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Overtly-reinforced cloze procedure versus conventional instruction in the teaching of selected science facts in the fourth grade

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Abstract

"They just can't read the material" is an expression which can be heard in almost any teacher's lounge. Often it is a science, social studies, or mathematics teacher who is complaining about the inability of students to comprehend what is read in textbooks. Media coverage suggests that children are experiencing difficulty with all the basic skills (Howe, 1979).

OVERTLY-REINFORCED CLOZE PROCEDURE VERSUS CONVENTIONAL INSTRUCTION IN THE TEACHING OF SELECTED SCIENCE FACTS IN THE FOURTH GRADE

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CHAPTER I

INTRODUCTION

"They just can't read the material" is an expression which can be heard in almost any teacher's lounge. Often it is a science, social studies, or mathematics teacher who is complaining about the inability of students to comprehend what is read in textbooks. Media coverage suggests that children are experiencing difficulty with all the basic skills (Howe, 1979).

Glenda S. Carter and Ronald D. Simpson (1978) educators at North Carolina University stated in a recent article:

> The surge of renewed interest in "basic education" is cresting. Nation-wide, public demand and legislative action are resulting in curricula that emphasize fundamental skills in reading, writing and mathematics (p. 19).

This increased concern prompted federal government appropriations of thirty-five million dollars for pilot projects investigating the lack of children's basic skills. In addition, the concern regarding this issue prompted the establishment of a "Human Resources Committee" that conducted hearings across the country (The Christian Science Monitor, 1979).

A chief witness at one of the hearings was Thomas F. Eagleson who said: "By many indications . . . very essential skills are deteriorating (The Christian Science Monitor, 1979, p. 5). Paul Copperman, education consultant and author of The Literacy Hoax, supported this view. "The academic achievement of late elementary

and secondary students has declined every year for fifteen years. The decline started in the early sixties" (The Christian Science Monitor, 1979, p. 5).

Harold Howe II, vice president for educational research at the Ford Foundation and former U.S. Commissioner of Education, argued, the reason for the decline in scores was due to the fact that education has recently provided "increasing opportunities for poor, non-English speaking and minority group children" (The Christian Science Monitor, 1979, p. 5). The decline in scores has coincided with the programs supported by the administration of the late President John Kennedy for the underpriviledged.

In an article, in the Fort Dodge Messenger, Gwyneth Britton and Margaret Lumpkin, both professors of education at Oregon State University, suggested why children don't appear to be able to read as well as they should.

> Seventy percent or more of the middle grade stories were written above the publisher's designated reading grade level and considerably above the reading abilities of the students assigned to read them (Fort Dodge Messenger, 1979, p. 6).

Accurate readability labeling may contribute to the answer, but in a recent educational journal John Harker (1977) reports, ". . . more important than readability formulas is establishing the number of concepts introduced and the degree of complexity and abstraction" (p. 127). A wide variation exists in readability formulas. When

identical passages in a textbook were analyzed, the variation was found to be as much as two to three years. Also, determination of complexity and number of concepts introduced varied from teacher to teacher because no universally accepted list of concepts was available for any grade level.

A word of caution was noted by Joan Nelson (1978) in an article in Journal of Reading:

> A content area textbook is not designed for independent reading. It is a teaching tool designed to present facts, concepts, and values, that are beyond the current knowledge and experience of the reader (p. 624).

She also suggested the fault may rest with teachers who hold outmoded ideas. Frequently they regard a reading assignment in the textbook as synonomous with teaching reading.

Another question may be raised regarding teachers' understanding of the nature of abstraction. Many abstract ideas are taught in the fourth grade and below when according to Piaget (1972),

> It is only as students enter the period of formal operations from about age eleven onward that their conceptual development has advanced to the stage where they can internally build and manipulate ideas without reference to concrete examples (p. 20).

Many children are not eleven years until the middle or end of fifth grade. In addition, Piaget's periods are not rigid and some children

may not reach the stage at which they can manipulate abstract ideas until much later.

