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ABSTRACT

The purpose of this study was to determine whether statements of the main idea of a paragraph made by elementary school children could be enhanced if a content relevant picture accompanied the paragraph or if simplification of the paragraph was undertaken. One hundred and ninety-two subjects were selected from among the third and sixth grade students attending nine public elementary schools. The subjects were asked to state the main idea or each of three paragraphs either accompanied or not accompanied by content relevant pictures. The various reading conditions were paragraphs alone, paragraphs and pictures with no direction to view the picture, paragraphs and pictures with minimum direction to view the picture, and paragraphs and pictures with maximum direction to view the picture. The three paragraphs developed for each of the three main ideas were four sentences long. The results indicated: (1) the analysis of variance did not reveal significant differences between responses of boys and girls, irrespective of grade, or among the reading conditions; (2) the addition of a content relevant picture to a paragraph with or without direction to use it did not enhance either third or sixth graders' main idea statements; and (3) the simplification of the paragraphs did lead to higher scale ratings for both third and sixth graders. (WR)

The Roles of Pictures and Readability in Comprehension of the Main Idea of a Paragraph*

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While there have been numerous studies of the effects of pictures and simplification of material on general reading comprehension, it would seem that the effects of these factors on a specific type of reading comprehension, e.g., reading for the main idea, have not been intensively investigated. This is contrary to suggestions for further study of the picture-reading comprehension relationship (Vernon, 1964; Weintraub, 1966) and the simplification of material-reading comprehension relationship (Powers and Kearl, 1958; Klare, 1963,p. 187). Specifically, the suggestions have been to use a single aspect of reading comprehension as the dependent variable.

There are several reasons for choosing "reading for the main idea" as the component of reading comprehension to be measured in this study. (1) Although the "main idea" had not been operationally defined or considered separately in any of the existing studies, Vernon (1953), Weintraub (1960), Strang (1941), and Halbert (1943) either attempted to measure "major points" or included questions concerning titles and "main thoughts" in a total measure. (2) Powers and Kearl (1958, p. 430) recommended study of the effect of sentence length and vocabulary load as measured by readability formulae on synthesizing the

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main ideas. (3) Tightly controlled materials which permitted an operational definition of the main idea were available through the Laboratory for Research in Basic Skills, University of Wisconsin. (4) Authorities (Russell, 1961; Harris, 1961; Gray, 1960), factor analysis by Davis (1944), and a survey by Broening (1941) had identified reading for the main idea as an important skill, a separate skill, and a commonly used skill.

The primary purpose of the present study, then, was to ascertain whether statements of the main idea of a paragraph made by elementary school children could be enhanced (1) if a content relevant picture accompanied the paragraph or (2) if simplification of the paragraph was undertaken. It should also be noted that there was a secondary focus: The effect on main idea responses of the directions about the picture-paragraph relationship was considered as a dimension because Vernon (1953) found some direction effects in her study.

METHOD

Subjects

The sample consisted of 192 subjects--48 boys and 48 girls from third grade and like numbers from sixth grade. The subjects were selected randomly from among the third and sixth grade students attending the nine public elementary schools within the city limits of a south-central Wisconsin city of approximately 34,000 people. The subjects selected met two criteria: (1) They had never been enrolled in a special class. (2) They had never repeated a grade.

Design

The subjects involved in this study were asked to state the main idea of each of three paragraphs or of each of three paragraphs when accompanied by a content relevant picture. Since the effect of direction to view a

paragraph and a picture as an integrated presentation was also of concern, three different sets of instructions for subjects viewing paragraphs with pictures were used. Thus, the various reading conditions were paragraphs alone, paragraphs and pictures with no direction to view the picture, paragraphs and pictures with minimum direction to view the picture, and paragraphs and pictures with maximum direction to view the pictures. The other variables were readability of the paragraphs--basic and equal to the reader's grade placement, grade placement of the subject--third or sixth grade, and sex of the subject.

