if induced to adopt one of the strategies. The interplay of knowledge concerning texts, study strategies and effective recall was described.

Getting the gist of a message, whether oral or written, is an essential communicative activity. Without this ability, children would never learn a language and would certainly never come to use that language as a vehicle for communication. Extracting the main idea is clearly an essential information-gathering activity and the ability to glean the main message, to the exclusion of nonessential detail, must be a naturally occurring ability, given of course, a reasonable match between the complexity of the message and the receiver's current cognitive status (Brown, 1975, 1978b; Brown & DeLoache, 1978).

In a series of recent studies (Brown & Smiley, 1977; Brown, Smiley, Day, Townsend, & Lawton, 1977; Smiley, Oakley, Worthen, Campione, & Brown, 1977), we have been concerned with children's ability to extract the main theme of prose passages. Our interest in this topic can be defended on both theoretical and practical grounds. First, there is considerable evidence that the more mature information processor is adept at channelling his attention to the most informative aspects of the stimulus. Conversely, young children or novices find it more difficult to ignore irrelevant or less-informative material. This is true whether the task involves visual scanning (Brown & DeLoache, 1978; Mackworth & Bruner, 1970; Pushkina, 1971; Thomas, 1968; Vurpillot, 1968; Zinchenko, Chzhi-tsin & Tarakanov, 1963), selective attention (Hale & Piper, 1973), or incidental learning paradigms (Hagen, 1972; Postman, 1964) where the subject must selectively ignore aspects of the stimuli. An extension of these findings to situations where children must study prose passages would be theoretically interesting.

Perhaps of more importance is the practical aspects of this work. Much of what we are required to learn must be extracted from prose passages; studying prose is the leading activity (Brown, 1978a) of schools. Effective reading and studying both involve the ability to extract the essential message

and discard trivia, as indeed does effective listening. Thus the current interest in understanding and remembering prose can be seen as a direct result of the call for ecological validity raised by memory theorists, developmental or otherwise (Bransford, Franks, Morris & Stein, 1978; Brown, 1978a, 1978b).

To date we have shown that even kindergarten children (Smiley et al, 1977), educable retarded grade schoolers (Brown & Campione, 1978), and poor readers (Smiley et al., 1977) are sensitive to the importance of various sections of texts, for their recall scores reflect the rated importance of the constituent idea units of stories. Although older children (seventh grade) did recall more than younger children (third grade) in the original Brown and Smiley (1977) study, there was no interaction of age and importance level. Children at each age tested recalled more important than unimportant elements of the text.

In the Brown and Smiley study the students were also asked to rate the importance of textual elements to the theme of the entire story. Here a dramatic age effect was found, for there was a gradual improvement in the ability to identify the important sections. College students could separate units of text into each of the four levels of importance, previously identified by other groups of college students, a nice replication factor. Seventh graders could separate low, medium, or high levels but were insensitive to fine gradations at the medium levels of importance. Fifth graders were only able to isolate the most important units from the remaining three levels, while third graders made no reliable distinction between levels of importance.

Younger children's ratings could diverge from those agreed upon by adults either because the children judged different material to be important or because they were not consistent in their importance rating patterns. The latter appears to be true. The ratings of the younger children were idiosyncratic with most units receiving the full range of possible scores. As

children were not asked to rate and recall the same passage, it was not possible to consider whether an individual child's rated importance was related to his own recall selectivity. But, in view of the close correspondence between the recall patterns of subjects of all ages, it was assumed that the rating patterns shown by the younger children reflected their insensitivity to degree of centrality to the theme rather than a different (and consistent) impression of what material was important.

A further reason why the young children did not display sensitivity to importance level could be the particular rating task chosen. Students were required to read (or listen to) the whole text and then eliminate (cross out) one quarter of the idea units. This procedure was repeated twice until only one quarter, the most important, remained. This is a reasonably difficult task, and even though the younger children received considerable pretraining, the difficulty of the task may have obscurred their sensitivity to fine degrees of importance. To check this hypothesis, we asked children from fifth through twelfth grade, and college students to read the same stories and then to pick the 12 most important units or to pick the 12 units they would like for retrieval cues (Brown, Smiley & Lawton, 1977). Children from seventh grade and above chose almost all level 4 units (the most important) and few level 1 units: 88% of college choices and 73% of seventh grade choices were of level 4 units. Fifth graders, however, selected only 48% of the level 4 units and their remaining choices were randomly distributed across the other three levels of importance. Thus, even with the easier task, fifth graders were only able to differentiate the most important levels from all others.

As children mature, they become better able to identify the essential organizing features and crucial elements of texts. Yet this must be an essential prerequisite for effective use of a limited processing capacity and

limited time when studying. Without such knowledge, it would be difficult for the child to select important units for extra processing. The adult reader, however, thanks to his foreknowledge concerning the relative importance of sections of the material he is studying, should be able to make effective use of extended study time. In order to concentrate on the essential at the expense of trivia, one must know what the essential elements are.

We tested this hypothesis in the following experiments. In the first section, we used only college students, and considered their performance under various intentional learning and incidental orienting conditions. If it is true that knowledge concerning the importance of certain textual elements leads to effective study, then we would predict a specific diagnostic pattern of recall scores. Following intentional study, the college student should improve his recall, but this improvement should be differentially distributed across the various degrees of importance. The effective learner should not direct extra study to the trivial units and, therefore, one would not expect an increase in recall of nonessential information. Concentrating the focus of his efforts on the important elements of the story, the efficient studier should enhance his recall of essential material.

The final experiment is a developmental study. Students from fifth through twelfth grade were also allowed extra study time. The relationship between their knowledge of textual importance and their knowledge of effective study strategies was examined with reference to the diagnostic pattern of recall scores and the physical records they produced, underlining or note-taking, while studying. The main prediction is that there should be an intimate relationship between the subject's knowledge of the importance of specific units of texts, his knowledge of strategies, and his ability to benefit from additional study time. If young children are not aware of the degree of centrality of a text

unit to the theme of a story, they can scarcely be expected to select out important units for extra study.

Experiment 1a

Method

Subjects. The subjects were 80 college student volunteers paid $2,00 for their participation. Half the subjects were female.

Stimulus materials. The same stories were used in all of the experiments reported here. They were two Japanese[2] folk tales, "The Dragon's Tears" and "How to Fool a Cat", selected because of their formal similarity; they both featured a trick ending and could be described as conveying a moral. Furthermore, both stories have been found to interest very young readers (Smiley et al., 1977), but they are still suitable for presentation to an adult population (Brown & Smiley, 1977). In addition, they are of comparable length (390 and 430 words, 34 and 28 lines) and contain approximately the same number of idea units (59 and 54). Finally, they are of comparable readability levels (i.e., fifth grade level, Dale-Chall readability scores of 5.2287 and 5.3682). This is an important control for developmental studies, for even the youngest children studied here would be able to read them.

The stories were divided into subunits following a procedure used by Johnson (1970) and Brown and Smiley (1977). Twenty-one college students were asked to read the stories thoroughly and then to divide the text into individual units by placing a vertical line at a division point. An individual unit was defined as one that contained an idea and/or represented a pausal unit, i.e., a place where a reader might pause. After division into independent units, each story was retyped with one unit per line, and a second group of 34 college students was asked to rate the importance of each unit to the theme of the story using a four-point scale. First they were asked to eliminate

one quarter of the units that they judged to be least important to the theme of the passage. This procedure was then repeated twice more until only one quarter of the units remained. These last rmmaining units were judged the most important to the theme, while the set eliminated first were the least important. (For fuller details of the rating procedure, see Brown & Smiley, 1977.)

Procedure. The students were tested in small groups or individually, depending on scheduling. All subjects first listened to a tape recording of one of the stories (stories counterbalanced across treatment groups), while they simultaneously read a printed version. They were randomly assigned to four treatment groups. Half the students received an immediate test as soon as the written version of the story was removed. The remainder were permitted five minutes interaction with the story prior to their recall attempt. The students were further subdivided into those receiving incidental and those receiving intentional instructions. Prior to hearing a tape recording of the story, the incidental group were told that we were collecting foreign folk tales that illustrated traditional morals (like Aesop's fables). We intended to use the stories to study moral development in children cross-culturally. They were to listen to the story and then we would ask them to answer a questionnaire concerning the moral of the story. For the immediate group, as soon as the story ended we asked them to recall the gist in their own words. the delayed group was given the stories to consider and asked to write a brief commentary on the moral and the suitability of the story for children in third to seventh grade. After five minutes of this activity they were given a surprise recall.

The intentional group received explicit instructions that they must attempt gist recall. The immediate group were tested for recall after hearing the story, with no chance to study; the delayed group received five minutes extra

study with the written passage, and were told to do anything they wanted to do in order to improve recall.

The written protocols were coded and then scored for gist recall by two independent raters (interrater reliability = .94). The judges rated whether or not the gist of each idea unit was retained, irrespective of the wording.

Results and Discussion

Preliminary inspection of the data revealed no differences attributable to sex of subject or to story, and therefore these variables were not entered into the analyses. The mean proportion correct recall as a function of treatment group and importance level are illustrated in Figure 1. Apparently, the

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Insert Figure 1 about here

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intentional group was better able to make use of the extended interaction with the story than were the incidental group. A 2 (Intentional-Incidental) x 2 (Immediate-Delay) x 4 (Importance Level) mixed analysis of variance revealed significant main effects of Intentionality, F (1,76) = 6.02, $p < .025$. Subjects in the intentional group outperformed subjects in the immediate condition, F (1,76) = 7.23, $p < .01$. The main effect of importance level was also reliable, F (3,228) = 309.35, $p < .001$, with recall an increasing function of importance level.