Whether it is an issue of adverse publicity, textbook readability, teacher incompetence, or a combination of the three, the decision regarding how to teach reading comprehension is left to the classroom teacher. Cloze procedure is a teaching technique that researchers are examining as a way to increase reading comprehension. It is a variation of the cloze test of reading. The cloze procedure is made by replacing words in a regular sentence in a given passage with an underlined blank space in which the pupil writes the word he believes was deleted. If overtly-reinforced cloze procedure can prove to be an effective way to teach factual subject matter, teachers may use this technique to help children's reading skills improve.

Statement of the Problem

The Laurens-Marathon Elementary School fourth grade science department at Laurens, Iowa has currently been examining ways to present factual information to children in a self perceived interesting and effective instructional manner. The purpose of the study was to determine the teaching effect of the use of overtly reinforced cloze procedure on the science achievement of a sample of fourth grade students.

Definition of Terms

For purposes of this study, the following definitions of terms were utilized:

Achievement referred to in this study is the accomplishment or proficiency of performance of a given skill or body of knowledge

(Good, 1957). In this study the given skill or knowledge referred to basic fourth grade level science facts.

Achievement Test is the accomplishment or proficiency of performance of a given skill or body of knowledge (Good, 1957). The unit test supplied by Steck-Vaughn Company was used as the achievement test in this study.

Comprehension is the act of understanding the meaning of printed or spoken language as contrasted with the ability to perceive and pronounce words without reference to their meaning (Good, 1957). Whereas, there are many different types of comprehension the one used in this study was literal comprehension which is the understanding of the primary or literal meaning of a word, phrase or sentence (Good, 1957).

Conventional Instruction (or Traditional) had a specific meaning for the purposes of this study. The conventional method may refer to many techniques but usually the student takes a passive role, listening and responding to teacher directions. Often included in the conventional method are the introduction of new terminology: reading the assignment orally or silently; teacher directed class discussion; and answering questions over the material either orally or in writing.

Conventional (Control) Group is the group in the study that was exposed to the conventional instruction described above.

Current Scholastic Achievement for the purposes of this study was the reading comprehension scores on the Iowa Test of Basic Skills taken at the end of their third grade.

Cloze Procedure is a procedure used to estimate readability of printed material and to evaluate and improve reading comprehension: based on the Gestalt concept of closure and involving a cloze test composed of reading selections from which words have been deleted. Completeness of the test requires that the examinee fill the blanks left by the deletion (Good, 1959).

Overtly reinforced cloze procedure means that upon completion of the cloze passage there should be a class discussion, involving all the children, where they can understand the reasoning of the correct responses.

Experimental Group was the group of students exposed to the overtly reinforced cloze procedure.

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the literature regarding topics relative to the study. First, the general use of cloze procedure as a teaching technique for the improvement of reading comprehension was reviewed. Secondly, cloze used with beginning readers was explored. Thirdly, research conducted concerning the use of cloze procedure with average readers was investigated. Finally, using cloze procedure in the content areas and how this can best be accomplished concluded this chapter.

In 1953, Wilson Taylor (while a graduate student at the University of Illinois) introduced a technique for measuring the effectiveness of communications which he called the "cloze procedure" (Jongsma, 1971). Cloze procedure systematically deletes words in a prose selection and the reader must use context clues in order to fill in the blanks. Several studies have shown cloze procedure to be a convenient way to measure textbook readability (Jongsma, 1971). Also, studies have confirmed the use of cloze procedure when measuring general reading comprehension (Jongsma, 1971). The following statement made by Schneyer (1965) in an article in Reading Teacher suggests cloze might be a good teaching technique as well:

> In order to select the specific word for the cloze passage the reader must possess a knowledge of word meaning, must understand the main idea of the passage, must attend to

> details, and must make inferences and draw conclusions (p. 178).

These important skills are involved in reading comprehension.