A 4 x 2 x 2 x 2 completely crossed factorial design was used to check questions concerning (a) the effects of pictures and directions, (b) the effects of simplification of the paragraphs, (c) the effects of the subject grade placement, and (d) the effects of sex. The six subjects of the same sex and grade randomly assigned to each cell saw three paragraphs or three paragraphs each with the appropriate content relevant picture. The order of presentation was randomized, but the readability and direction conditions were held constant tasks.

Main ideas. Three main idea statements were developed in four-sentence paragraphs at three readability levels--a basic form, grade three, and grade six--by the personnel of the Laboratory for Research in Basic Skills, University of Wisconsin. The main ideas are as follows:

(A) Animals help farmers in different ways.

(B) Birds build nests in different places.

(C) Animals use claws for different things.

Each of the main ideas is six words in length and contains a class noun for the subject, a transitive verb, a direct object and a prepositional phrase of three words--preposition, adjective, and noun. The length and the structure

of the main idea sentence were delimited (1) by the acceptance of T.L. Harris' model of a main idea[1], and (2) by the content.

Harris reasoned that a model main idea sentence should include two elements: (1) a statement of the general topic covered, and (2) a restrictive statement derived from the specific content. Thus, each of the three main ideas comprise two main elements.

	General Topic	Specific Restriction
(A)	Animals help the farmer	in different ways.
(B)	Birds build nests	in different places.
(C)	Animals use claws	for different things.

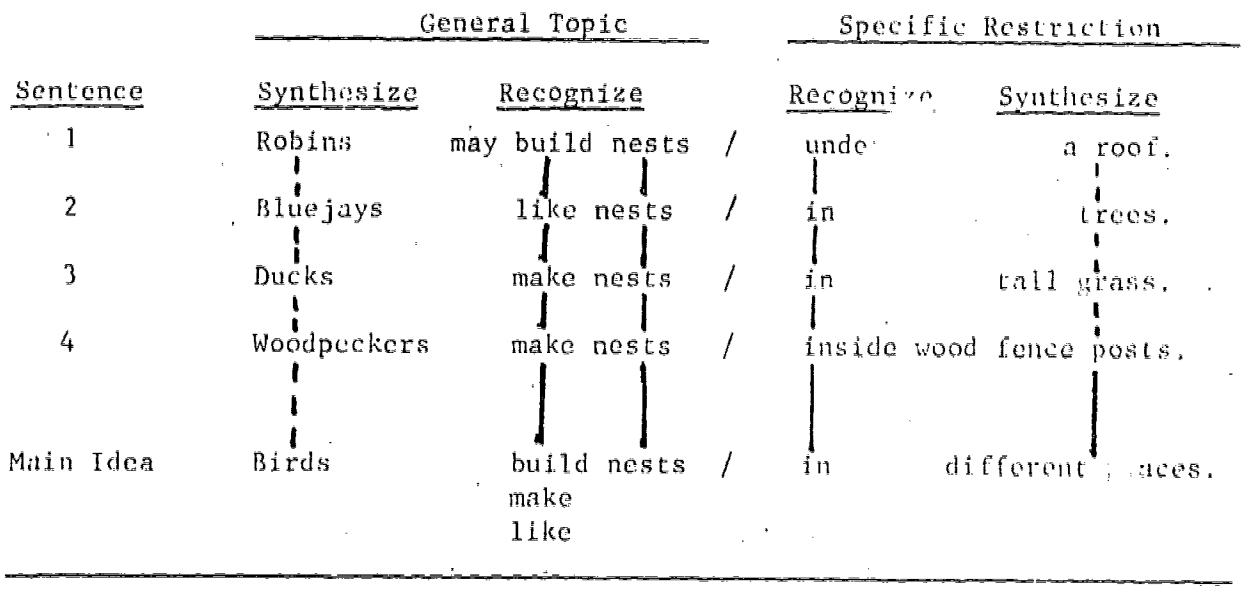
The subject matter of the main ideas and the four-sentence paragraphs was dictated in part by the words listed on the Stone list of 769 easy words (Stone, 1957), which is a revised vocabulary measure used in the Spache readability formula for primary grade material (Spache, 1953). This list provides some guidance regarding words known by first grade children, and an attempt was made to write the basic paragraphs at the first grade level.