Of more interest, the following interactions were also reliable, Immediate Delay x Importance Level, F (3,228) = 5.30, $p < .005$; Intentionality x Importance Level, F (3,228) = 3.29, $p < .025$; and the three-way interaction of Immediate Delay x Intentionality x Importance Level was just short of statistical reliability, F (3,228) = 2.33, $p < .10$.

These higher-order interactions confirm the visual impression from Figure 1. The delay group outperforms the immediate group only in the intentional condition.

Separate analysis of variance on the intentional subjects did result in a significant main effect for Immediate-Delay, F (1,38) = 7.39, $p < .001$ and the Importance Level x Immediate Delay interaction was also reliable, F (3,114) = 8.16, $p < .001$. The improvement in the delay group was entirely on the two highest levels of importance. The slight improvement at the lower two levels was not reliable. In the incidental condition the effect of immediate-delay was not significant; performance between the immediate and delay groups was comparable.

The data suggest that students in the intentional study condition were able to use the extra time provided to enhance their recall, but the improvement shown by those awarded extra time was not uniformly distributed across importance level. Students used extra study time to improve their recall of the important elements of texts, thus producing the anticipated diagnosis recall pattern. That intentional study strategies are involved in this improvement is supported by the incidental-intentional comparison. Although both delayed recall groups interacted with the story for the same amount of time, and the incidental orienting task would be regarded as semantic (Craik & Lockhart, 1972), only the deliberate study strategies of the intentional group led to enhanced recall of important units. In addition, 80% of the delayed intentional group reported using some recognizable strategy to help their recall. Only two of the 20 incidental delayed group reported awareness that a recall would probably be called for and only one subject indicated a surreptitious plan for remembering. Unfortunately we did not retain the physical records of the students studying, e.g., notes or underlined sections of text. This oversight we have reason to regret, as will become obvious later.

In Experiment 1a the comparison between immediate and delay conditions was a between subjects variable. This was done to ensure comparability with the incidental groups where a between subjects manipulation was of course necessary to maintain credibility of the cover story. In Experiment 1b we repeated the intentional condition with further groups of college suudents as a desirable replication, and to see whether individual students improve their own recall if given extra time to process the material.

Experiment 1b

Method

Subjects. A further group of 40 college student volunteers participated in this study. Half the students were female.

Stimulus materials. These were the same as in Experiment 1a.

Procedure. Each student was tested on two separate days, in groups or individually. Half the students were randomly assigned to the Cat story on Day 1, and the Dragon story on Day 2, and the reverse was true for the remaining subjects. On the first day, they listened to the story while simultaneously reading it through and then, after a short retention interval (5 minutes, during which they worked on a word puzzle), they attempted gist recall. Following this they were given five minutes extra study and told to undertake any activity they wished in order to improve their recall. They had at their disposal note pads, felt pens, pens and a copy of the text printed in primary type. After the five-minute period had elapsed the aids were removed and the students attempted gist recall, again following a five-minute filled retention interval. On the second day the entire procedure was repeated with the second story, but before the study period the students were told that it helps some people to underline or take notes and they might do so if they wished. The protocols were coded and scored blind by two.

independent raters for gist recall of idea units (interrater reliability = .94).

Results and Discussion

Again there were no obvious effects of story or sex of subject so the data were combined over these factors. A 2 (Immediate-Delay) x 2 (Prompt, No Prompt) x 4 (Importance Level) mixed analysis of variance revealed a main effect of Immediate-Delay, F (1,38) = 68.35, $p < .001$ and of Importance Level, F (3,114) = 295., $p < .001$. In addition, the Immediate-Delay x Importance Level interaction was reliable, F (3,114) = 14.86, $p < .001$. This interaction is illustrated in Figure 2. The pattern for intentional learners found in Experiment 1a was

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Insert Figure 2 about here

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replicated here. Intentional learners, given extra study time, improve their own recall scores reliably for the most important units but the slightly increased recall for the lower two levels of importance was not significant. The data from both the prompted and unprompted condition were essentially similar, probably because college students spontaneously took notes or underlined in the unprompted condition.

We attributed this efficient recall pattern to the students' ability to predict in advance what were the important elements of text and to differentially direct their study time to the most important units. In both Experiments 1a and 1b, the intentional subjects benefit from extra study. They concentrate on the main ideas to the exclusion of less important detail; as a result, recall of main ideas improved after studying, but recall of nonessential details did not improve.

College students are able to use extra study time to improve their recall of important elements of text, but are children also able to benefit from

additional time? We predicted, on the basis of the Brown and Smiley (1977) data, that children below seventh grade would not improve recall differentially for important elements of these particular stories, for, lacking the necessary insight into what were the essential elements of the texts, they could not use increased study time to focus on the essential. Thus their recall should improve, if at all, evenly across units. To test this hypothesis, we repeated the main features of Experiment 1b with school children from fifth through twelfth grades.

Experiment 2

Method

Subjects. There were three groups of subjects, young (fifth grade), medium (seventh and eighth grade), and old (eleventh and twelfth grade). There were 51 subjects in the young group, 79 in the middle age group, and 59 students in the old group. Approximately half the children at each age were female.

Stimulus materials. The Cat and Dragon stories from the preceding experiments were retained.

Procedure. The procedure was very similar to that used in Experiment 1b; the first story was presented in an unprompted condition, and the second with the additional prompt to underline or take notes if desired. The only differences between the procedure used for children and adults were: (a) children heard the story twice before an immediate recall, (b) their study time was set at three times the median required by pilot groups of children to read the story through (7.5, 6.5, and 3.6 minutes for young, middle, and old respectively), and (c) there was no retention interval between the removal of the text and the recall attempt. The written protocols were scored for gist recall by two independent raters (interrater reliability = .96).

Results and Discussion

As preliminary inspection of the data revealed no effects of story, or sex of subject, these factors were not included in subsequent analysis. The mean proportions of correct recall as a function of age are shown in Figure 3.

Insert Figure 3 about here

Fifth-grade children do not improve with the extra study time, indeed their immediate-delay curves look like college students' in an incidental learning situation (see Figure 1). Medium-aged children (seventh and eighth grade) do show a pattern like adults: they improve their recall only on the two important levels. Older children look even more like a college sample.

The analyses of variance confirmed this visual impression. A 3 (Age) x 2 (Prompting) x 2 (Immediate-Delay) x 4 (Importance Level) mixed analysis of variance was conducted on the gist recall scores. Main effects were found for Age, F (2,166) = 41.14, $p < .001$, Immediate-Delay, F (1,166) = 85.25, $p < .001$, and Importance Level, F (3,498) = 617.61, $p < .001$. Of more interest, the Age x Immediate-Delay interaction, F (2,166) = 14.34, $p < .001$, the Age x Importance Level interaction, F (6,498) = 22.28, $p < .001$, the Immediate-Delay x Importance Level interaction, F (3,498) = 24.22, $p < .001$, and the Age x Immediate-Delay x Importance Level interaction, F (6,498) = 7.03, $p < .001$ were all significant.

Separate analysis of variance on the immediate and the delayed condition throw some light on these patterns of interaction. In the immediate condition there is no effect of age. Subjects at all ages show a dramatic effect of Importance Level, F (3,498) = 664., $p < .001$, but there are no interactions with age. This replicates our previous findings (Brown & Smiley, 1977) that children of all ages are sensitive to the Importance Level of the idea units.

The separate analysis of variance on the delayed data did show a reliable Age x Importance Level interaction, F (6,498) = 23.26, $p < .001$. Fifth graders do not improve their recall after study, seventh and eighth graders show some improvement on the two most important levels and the older children show an adult-like pattern, sizable improvement on the two high importance levels and little or no change after study on the lower levels of importance. It is this interaction that is illustrated in Figure 3.

Thus it would seem that children below seventh grade cannot benefit from extra study time on these particular stories, either because they lack effective study strategies, or because they lack the necessary insight into what are the important features of texts that they should select for extra processing. This time we did keep the children's physical records to help us untangle the reasons for study failures. Children were free to take notes or underline their copy of the text. Consider first the youngest sample. Only three fifth-graders appeared to take reasonable notes and so we could not consider them as a separate group. Underlining, luckily, was much more common. Therefore, the fifth graders were divided into three groups: (1) spontaneous underliners (N = 11), those children who underlined on the first day, when no prompt to underline was given, (2) induced underliners (N = 25), those children who underlined only on the second day, when told that it might help, and (3) no strategy (N = 12), those children that did not underline or take notes on either day. They may, of course, have been occupied with a strategy we could not observe.

The pattern of underlining is summarized in Figure 4. The spontaneous

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Insert Figure 4 about here

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users underlined more level 4 units than any other, both before and after prompting to underline. The induced users did underline when prompted but their choice of units was randomly distributed across importance level, not a very efficient study strategy.

Analysis of variance did confirm the pattern. We could not compare the spontaneous and induced subjects in the unprompted condition, obviously, but in the prompted condition we ran a 2 (Spontaneous-Induced) x 4 (Importance Level) mixed analysis of variance. Neither of the main effects were reliable but the Spontaneous-Induced x Importance Level interaction was significant. Post hoc tests confirmed that it was only on importance level 4 that the groups differed. Spontaneous users of the strategy underlined significantly more level 4 units than any other, induced users did not differentiate importance level in their underlining. That only level 4 units were differentially selected by spontaneous subjects fits in nicely with our two previous sets of rating data. Brown and Smiley (1977) found that fifth graders, attempting to rate the units of these stories for importance to the theme, were only able to indicate level 4 units as more important than any others, an outcome we have replicated (Brown, Smiley, & Lawton, 1977).