Cloze Procedure for Reading Comprehension Improvement

Patricia Grant (1976) agrees with Schneyer and feels there is a place for cloze in instructional classrooms. In a paper presented at the annual meeting of the International Reading Association in 1978, she reviewed the literature on cloze procedure being used as a teaching technique and drew the following conclusions.

> Instruction that promotes the awareness and use of contextual aids in reading may be achieved by the use of cloze procedure in the classroom. Training with the cloze procedure helps to focus the attention of the student on the conceptual aspect of reading rather than the perceptual and may be used from the primary grades through college (p. 1).

Grant (1976) noted cloze procedure, employed as a teaching technique to improve reading comprehension, had been explored by several investigators but firm evidence of the effect of cloze in this area is lacking. However, in most studies which failed to find significance, no direct teaching actually took place (Jongsma, 1971). Students were given the cloze passage to complete and materials were then collected and scored. When a discussion followed the completion of the cloze passage and there was reinforcement of the correct response, more favorable results were obtained (Jongsma, 1971).

Cloze Used With Beginning Readers

In the 1970's research on cloze procedure as a teaching technique took several different directions. Mary Gove (1975) used cloze procedure as one means of encouraging beginning readers to apply their knowledge of how language works to written language. The program supplemented a regular basal program in an average first grade classroom. Gove did not try to make an empirical assessment of the program but she felt it was a way to focus the beginning readers attention on one of the most important parts of reading comprehension.

Blackowicz (1971) suggested a sequence of activities she had found successful in introducing primary students to cloze. She felt the prediction procedures used in cloze was so critical to comprehension development.

An examination of the effect of systematic cloze type instruction on primary grade reading success was conducted at the University of Wyoming (Paradis, 1975). No significant effect was found from using cloze task instruction. The results of this study indicate that the cloze treatment and a treatment combining self-selected reading and phonic reinforcement activities had equal effect on the reading success of primary grade subjects.

Cloze Used With Average Readers

Pat Gunn and John Elkins (1976) working with a third grade average classroom in Australia found that a cloze program was effective in raising the children's reading comprehension skills (measured by standardized tests) after both an initial and a subsequent period of

eight weeks. They applauded cloze technique for the way it helped children to use processing strategies.

Jerry Johns (1977) took 222 average third grade students and worked with them for 25 weeks (20 minutes 2 x a week). He used discussion along with cloze procedure. He found no significant differences in vocabulary or comprehension.

Deloris Kessler Kennedy and Paul Weener (1973) conducted a study that dealt with the effect of individualized training with the cloze procedure to improve reading and listening comprehension. It was found that visual training with the cloze procedure improves reading comprehension and auditory training using cloze improves listening comprehension. The visual training program is to be preferred to the auditory training program not only because it resulted in the greatest positive effects but also because it is easier to use.

Cloze Used in the Content Areas

The importance of a fusion of process and product was mentioned in a lecture "Concept Development in Content Reading" given by Dr. Keith Thomas (1979). What we really want is children to internalize the process so they can generalize the process to other materials. Dr. Thomas felt that cloze technique is an appropriate teaching format. It places a premium on context. He suggested that in content areas, delete important concepts, work the cloze passage, discuss, and then read through completed passage for continuity.

Other researchers who have been working with cloze are John Bormuth and E. G. Begle. Bormuth (1975) felt that from about grade four onward students are expected to acquire ever increasing amounts

of knowledge and are expected to acquire that knowledge in ever increasing proportions by reading and comprehending written instructional materials. Bormuth (1975) also found that 65 percent of his students in the upper elementary grades gained little or no information from the average textbook used in instruction.

Begle (1973) explored the use of cloze in the area of mathematics. His findings suggested that tests of mathematical reading ability might have diagnostic value in the area of mathematic underachievers in the upper elementary grades. He would like to see further research on improving math reading ability through cloze procedure and the relationship it would have on problem solving ability.