The formulation of the main idea of the paragraph can be viewed as a process of synthesizing four examples into one main idea or principle (Gagne, 1965). Figure 1 is a schematic represenation of the operation of a reader within the framework of a first grade paragraph written to evoke Main Idea B. As shown in Figure 1, the reader synthesizes four referents to conceptualize portions of the first and second elements of the main idea and also recognizes the remaining words as those which appear in most of the sentences of the paragraph. Davis (1966, p.254) specifically places synthesizing of class nouns (birds, animals) and relationships (different places,

[1]Unpublished paper entitled "Notes on Controlling the Ideational Structure of Paragraphs," 1965.

different ways) within the same type of concept learning--categorizing. Assuming this to be true, the conclusion is that although hypothetically the general topic may be more important than the specific restriction of the paragraph, cognitively the two elements are formulated in similar ways.

Figure 1. The Cognitive Functions Used in Attaining the Concepts in a Main Idea



Paragraphs. As previously mentioned, the three paragraphs developed for each of the three main ideas were four sentences long. This length was held constant even though within a set of three paragraphs carrying the same main idea the readability levels varied from the simplest form consistent with the main idea and sentence structure controls placed upon the material to a sixth grade difficulty level. Besides the three basic paragraphs, one for each main idea, readability ratings showed one paragraph for each main idea as of third grade difficulty and one paragraph for each main idea as of sixth grade difficulty. The Spache readability formula (Spache, 1953; Stone, 1957) was used to rate the basic paragraph form and the third grade paragraphs.

but the Dale-Chall readability formula (Dale and Chall, 1948a, 1948b; Klare, 1952) was used to rate the sixth grade paragraphs. The use of two formulae was necessary because no commonly used readability formula developed for use on educational materials was found to judge both primary and upper grade material.

The difficulty level of the paragraphs was manipulated by increasing the length of the sentences and adding more words not appearing on the list of easy words associated with the formula. Complete readability information is given in Table 1, and the paragraphs are reproduced in Appendix A.

The three structural controls placed on the paragraphs, other than the selection of the topics from the Stone word list (1957), were those measured directly by readability formulae, i.e., vocabulary and sentence length, and one extra control, internal structure of sentences. The final control was decided upon because some control of sentence structure was felt necessary and because it would facilitate description of the material. Since data were not available to support a progressive ordering of sentence complexity to coincide with the readability levels associated with grades one to six, an arbitrary manipulation of the number of phrases and clauses across grade levels was used. The manipulation shown in Table 2 was thought to (a) give sentence structure some of the developmental aspects of the vocabulary and sentence length variables which readability formulae measure and (b) clarify the placement of phrases and clauses in the materials used in this study (Table 3). The paragraphs used are designated as for grades one, three, and six in Tables 2 and 3. The following assumptions about the relative difficulty of phrases and subordinate clauses were the basis for the ordering. (a) A phrase does not add as much to the complexity of a sentence as a subordinate clause does.