How did the use of the underlining strategy effect recall? We looked at the fifth grade recall scores as a function of underlining behavior. These data are included in Figure 5. Although the difference is not visually dramatic,

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Insert Figure 5 about here

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the spontaneous underliners did show a more adult-like pattern than the induced underliners or no strategy children. An analysis of variance on the fifth-grade recall data in the delayed condition only was conducted with Groups (Non-users, Spontaneous, and Induced Unerlining), Phase (Prompted and Unprompted) and

Importance Level (4) as variables. The main effect of Group was reliable, F (2,45) = 3.71, $p < .03$ as was the main effect of Importance Level, F (3,135) = 148., $p < .001$. The Importance Level x Group interaction was also significant, F (6,135) = 5.67, $p < .001$. Induced Underliners, Spontaneous Underliners and Non-users do not differ from each other after study on the first three levels of Importance· however, the spontaneous users were significantly better on the fourth level of importance. Thus, there is a neat tie between the underlining efficiency of the spontaneous users and their recall pattern. Fifth graders who underline spontaneously, choose more high level units for emphasis and, subsequently, recall more of the level 4 units after study. The induced underliners do not underline strategically and do not recall more effectively as a result of the induced strategy, indeed they do no better than those children showing no discernible activity during study. It would appear that telling children to underline does not result in the same pattern of effective study followed by those who think to underline spontaneously. Combining the data from all the fifth graders, as in Figure 3, masks the emergent sensitivity of the more strategic children.

We made a similar post hoc division of our seventh- and eighth-grade sample but here we had sufficient note-takers to form groups. Thus the seventh- and eight-grade sample was divided into five groups· (1) spontaneous underliners (N = 19), (2) induced underliners (N = 21), (3) spontaneous note-takers (N = 10), those children who took notes without prompting on the first day, (4) induced note-takers (N = 13), those children who only took notes when prompted, and (5) no strategy (N = 16), those children showing no discernible activity. A further six children took notes and underlined but we did not consider their data further as the group size was too small.

Consider first the underliners. The pattern found with fifth graders was repeated with the older children, only more dramatically. Seventh- and eighth-grade underlining scores are shown in Figure 6. Under both prompted and

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Insert Figure 6 about here

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unprompted conditions they displayed a much more strategic pattern of underlining responses, selecting less level 1 and 2 units than fifth graders and many more level 3 and 4 units. Unlike the fifth-grade induced underliners, the seventh and eighth graders who underlined only after prompting did show some sensitivity to importance level, but they were not nearly as effective as those who chose to underline on their volition. A Groups (Spontaneous and Induced) x Importance Level mixed analysis of variance was conducted on the underlining scores in the prompted condition only. Both the main effects were reliable (Groups, F (1,38) = 8.78, $p < .005$, and Importance Level, F (3,114) = 68.6, $p < .001$), and the Groups x Importance Level interaction was also significant, F (3,114) = 19.92, $p < .001$. This interaction is illustrated in Figure 6. The spontaneous users of the underlining strategy show a greater sensitivity to the importance level of constituent units of texts, they underline many more level 3 and 4 units.

The relation of strategy use to recall effectiveness was again revealed by a comparison of the recall scores of the spontaneous and induced underliners and the no strategy group. These data are depicted in Figure 7. The spontaneous

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Insert Figure 7 about here

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underliners are much the superior group, indeed, they look like adults. If permitted extra study time, they improve considerably on the highest levels of importance. The induced underliners and the no strategy subjects look like

younger children. They give no indication of improvement after study. Again, the analysis of variance confirmed this impression. We conducted separate analyses on the recall scores of the Induced and Spontaneous Underliners and the No Strategy groups. The only effect to reach significance for the induced underliners and the no strategy group was that of Importance Level, F (3,60) = 227.08, $p < .001$, and F (3,45) = 2.33, $p < .001$ respectively. For the Spontaneous Users, however, the Immediate-Delay main effect, F (1,18) = 32.82, $p < .001$, the Importance Level main effect, F (3,54) = 361.72, $p < .001$, and their interaction, F (3,54) = 44.81, $p < .001$, were all reliable. The difference between immediate and delay conditions was not reliable on importance levels 1 and 2, but did reach a significant effect on importance levels 3 and 4--in short, for spontaneous underliners, the pattern of results is the adult one (see Experiment 1b).

We also had enough note-takers in the seventh and eighth grade sample to form separate groups. The pattern of notes taken are presented in Figure 8; it is similar to that found for underliners, although less units were noted than underlined

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Insert Figure 8 about here

(it takes longer to write notes). Spontaneous users of the strategy take notes of important elements. Induced note-takers are not so sensitive. A comparison of the two groups on the prompted condition revealed a main effect for Importance Level, F (3,63) = 20.43, $p < .001$. In addition the Groups (Spontaneous and Induced Note-takers) x Importance Level interaction was reliable, F (3,63) = 6.72, $p < .001$. Spontaneous note-takers are more sensitive to the Importance Level of the texts than are the induced subjects.

Again we considered the recall scores of the spontaneous and induced note-takers in comparison to the no strategy group, shown in Figure 9. Spontaneous subjects look like college students, induced subjects and no strategy students

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Insert Figure 9 about here

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look like younger children. Separate analyses of variance were conducted on the recall scores of the spontaneous and induced note-takers. The pattern was similar to that found with underliners. The induced group did not show significant effects for any variable except Importance Level, but the spontaneous subjects showed main effects of Immediate-Delayed, F (1,9) = 7.41, $p < .02$, Importance Level, F (3,27) = 92.9, $p < .001$, and again the necessary interaction of Immediate-Delayed x Importance Level was reliable, F (3,27) = 12.25, $p < .001$. The spontaneous note-takers show the diagnostic adult-like pattern of increased recall on the important units of the texts. The relation between note-taking and increased recall was again clear. When all the seventh and eighth grade data are combined, as in Figure 3, we did see a reliable recall improvement on the two higher levels of importance, but combining strategic and nonstrategic subjects masks the real sensitivity of the spontaneous strategy users. Note that in all cases induced subjects failed to benefit from the imposition of a strategy they do not use on their own volition.

The oldest group of children studied were selected from the eleventh and twelfth grades. As can be seen in Figure 3, their recall pattern is essentially the same as college students. We ran into some difficulties with this sample. First, in order to maintain comparable conditions across ages, we did not include a retention interval and were, therefore, forced to drop students whose initial recall attempts included 75% of the units. We also dropped several students for failure to cooperate, defined either as a post-study recall of less than 15% (a level we have extracted from a preschool population: Brown & Smiley, 1977) or as obvious noncompliance. For example one student underlined isolated letters or parts of words. When decoded we found he had written, "I hate these (expletive

deleted) research things"; ingenious, but not exactly cooperative.

Of the 59 students tested, 42 provided usable data; of these, 11 were spontaneous underliners, and 21 were spontaneous note-takers. The remaining possible groups consisted of too few students for consideration. Thus, the majority of eleventh and twelfth graders were spontaneous users of a strategy and this probably contributed to their adult-like performance. Their pattern of underlining and note-taking is shown in Figure 10, together with comparable

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Insert Figure 10 about here

---

data from spontaneous producers in the younger groups. As children mature they increasingly reflect the importance of constituent units of texts in their physical records.

We are currently attempting to analyze the notes taken by students against some more qualitative criteria than level of rated importance. Preliminary inspection of the notes suggests that younger children take notes which are closely related to the text, both in order of occurrence of the idea units, and in correspondence of the actual words produced. Older students show a greater ability to paraphrase, and to rearrange order. In addition, many of the older note-takers introduced an organizational pattern of topics, subtopics, etc, often with spatial indentation and separation of the subunits on the page to further emphasize the organizational scheme. Our scoring did not begin to reflect such subtleties. Methods of quantifying this apparent qualitative improvement are being examined.

We believe that the pattern of results obtained across all ages provides strong support for the contention that it is the activity of the subject that determines recall (Brown, 1978b). Spontaneous strategies are more effective than imposed behaviors. However, there is a possible alternative explanation of

the nice correspondence between spontaneous subjects and efficient recall patterns. Spontaneous subjects could be more sophisticated and intelligent. One reflection of this superiority could be a greater sensitivity to level of textual importance. If this were so, then spontaneous subjects might do well whatever strategy they used. To test this hypothesis we intend to isolate spontaneous note-takers and underliners and force half of each sample to use the alternate strategy. If, as we believe, enhanced performance is due to the operation of a subject-generated strategy, then this procedure should be detrimental to the students forced to use a non-preferred technique. If, however, the spontaneous users still outperform the less active then one must invoke some notion of the general superiority of spontaneous subjects regardless of activity undertaken.

General Discussion

In summary of these somewhat complex results, we have found good evidence that as children mature they become increasingly able to predict in advance what are the essential organizing features and crucial elements of texts (Brown & Smiley, 1977; Brown, Smiley & Lawton, 1977). Thanks to this foreknowledge, they make better use of extended study time. If given an extra period for study, children from seventh grade up improve their recall considerably for important elements of text; recall of less important details does not improve. Children below seventh grade do not usually show such effective use of additional study time. As a result, older students' recall protocols following study include all the essential elements and little trivia; younger children's recall, though still favoring important elements, has many such elements missing.