Joyce Lee, (1978) a reading specialist from Pennsylvania, believed emphatically that cloze will help students make use of contextual analysis cues in their content area reading materials. She felt that the lack of significance in a number of studies involving cloze was because of the absence of direct teaching.

An essential component of the cloze procedure is classroom discussion following the completion of the passage. This should include reinforcement of the correct response. Jongsma (1971) cited studies (Schneyer, 1965; Bloomer, 1966; Martin, 1968) which supported this pratice. After completion of cloze exercises it is necessary to encourage students to explain their reasons for selected responses. One instructional procedure was to conduct these discussions on a group basis.

A more detailed procedure, using cloze, was described by Patricia Grant (1976). She suggested:

1. Reading the cloze passage to insure maximum use of context.
2. Divide students into groups of three to complete cloze passage.
3. Discuss answers as total group.
4. Compare to author's own words.
5. There will be little emphasis on scoring.
6. The authors exact words will not be required (pp. 55-57).

This method provides the opportunity to learn to systematically use context clues for problem solving while also benefiting by the experiences of others.

According to Jongsma (1971), Culhane has suggested the deletion of nouns and verbs when teaching an understanding of factual material. Grant (1976) found, however, that deleting a variety of words representing different word classes seemed to be less boring to her subjects. Grant observed some positive results in long term recall when a variety of words were deleted in the cloze exercise. She found that through this method, subjects were forced to use inference and logic skills. She, also, suggested a 10 percent selective deletion pattern be used in constructing the cloze exercises. In this pattern ten words are counted off, and one word in ten was selected for deletion. This process is continued until the desired number of deletions have been made.

There are numerous studies about cloze procedure. This chapter reviewed the literature that was concerned with the use of cloze as a teaching technique to improve reading comprehension. Included were content area studies relevant to this study. A few of the studies provided a rationale for the procedures used in the present study.

CHAPTER III

METHOD OF PROCEDURE

The purpose of this study was to evaluate the effect of cloze procedure under actual instructional conditions by comparing post test scores in science content reading material. This chapter notes the hypotheses, describes subjects, the treatment, data collection procedures, basic assumptions and limitations.

Hypothesis

The major research question was whether there was achievement in the acquisition of science concepts presented in reading material, by an experimental group who had been taught to read science materials using cloze procedure compared to the control group who received conventional science reading instruction.

The hypotheses derived from the research question is: there is no significant difference in science posttest scores between students receiving science reading instruction utilizing cloze procedure and those receiving conventional science reading instruction.

Subjects

The subjects used in this study consisted of two sections of the fourth grade. Assignment to the two sections was made by the student's prior teachers. A balance of academic ability, rural and town children, and an even distribution of behavioral problems was the basis for this division. Such a method resulted in probable balanced groups with similar social and academic background. Section one (4^1) consisted of 17 students and section two (4^2) consisted of 17 students.

Procedure

By the toss of the coin section 4^2 was chosen as the experimental group (overt reinforced cloze procedure) and section 4^1 was chosen as the control group (conventional instruction). Both sections were taught by the researcher. This study used two one-week units, each unit was taught for five consecutive class days. The subject matter of both units included "Space" and "Living Things Need Food, Water, and Air" (Ware, 1970).

Since the beginning of the 1979-80 school year the subjects involved in the study had been exposed to various teaching strategies, therefore, the pretest was not considered a significant departure from normal conditions. The pre and posttest consisted of the unit test supplied by Steck-Vaughn Company (Appendix A). The test consisted of a 37 point objective test. This test has been used by the fourth grade teachers at the Laurens-Marathon Elementary School for the last four years and has seemed to be a reliable indication of achievement.

The pretest was administered under standardized conditions. These conditions were:

1. They were going to be studying a new unit.
2. Their teacher's awareness of what they knew prior to the unit and what they know following the unit would be helpful.
3. They were told to do the best they could but not to worry if they didn't know the answers.
4. They would not be timed.
5. The teacher would help them pronounce any unrecognizable words but would not help them with the definitions of words.