TABLE 1

READABILITY DATA FOR ALL THE PARAGRAPHS ACCORDING TO MAIN IDEA

Readability Factors	Main Idea A Paragraphs			Main Idea B Paragraphs			Main Idea C Paragraphs		
	Basic	Grade 3	Grade 6	Basic	Grade 3	Grade 6	Basic	Grade 3	Grade 6
No. of Sentences	4	4	4	4	4	4	4	4	4
No. of Words	25	50	63	25	50	63	25	50	63
$\bar{x}$ Sentence Length	6.5	12.5	15.75	6.25	12.5	15.75	6.25	12.5	15.75
No. of "Hard" Words[a]	1	5	5	2	5	5	1	5	5
Percentage "Hard" Words	4	10	7.9	8	10	7.9	4	10	7.9
Readability Scores[b]	2.1	3.5	5.69	2.4	3.5	5.69	2.1	3.5	5.69

[a] "Hard" words for the basic and grade 3 paragraphs are those not appearing on Stone's list which is used as the vocabulary control in the Spache formula. For the sixth grade paragraphs "hard" words were those not on the Dale list of 3,000 words, which serves as the vocabulary control for the Dale-Chall formula.

[b] Readability scores for the basic and grade 3 paragraphs are expressed in grades and are computed from the Spache formula. The readability scores for the sixth grade paragraph is a Dale-Chall score which places the paragraph in the upper 1/3 of the score range for grades 4 to 6.

(b) A sentence with only one phrase is easier to read than a sentence with one clause or two phrases. (c) A two-phrase sentence is not as difficult to read as a sentence with a phrase and a clause, but is more difficult than a single-phrase sentence. (d) A sentence containing a phrase and a clause is more difficult to read than sentences without a clause.

TABLE 2

THE NUMBER OF PHRASES AND CLAUSES IN

EACH SENTENCE OF THE PARAGRAPHS, GRADES 1-6

	GRADE					
Sentence	1	2	3	4	5	6
1	p[a]	p	p	pp	pp	pc[b]
2	p	p	pp	pp	pc	pc
3	p	pp	pp	pc	pc	pc
4	p	pp	pc	pc	pc	pc

[a] "p" denotes a prepositional, infinitive, gerund, or participial phrase.

[b] "c" denotes an adjective or adverb clause.

TABLE 3

SENTENCE LOCATION OF PHRASES AND CLAUSES IN PARAGRAPHS

FOR GRADES 1, 3, AND 6 OF MAIN IDEAS A, B, AND C

	Main Ideas								
	A			B			C		
	Grades			Grades			Grades		
Sentence	1	3	6	1	3	6	1	3	6
1	p[a]	pp	pc[b]	p	pp	pc	p	pc	pc
2	p	pp	pc	p	pc	pc	p	p	cp
3	p	p	cp	p	pp	pc	p	p	cp
4	p	pc	pc	p	p	cp	p	pp	pc

[a] "p" denotes phrase

[b] "c" denotes clause

While Table 2 shows the relationship of phrase to clause as it was conceived, Table 3 shows the actual phrase-clause ordering within each sentence of the nine paragraphs used in this study.

Pictures

The three 4" x 6" black and white ink drawings (Appendix B) were done by aprofessional illustrator with experience in illustrating educational materials. The illustrator was given copies of the main ideas and the paragraphs which had first, third, and sixth grade ratings according to the readability formulae and asked to draw several pictures illustrating each of the three main ideas. It was recommended that the information from

each of the four sentences developed as specific examples for a main idea be integrated into one picture. This was done for all sample pictures of the three main ideas. The illustrator and the investigator then chose a best picture for each main idea from the three or four available.

To gain some assurance that the pictures evoked about the same type of response, 24 third and 24 sixth grades were asked for the main idea of the pictures. Of the total 140 responses, 119 were placed in the same category and 18 more were placed in the adjacent category by three independent judges.

Scale

The 7-point scale (Figure 2) which was used to rate the responses was developed after a year of piloting materials and scales in various forms. The scale reflects three assumptions: (1) The optimal main idea statement is a sentence, not a topic or phrase. (2) The optimal main idea contains the general topic of the passage and the specific restrictions of the passage. (3) The general topic portion of the main idea statement is hypothetically more important than, but not operationally different from, the specific portion of the main idea statement.