We believe that older students benefit from increased study time as a direct result of their knowledge of textual importance (Brown, 1978c), their ability to predict ahead of time what are the important elements. Younger students, not so prescient, cannot be expected to distribute extra time intelligently; they do not

concentrate exclusively on the important elements of text, since they do not know in advance what they are.

To substantiate our belief that some form of metacognitive (Brown, 1978c; Flavell & Wellman, 1977) control governs this developmental trend, we observed the study actions of our subjects. A certain proportion of children from fifth grade and up spontaneously underlined or took notes during study. At all ages, the physical records of spontaneous subjects favored the important elements; i.e., the notes or underlined sections concentrated on elements of the text previously rated as crucial to the theme.

Students induced to adopt one of these strategies did not show a similar sensitivity to importance; they took notes or underlined more randomly. Some of the very young children underlined almost all the text when told to underline. Although the efficiency of physical record keeping in induced subjects did improve with age, it never reached the standard set by spontaneous users of the strategy. Furthermore, the recall scores of spontaneous producers were much superior to those produced by unwilling users of the strategies. Even fifth graders who spontaneously underlined showed an adult-like pattern and used extra study to differentially improve their recall of important elements.

The difference between active and passive users of the two strategies is particularly noteworthy. There are a multitude of prior studies in the education literature concerned with the efficacy of note-taking or underlining during study (Anderson, 1978). The results are equivocal.

Using a read-reread condition as a control, investigators have sometimes found that note-taking is the superior (Kulhavy, Dyer & Silver, 1975) or inferior strategy (Arnold, 1942), but the general consensus is that there are no differences between note-takers and rereaders (Dynes, 1933; Horn, 1974; Stordahl & Christensen, 1956). Underliners fare even less well. The majority opinion is that underliners do no

better than rereading controls (Arnold, 1942; Horn, 1974; Idstein & Jenkins, 1972; Kulhavy et al., 1975; Stordahl & Christensen, 1956). Thus, a general summary of the education literaure is that such activities are less helpful than one might predict on intuitive grounds; only a few studies find a clear advantage of the use of underlining or note-taking and these may be methodologically flawed (Anderson, 1978). An important factor in prior studies, however, has been that subjects have been randomly assigned to treatment groups, i.e., forced to adopt one or other strategy. Thus, spontaneous and induced subjects are randomly combined, a procedure we have shown to mask the effectiveness of these strategies. This routine practice might explain the common failure to find improved study scores following instructions to underline or take notes. If so, it would provide yet another example of the superiority of subject-generated strategies for study over teacher- or experimenter-provided techniques (Anderson & Biddle, 1975; Anderson, 1978).

Another interesting aspect of these data is that they speak to the issue of the intimate relationship between factors that have come to be called metacognitive (Flavell & Wellman, 1977), and the basic strategies of learning. Metacognition is a term that has been introduced to refer to the knowledge and control a learner has over his own cognitive processes. The domain covered is roughly that of planning in prior terminologies (Miller, Galanter & Pribram, 1960). The mature learner has at his disposal various strategies for effective study, but he must also know how to orchestrate the deployment of these strategies in an intelligent fashion, for example, by checking and monitoring their suitability, efficacy, and cost effectiveness for the task at hand.

There has been a tendency in recent developmental research (Brown, 1978a) to study skills of metacognition in somewhat isolated situations, i.e., children are asked to predict how well they will perform, what strategy they would use, or what would be the outcome of the introduction of a particular strategy (Brown, 1978a;

Kreutzer, Leonard & Flavell, 1975). While these studies have undoubtedly provided interesting data, we believe that there are crucial problems inherent in asking the immature to judge psychological events (Brown, 1978a, 1978b; Nisbett & Wilson, 1977). A cursory review of the literature concerning the ontogenesis of metacognition would suggest that the developmentally young share a fundamental problem: they are less conscious of the workings of their own mind, less facile with the introspective modes necessary to reveal their mental states, and, therefore, less able to exert conscious control of their own cognitive activity. If this is true, then experimentalists are faced with a thorny problem in studying metacognition in children, the problem of externalizing mental events. Not only is the young child less able to express himself, but he is also less aware of his own cognitive processes and less familiar with the self-interrogation techniques needed to achieve adequate self-evaluation (Brown, 1978c).

We believe that a more promising approach to this problem is reflected in the studies reported here. The relationship between strategy use, metacognitive insights, and effective study is one of mutual compatibility, and this interplay is nicely demonstrated when one examines both factors during an ongoing purposive sequence of behavior (Brown, 1978b). Here the older child's knowledge of the gradations of importance of textual units was independently assessed, but the dependence on this knowledge of subsequent effective strategy use was also demonstrated. The system is a tightly related one, students need knowledge concerning texts, knowledge concerning strategies, and knowledge concerning the interface of these factors before they can study strategically.

In addition, we would like to point out that contrary to the impression one might form from the existing developmental literature on metacognition (Brown, 1978a), we do not believe that there is a magical age at which children become able to indicate the important elements of a text. This is obviously dependent on the intimate relation of the child's current knowledge and the complexity of the

stimulus materials. With much simpler texts, children are able to pick out the main ideas at a much earlier age (Brown, Smiley & Lawton, 1977; Danner, 1976). We are currently examining whether they show a concomitant decrease in the age of onset of simple strategies as a result of this foresight.

In short, knowledge about texts (or any message source for that matter) must consist of general knowledge about consistent features of all texts and specific knowledge about the particular exemplar at hand. Therefore we expect that the deployment of strategies for learning from text would depend on general strategic knowledge about suitable activities but these would have to be triggered by certain specific features of the text now being studied. Quite simply, if the text is so complicated that the reader cannot identify the main points, he can scarcely be expected to select them for extra study, even if he possesses the prerequisite strategic knowledge that this would be a good study ploy. Thus, we would predict that even the sophisticated college student may behave immaturely when studying a difficult task.

The current set of studies, together with our previous sequence (Brown & Smiley, 1977; Brown et al., 1977), have identified two major influences on how effectively children can obtain information from prose. First, children appear to be dependent on the interplay between their preexisting knowledge and the text content (Brown et al., 1977a) in the same manner as are adults (Bower, 1977). They disambiguate, instantiate, and elaborate vague or misleading sections of texts on the basis of their prior expectations and, in addition, if provided with relevant background information they recall significantly more of the passage details. It is an interesting point that providing relevant backgrounds leads to better recall of actual textual elements and to more intrusions, intrusions that are technically errors. But, in a sense intrusions are creative errors as they add to the cohesion and coherence of the story that is remembered and probably help initially in rendering

the material interpretable. That children also make these creative errors is encouraging for it suggests that a fruitful approach to aid reading comprehension would be to manipulate preexisting knowledge. For example, before giving a passage to be understood or remembered, it should be helpful to excite the right background expectations, by providing pictures, précis, examples, or brief background descriptions, so that the child would be more likely to make inferences or creative errors while reading. Furthermore, it would be interesting to see if children are capable of generating appropriate contexts from their own past experience in a deliberate attempt to aid the comprehension process. If not, training children to generate appropriate contexts for material they must comprehend may be a fruitful mechanism for improving their understanding and retention of prose materials.

The second major influence on how effectively children study prose passages has been the main focus of this series of experiments. As children mature they develop the necessary knowledge of textual importance, and effective study strategies which enable them to capitalize on this information. Again this finding has interesting educational implications, for it is possible that we might be able to improve the comprehension and retention of young children, or slow learners, by teaching them effective study strategies. How much the developmental progression reported here was, or could be, dependent on deliberate instructional intervention remains an important educational question.

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Footnotes

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Thanks are also due to the principal, Dr. Mary Ann Lynn, teachers Miss Linda Walker, Mr. John R. Carlock, Miss Peggy Scott and Mrs. Eileen Kanzler, and students at University High School in Bloomington, Illinois.

[2]Stories from Florence Sakade, (ed.), Japanese Children's Stories. (Rutland, Vt. and Tokyo: Tuttle, 1957). Copies of the stories, with the corresponding idea units and rated importance values are available on request.

Figure Captions

Figure 1. Mean proportion of idea units recalled by college students as a function of intentional or incidental orienting conditions.

Figure 2. Mean proportion of idea units recalled by college students as a function of importance level and extent of study period.

Figure 3. The main developmental data. The mean proportion of idea units recalled as a function of age, importance level, and extent of study period.

Figure 4. The distribution of underlining of the fifth grade spontaneous and induced underliners.

Figure 5. The mean proportion of idea units recalled by the fifth grade subjects as a function of their underlining behavior.