On the first day of each unit both sections spent the class period reading the material out loud. This insures that all students enter the treatment phase with similar background. During these two days, the teacher refrained from any discussion or comments and aided only in word pronunciations. On the following days the differential treatment took place.

Treatment of the experimental group (4^2) began the second day. The cloze exercises were constructed by using a 10 percent selective deletion pattern (Grant, 1976). This is a pattern in which ten words are counted off and one word out of ten words is selected to delete. This is continued throughout the passage. From the review of the literature it was decided a variety of words would be deleted (Grant, 1976). The word deletions were balanced so that one-half of them were very easy to obtain (noun determiners, prepositions, verbs, adjectives) while one-half of them were concepts (Thomas, 1979). Every attempt was made to require the student to use inference and logic skills to arrive at the missing word. The cloze exercises were taken directly from the text (Thomas, 1979) using only nine pages of the units because almost half of the units consisted of pictures and exercises. Once the deletions were made the material was typed on a spirit master. Each deleted word was replaced by a typewritten blank of ten spaces. Finally all passages were duplicated (Appendix B). The experimental group was given a cloze passage over a portion of the unit. The students were divided into groups of three (Grant, 1976) to work together on the cloze exercises. The students were

instructed to read through the passage and then go back and fill in all the blanks.

The next day students corrected their work while the teacher read the answers. Students were allowed to raise hands and suggest their own words, then the entire class would discuss the appropriateness of a given response. In so doing the students would determine whether or not a response could be counted correct. The students were encouraged to verbalize their thinking in making their choice. This procedure of working a passage and then correcting, continued until the unit was completed. This was four days for the first unit and four days for the second unit.

Instruction of the control group (4^1) was also begun on the second day. In this group conventional instruction as defined by Oliphant (1976) was applied. The teacher stood at the front of the classroom, the students sat quietly at their desks and participated overtly only at the direction or certification of the teacher. The class time was carefully planned out in advance by the teacher. Students were dealt with as a group. There were short lectures by the teacher as a means to emphasize and clarify terms. On the second day of the experiment this group was given the questions at the end of the unit (Appendix C). It was arranged that the control group spend the same amount of time answering questions as the experimental group did on cloze exercise.

The next day the control group corrected their answers under the teacher's direction and discussed their various responses. This procedure of answering questions and discussion continued until the unit

was finished. This took four days for the first unit and four days for the second unit.

The post test was administered to both groups on the eleventh day under standardized conditions. The subjects were told to do the very best they could. They would not be timed. The teacher would help them pronounce any unrecognizable words. This assistance was to ensure measurement of knowledge gained rather than reading ability.

Data Analysis

To establish pre-treatment equivalence a t-test of independent means was utilized to compare the CAT Standard Verbal Scores and the ITBS Reading Grade Equivalent Scores. A t-test of independent means was also used to compare the two groups pre-treatment science achievement scores. Statistical significance was determined by the .05 level.

Assumptions

The researcher assumed that the Steck Vaughan Company test was an accurate tool for the measurement of growth in achievement. Also, the assumption was made that grouping for discussion would not be a significant factor in this study.

Limitations

It is necessary to define the limits of this study as it was conducted on a very selected and limited population. The geographical location was limited to the Laurens-Marathon Elementary School in Laurens, Iowa. Laurens is a rural town of 1,800 people located in an agricultural community in northwest Iowa. The school district includes Marathon (population 600) which is located seven miles from

Laurens. There are 680 pupils in the school district of which 230 are in the elementary school. The study was limited to 34 white middle class fourth graders, children of predominantly German and Scandinavian background. There were 21 boys and 13 girls involved in the study.

The data collection was accomplished during a two week period from May 5, 1980 to May 16, 1980. A 35 minute period per day for five days a week was allowed for the experiment. The time of year which was close to the end of the academic year was most likely a factor in the study. The children were restless and not quite as ready to try new things as they may have been during the beginning or middle of the academic year. Also, the short amount of time allotted to the study was a limitation.