Briefly, the responses were ranked on the scale by the degree of synthesizing within a main idea sentence. Optimal value was placed upon the complete main idea sentence, next were ranked sentences which did not contain all the syntehsized material, then came general phrases or titles which children may be accustomed to make, and finally came incorrect main idea statements, garbled phrases, and non-synthesized responses.

The responses were rated independently by three experienced judges. At least two judges gave identical ratings to 596 or 96.7% of the responses. The eighteen responses which received divergent ratings were judged independently a second time by the same people with only three main ideas requiring a discussion before a consensus was reached.

The reason for dwelling on the consensuality of the judges' ratings is that the subject's score for a main idea was that identical rating given by two or more judges. The total score for each subject was then the sum over the three main ideas.

Figure 2. The Main Idea Scale and Example Responses

Scale Value	Category Description
6	Both elements correctly stated.*
5	One element correctly stated, the other too generally or too specifically stated. e.g. Where birds like to build nests. How different animals help the farmer. How animals use their claws. What animals use their claws for. Robins, bluejays, ducks and woodpeckers build nests in different ways. Horses, dogs, cats, and cows help the farmer in different ways. Lions, tigers, bears and cats use their claws for different things.
4	One element correctly stated. e.g. Animals that help the farmer on the farm. Animals put nests in different places. Animals use claws
3	Irrelevant or incorrect material plus one element correctly stated OR one element correctly stated and the other too general or specific OR both elements correctly stated. e.g. How birds make nests. All the animals help the farmer in the summertime. How animals do and do not help the farmer. Where most birds build nests.
2	One or both elements too generally stated. e.g. Birds or Nests. Animals or Claws. About animals on a farm. About animals in the woods. Where birds live. Animals on the farm and what they do.
1	One or both elements too generally or specifically stated plus irrelevant or incorrect material OR one or both elements too specifically stated OR only irrelevant or incorrect material. e.g. Animals have sharp claws. Birds hide their nests. Re-read paragraph or a single sentence. How safe the farmer keeps the farm.
0	No response.

* Synonyms of the verb and of the adjective in the final prepositional phrase are acceptable.

RESULTS

The main effects in the analysis of variance of the ratings of the main idea responses were Reading Conditions, Readability Levels, Grades, and Sex. The assumption of homogeneity of variance was confirmed with Hartley's F max test (Winer, 1962) with none of the variance ratios within any of the main effects approaching the .05 level.

The analysis of variance, summarized in Table 4, did not reveal significant differences between responses of boys and girls irrespective of grade or among the Reading Conditions.

TABLE 4

ANALYSIS OF VARIANCE OF THE MAIN IDEA RESPONSE RATINGS

Source		df	MS	F
Reading Conditions	(RC)	3	16.84	1.12
Readability Levels	(RL)	1	159.51	10.60**
Grade	(G)	1	344.01	22.86***
Sex	(S)	1	.42	< 1
RC x RL		3	8.56	< 1
RC x G		3	8.56	< 1
RC x S		3	18.92	1.26
RL x G		1	45.05	2.99
RL x S		1	11.51	< 1
G x S		1	81.38	5.41*
RC x RL x G		3	17.05	1.13
RC x RL x S		3	.23	< 1
RC x G x S		3	27.76	1.84
RL x G x S		1	4.05	< 1
RC x RL x G x S		3	16.98	1.13
Error Within		160	15.05	

* $p < .05$
** $p < .01$
*** $p < .001$

However, the Readability Levels (.01) and Grade (.001) effects were significant as was the Grade x Sex (.05) interaction. Inspection of the means in Table 5 showed that the mean of subjects who read basic materials was higher than the mean of subjects who read materials rated at the reader's grade placement in difficulty, and that the mean of the sixth graders was higher than that of the third graders.