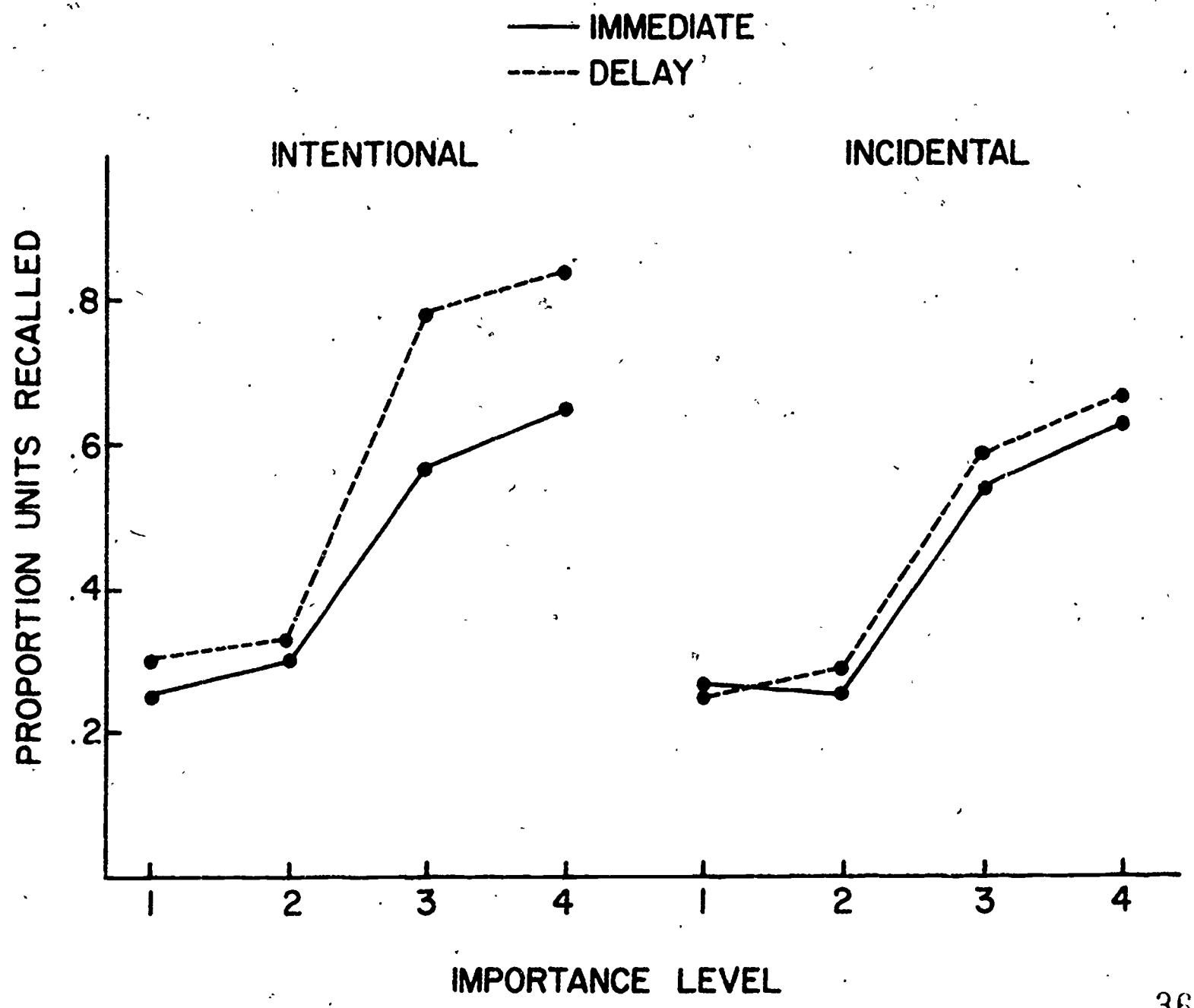
Figure 6. The distrubution of underlining of the seventh and eighth grade spontaneous and induced underliners.

Figure 7. The mean proportion of idea units recalled by the seventh and eighth grade subjects as a function of their underlining behavior.

Figure 8. The distribution of note-taking of the seventh and eighth grade spontaneous and induced underliners.

Figure 9. The mean proportion of idea units recalled by the seventh and eighth grade subjects as a function of their note-taking behavior.

Figure 10. Distribution of note-taking and underlining as a function of age.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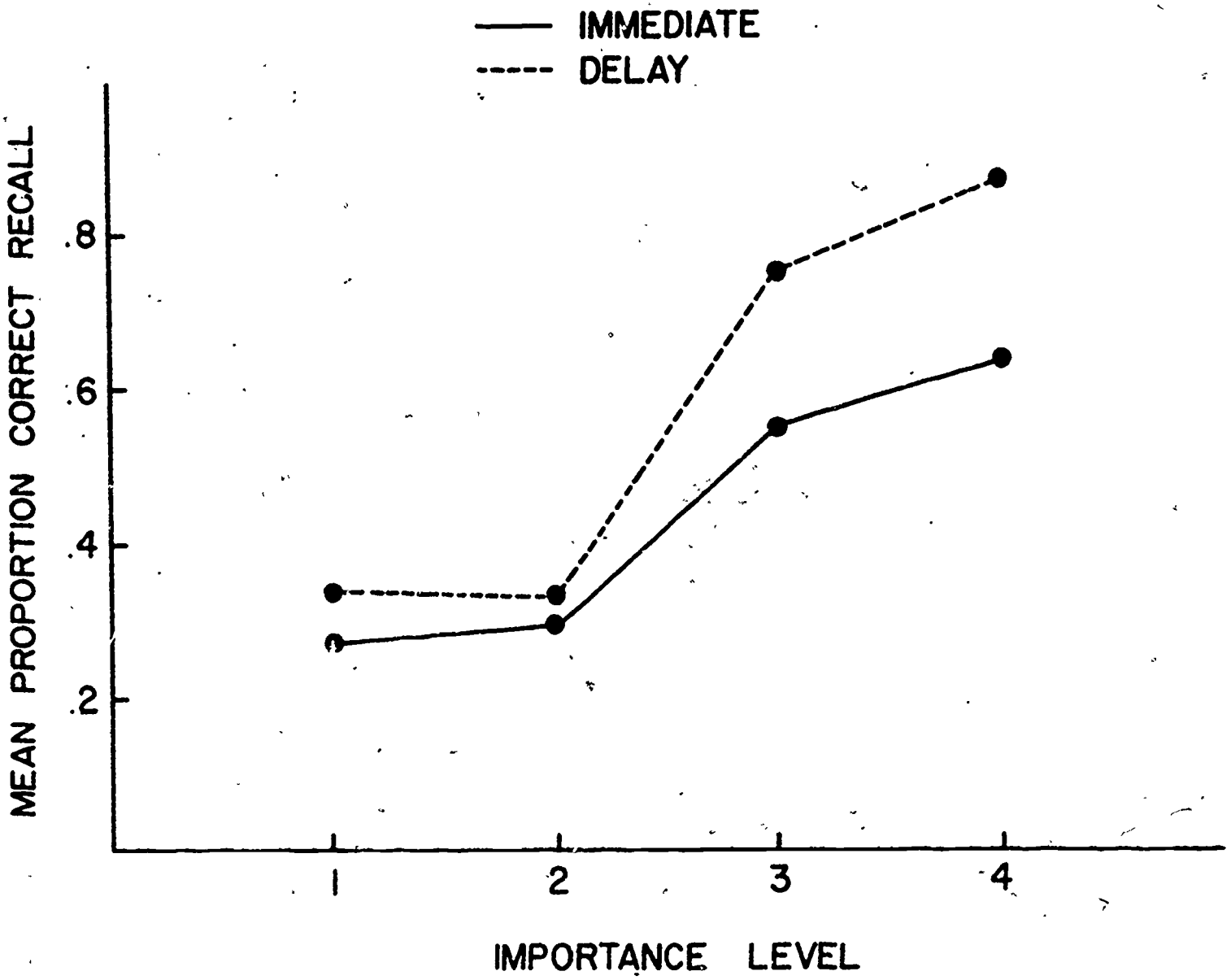
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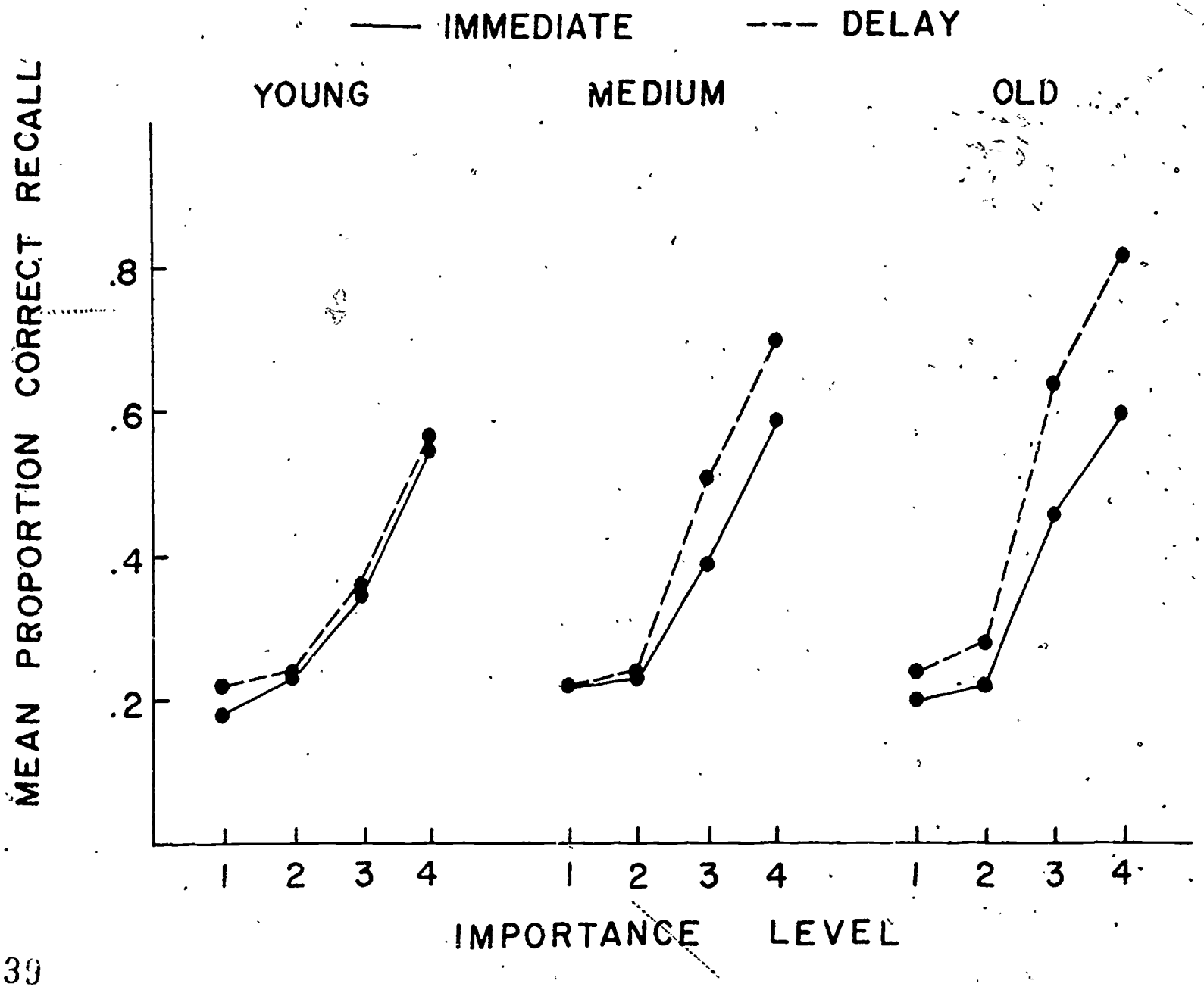
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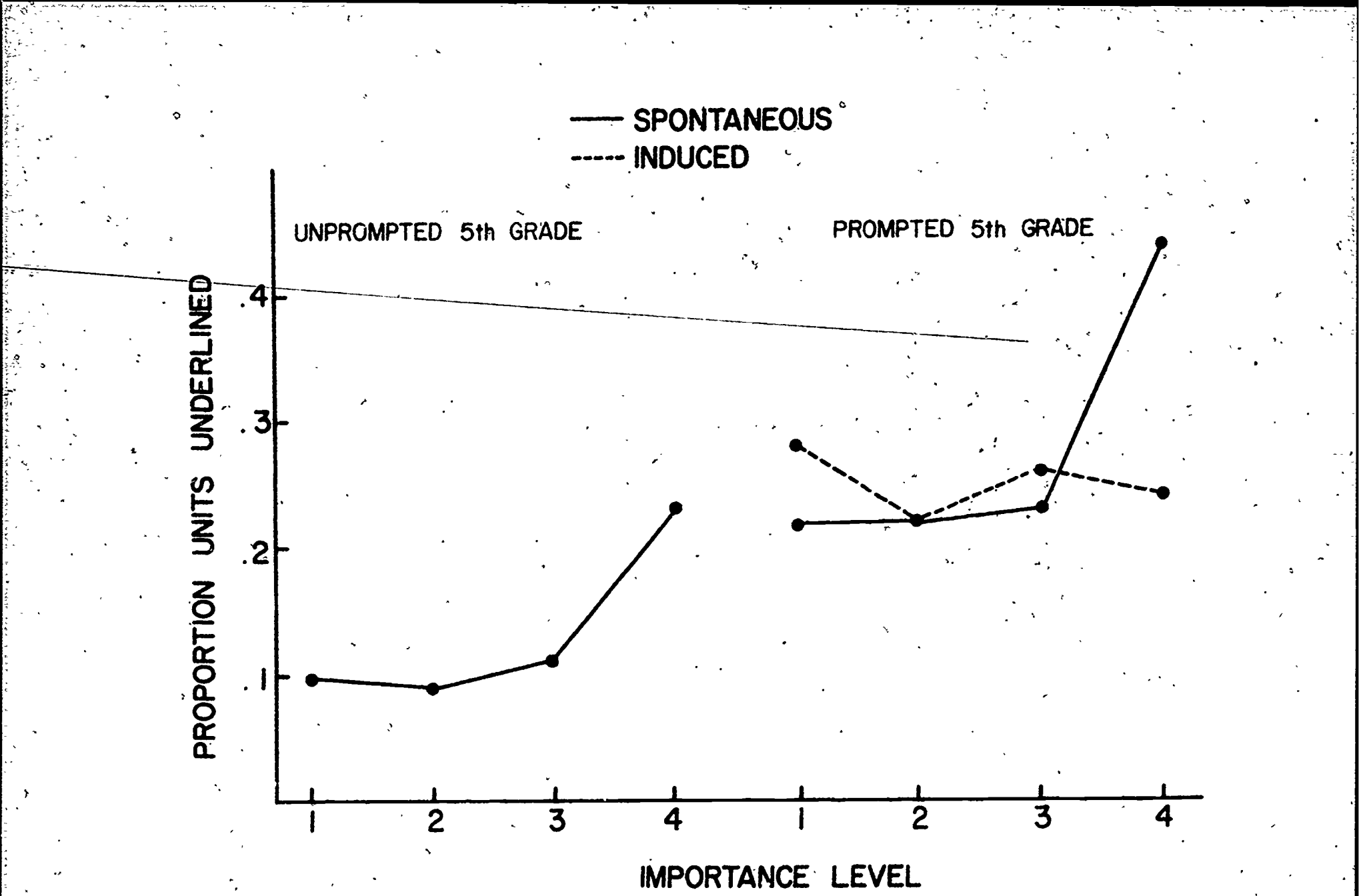