Table 5

MEAN MAIN IDEA SCORES OF 192 SUBJECTS READING PARAGRAPHS

Reading Conditions				Readability		Grade		Sex	
Para Only	Para. with Pic.			Basic	Grade	Three	Six	Boys	Girls
	No Dir	Min	Max						
9.96	10.83	9.49	9.71	10.91	9.08	8.66	11.33	9.95	10.04

Post hoc comparisons of the relevant means by the Tukey (a) test, summarized in Table 6, showed that the mean of the sixth grade boys was significantly different from the means of both boys and girls in third grade, but was not different from that of the sixth grade girls. In fact, only the third grade boys' mean differed significantly from that of the sixth grade girls'.

TABLE 6

ORDERED MEANS AND ALL PAIR WISE GAPS:

SEX GRADE INTERACTION

Means: Grade & Sex	Means: Grade & Sex			
	3-Boys	3-Girls	6-Girls	6-Boys
	7.96	9.35	10.73	11.94
3-Boys 7.96	---	1.39	2.77*	3.98*
3-Girls 9.35		---	1.38	2.59*
6-Girls 10.73			---	1.21
6-Boys 11.94				---

* Significant at the .05 level according to Tukey's (a) procedure (Winer, 1962, p.87).

DISCUSSION AND CONCLUSIONS

Before discussing the results, some of the limitations of the study should be made clear. (1) The paragraphs were short, expository in style, specifically controlled as to structure and content, and the type of relationship between paragraph and main idea would seem to be only one of many possible relationships. (2) The main idea was not explictly stated in the paragraphs; therefore, the results are not applicable to cases where the main idea is stated in a topic sentence in a paragraph. (3) The scaling of the responses is unique.

Within the scope of the limitations of the study, it is apparent that the addition of a content relevant picture to a paragraph with or without direction to use it did not enhance either third or sixth graders' main idea statements. Thus, the argument that pictures should be placed in books because they serve as aids to comprehension of the main ideas is not supported by the present data. On the other hand, the data should not serve as a basis for conclusions about the removal of pictures from books because pictures serve other purposes, e.g., Vernon (1954) has found that specific facts pictorially presented are recalled relatively more times than facts not so presented, and Whipple (1953) has found that pictures increase the interest appeal of the book. Furthermore, the present data do not show that content relevant pictures interfere with comprehension of the main idea.

As previously stated, the effect of direction to view the picture and even to consider the relationship of paragraph to picture did not enhance the subjects' main idea statements. Since this is contrary to expectation, one is led to the possibility that the pictures did not convey enough content relevant data which the reader could use as an aid. Indeed, main idea statements about the pictures generally received low scale ratings (Koenke, 1968). Therefore, it is possible that directions to use a picture as an aid to comprehension of the main idea would be of value only in a situation where the picture and the text are related more closely or in a different manner.

Contrary to the lack of success in enhancing children's main ideas through the use of pictures and directions as aids, the simplification of the paragraphs did lead to higher scale ratings for both third and sixth graders. The data of the present study, then, would tend to support the argument that one can simplify material by shortning sentences and using easier words thereby enhancing the reader's comprehension of the main idea.

Finally, it is apparent that, irrespective of the reading conditions in the present study, sixth graders generally had greater success in stating the main idea than third graders. This was expected and merely underscores the developmental nature of the skill to infer a main idea. It should also be noted that although sex was not a significant factor within either third or sixth grade, the variability of the boys' scores undoubtedly led to the statistically significant differences between grades. Since the present study is the only one known to invesitgate sex as a factor affecting comprehension of the main idea, the implication seems to be that replication is needed before conclusions are drawn that developmental patterns in the growth of the skill to infer a main idea are related to the sex of the student.

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Appendix A

Main Idea: Birds build nests in different places.