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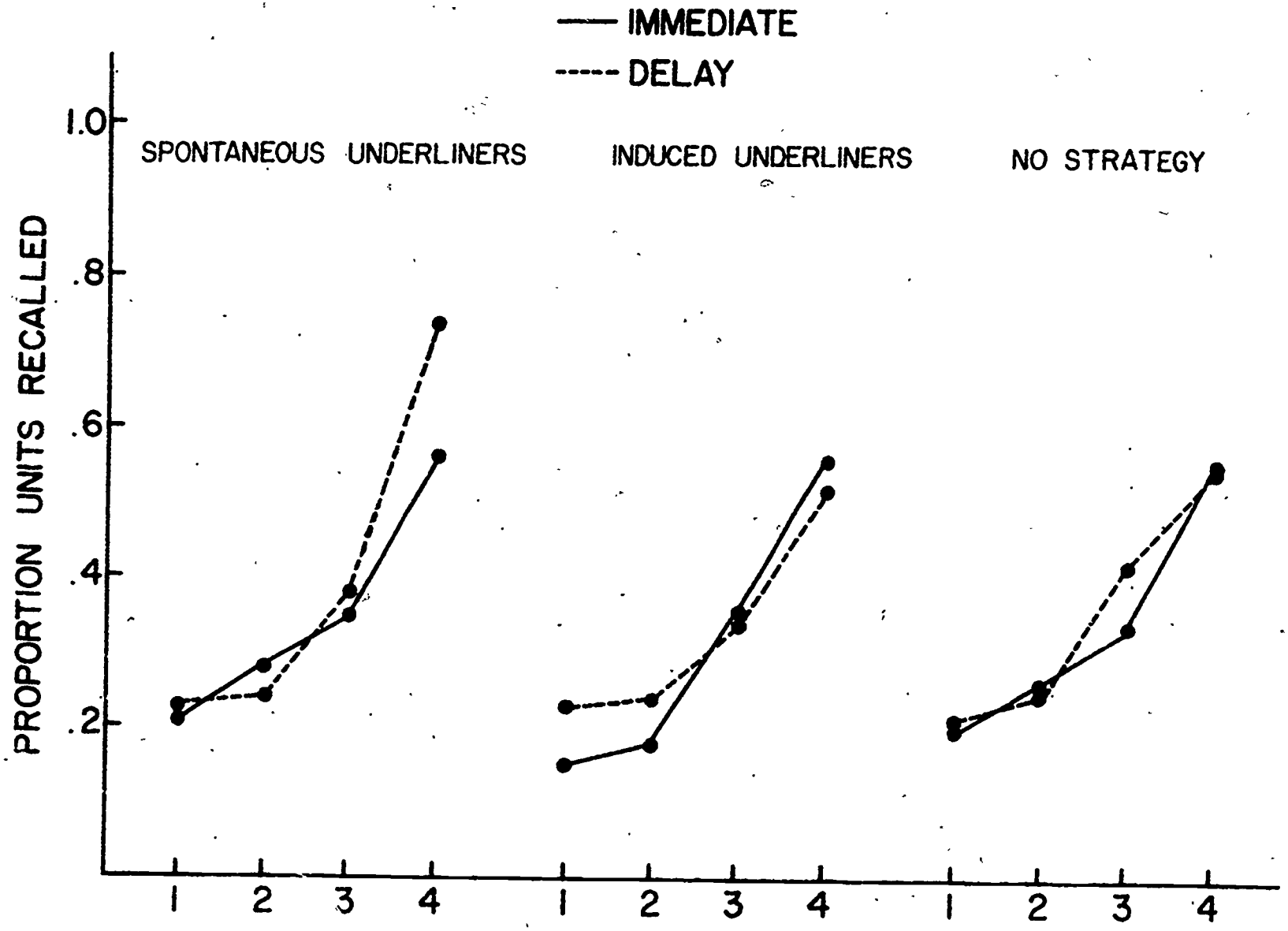
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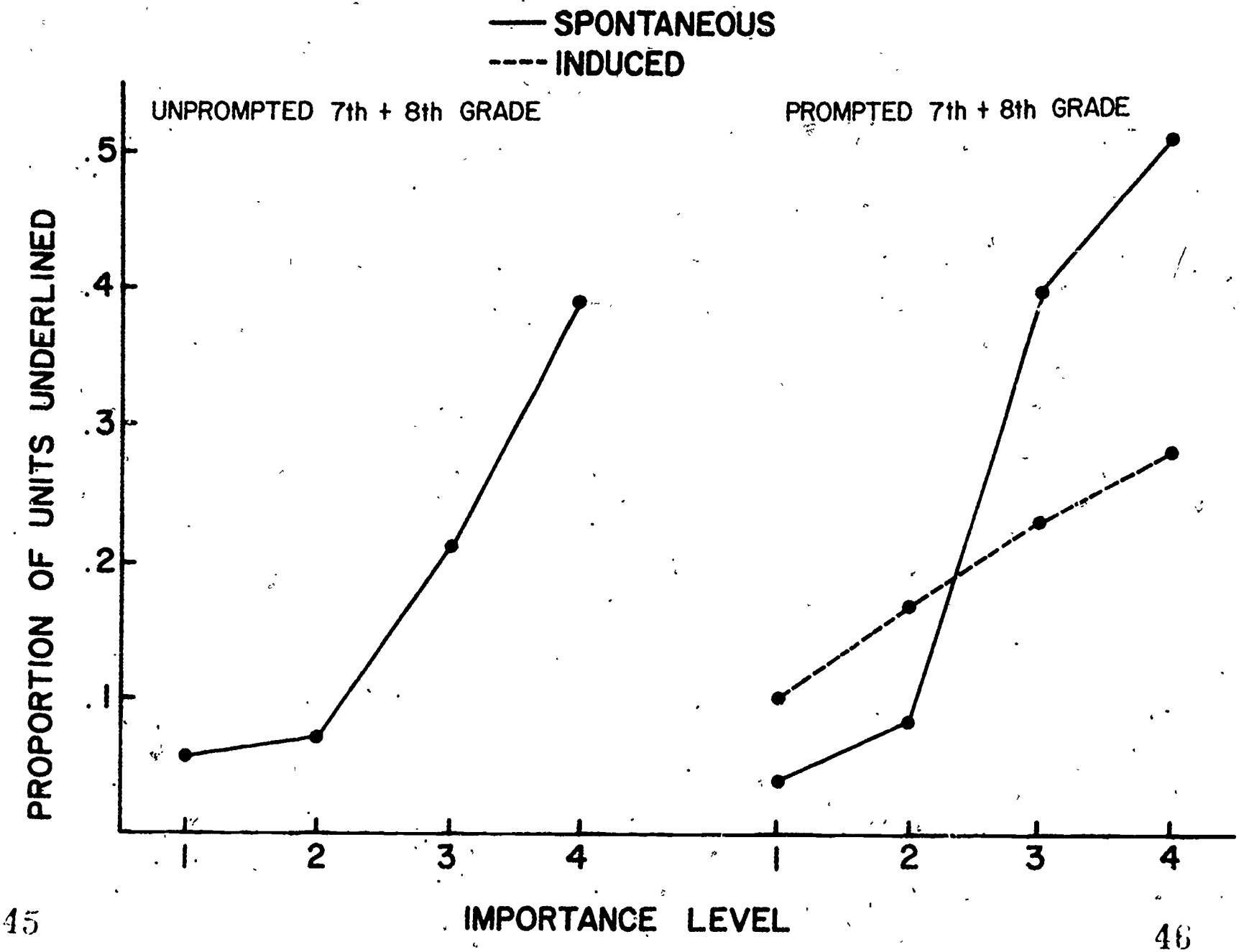
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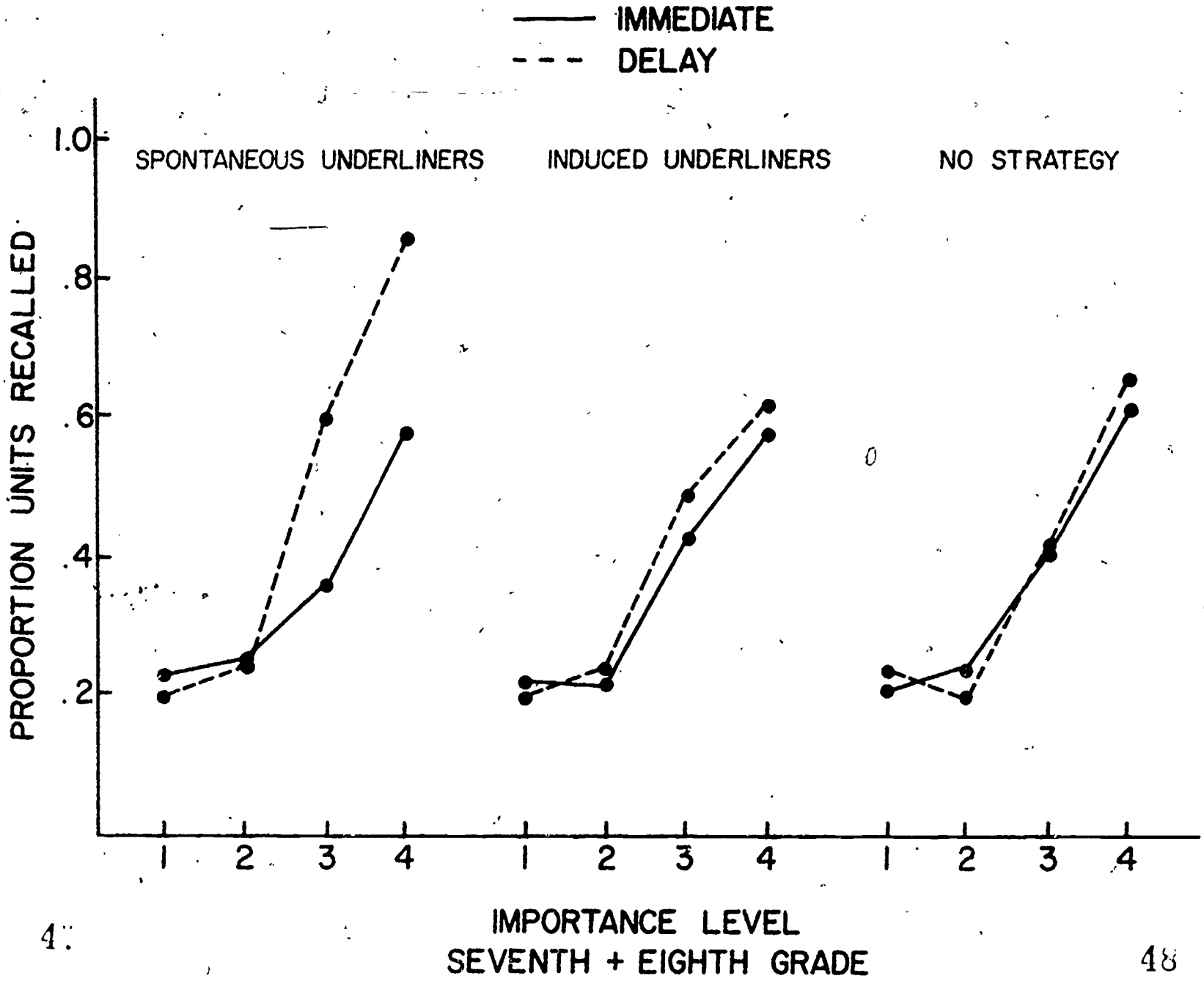
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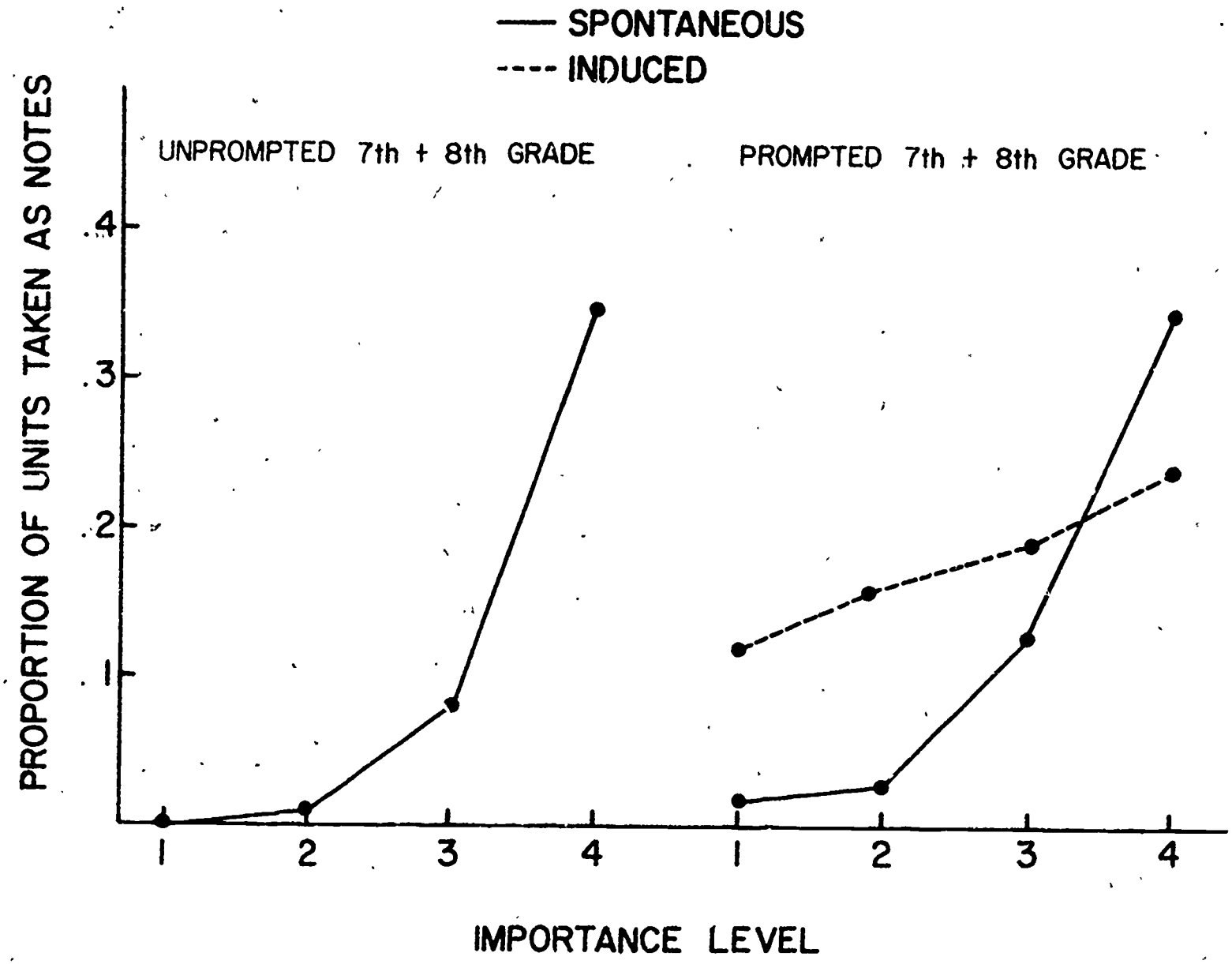