Basic Paragraph

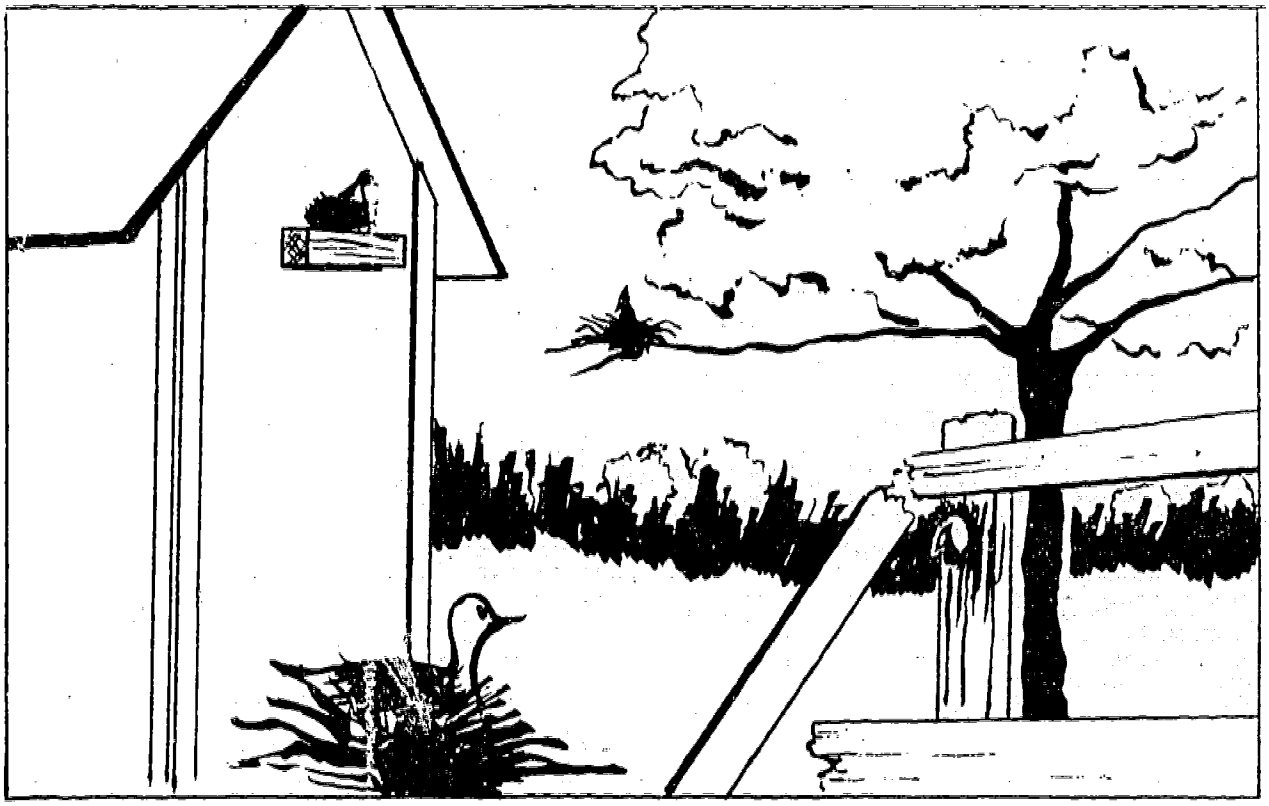
Robins may build nests under a roof. Bluejays like nests in trees. Ducks make nests in tall grass. Woodpeckers make nests inside wood fence posts.

Third Grade Paragraph

Robins build their nests under the roofs of houses and barns. Blue jays like nests in trees that have many big branches. Ducks, however, carefully make their nests in the wild rice, high weeds, or tall marsh grass near other duck nests. Woodpeckers sometimes make nests inside old wood fence posts.

Sixth Grade Paragraph

Robins build their nests under house and barn roofs where they overhand the building. Bluejays like nests in leafy trees that have big branchs. Ducks, however, carefully make nests in wild rice, high weeds, or tall marsh grass that may contain many duck and other whild life homes. Woodpeckers sometimes make nests that are quite soft and comfortable inside old wooden fence posts.



Content Relevant Picture for Main Idea B:

Birds build nests in different places.