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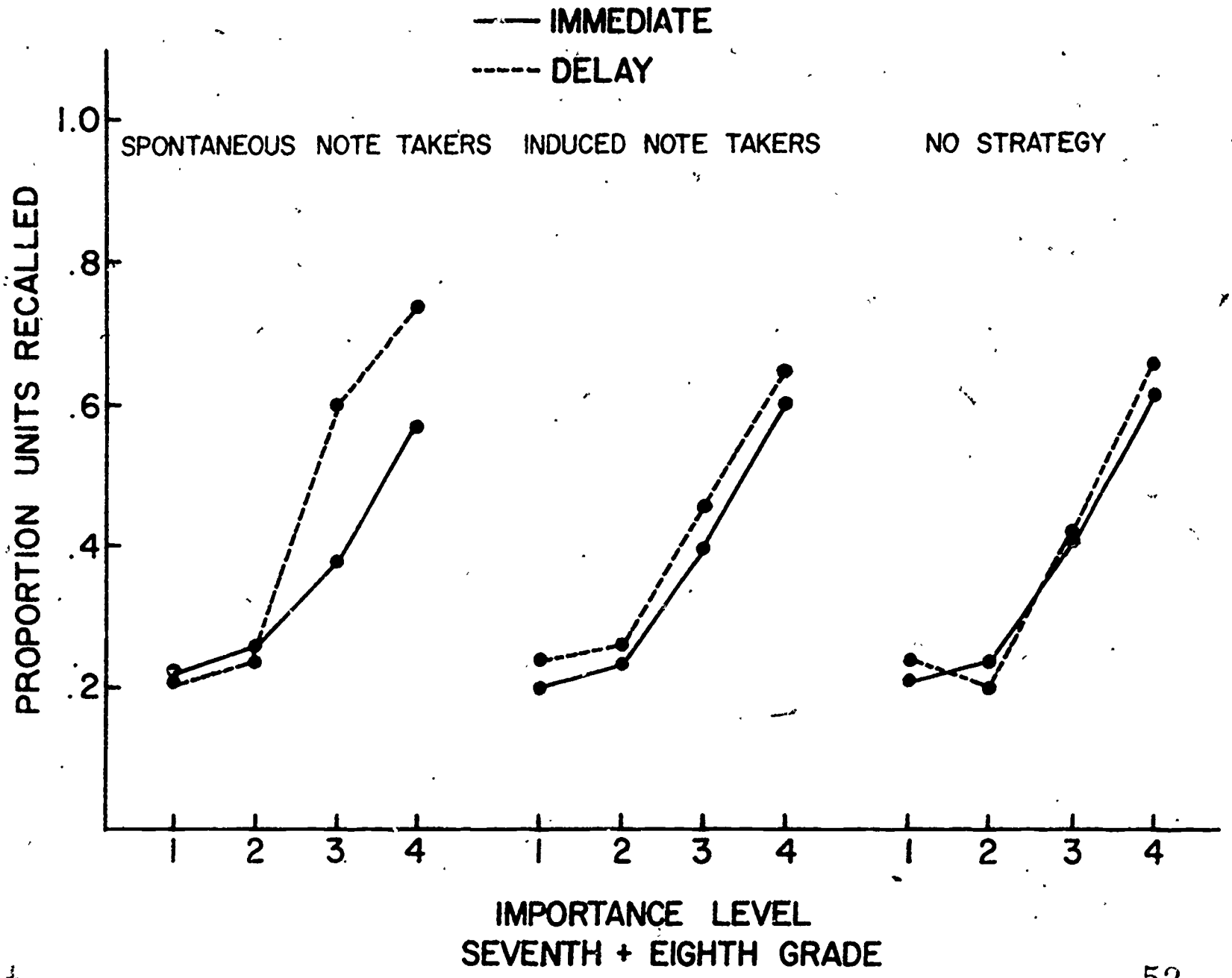
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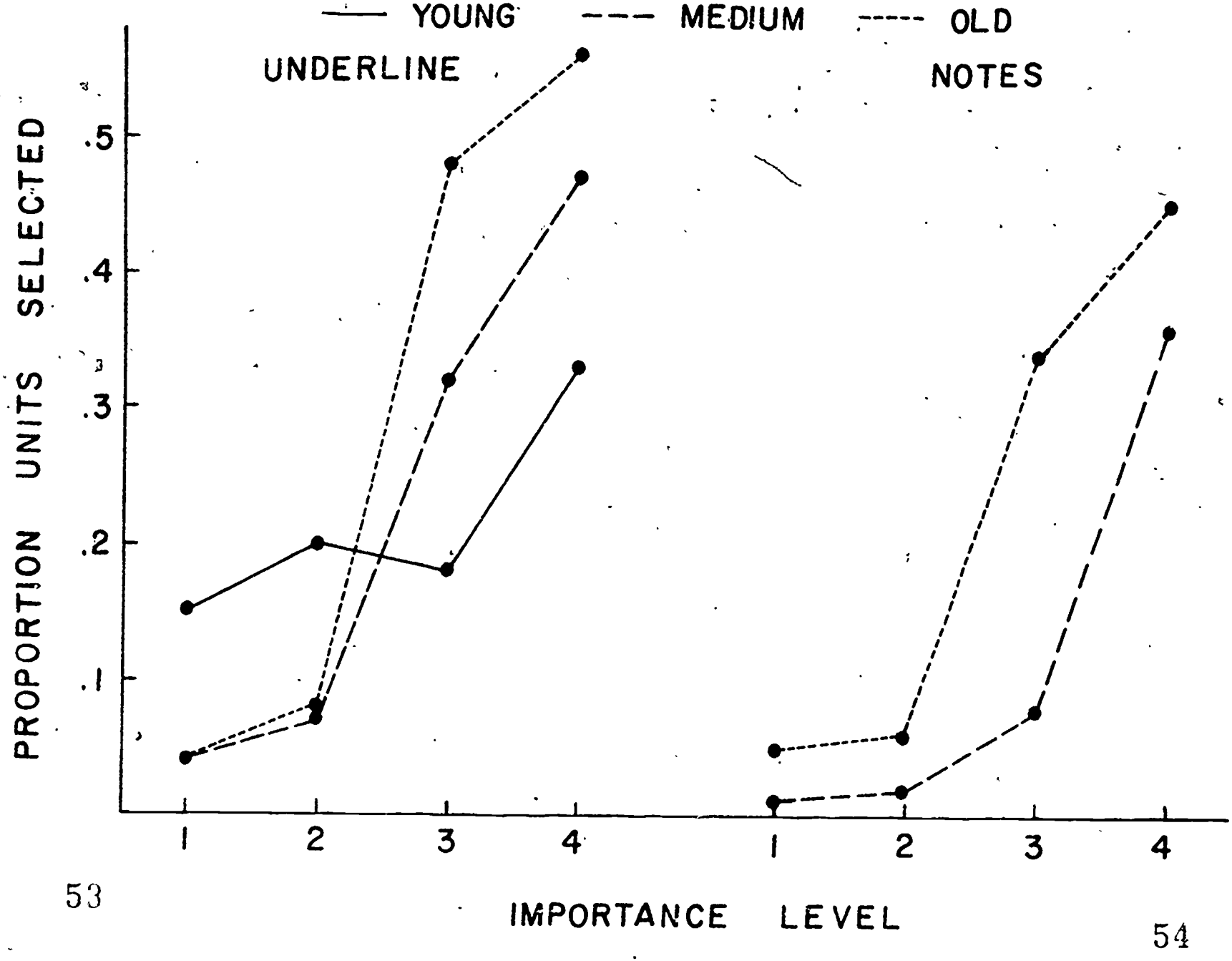
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IMPORTANCE LEVEL

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