The subjects were not chosen by any criteria except enrollment in the researchers science class. Also, the teacher was the researcher in the study. Lack of randomization and using the researcher as the single teacher greatly restricts the ability to generalize the findings.

CHAPTER IV

FINDINGS

To present findings the research question and hypothesis are stated. Verbal and tabular presentation of the analysis follows the statement. A significance level at or beyond the .05 level of confidence was necessary to reject the hypothesis.

The major research question was whether there was achievement in the acquisition of science concepts presented in reading material, by an experimental group who had been taught to read science materials using cloze procedure compared to the control group who received conventional science reading instruction.

The hypotheses derived from the research question is: there is no significant difference in science posttest scores between students receiving science reading instruction utilizing cloze procedure and those receiving conventional science reading instruction.

To determine the equivalence of the groups prior to treatment the groups were compared on CAT Standard Verbal Scores and ITBS Reading Grade Equivalents. The means, standard deviations and values for each of the measures for both groups are reported in Table 1.

Table 1

Means and Standard Deviations for the

Experimental and Control Groups on the CAT and ITBS

Test	ITBS			CAT		
Group	Mean	S.D.	t Value	Mean	S.D.	t Value
Exp. (N=17)	3.54	1.20	1.01	99.71	14.29	4.71
Control (N=17)	3.94	1.08		104.6	13.13	

No significant initial differences were found between the groups on these two variables.

The results of the t-test for independent means on the pretest science achievement test are presented in Table 2.

Table 2

Means and Standard Deviations for the

Experimental and Control Group on the Science Achievement Pretest

	Mean	S.D.	t Value
Exp. (N=17)	25.82	3.54	2.13
Control (N=17)	28.12	2.67	

Statistical significant differences were found between the two groups on the pretest.

The results of the posttest mean scores and standard deviation are shown on Table 3

Table 3

Means and Standard Deviations for the Experimental and Control Group on the Science Achievement Posttest

	Mean	S.D.
Exp. (N=17)	28.29	2.62
Control (N=17)	30.24	1.96

There was no significant differences found on the posttest scores.

The results of the analysis of covariance for the comparison of posttest science achievement scores are reported in Table 4.

Table 4

Analysis of Covariance of Posttest Scores by Teaching Method

Source	Proportion of variance	S.S.	d.f.	M.S.	F value
Covariate:					
Pretest	.2333	47.271	1		
Treatment (after adjustment)	.0589	11.934	1	11.934	2.5798 NS
Error	.7078	143.414	31	4.626	
Total	1.000	202.619	33		

The f-value we found failed to reject the hypothesis. As indicated by Table 4, there were not significant differences in science

achievement posttest scores after adjustment for initial pretest differences. This would indicate the treatment, use of the overtly reinforced cloze procedure, was not more effective in developing science achievement than the conventional instructional approach.

CHAPTER V

SUMMARY AND CONCLUSIONS

The teaching of comprehension skills in order to help children learn factual knowledge is a concern of content area teachers. There has been much publicity indicating that basic skills are deteriorating in our school children. Concern in this area had prompted the researcher to undertake this study in order to find a better method for teaching selected science facts.

The purpose of the study was to evaluate the effect of cloze procedure used under actual classroom conditions. Two groups of science students at Laurens-Marathon Elementary School, Laurens, Iowa were given differential treatment. A conventional instruction approach was used with one group and an overtly reinforced cloze procedure was used with the other group. The study used two one-week units taught for a period of 35 minutes daily. Each section was taught by the researcher.

The equivalence of the groups prior to the experiment was found to be of no significant value. However, on the pretest comparison of the two groups a significant difference was found. After using analysis of covariance on the posttest scores, no significant difference was found between the two groups.

The conclusions derived from this study are that even though researchers in the field of reading are looking at cloze procedure as a viable way to teach reading comprehension it is the researchers opinion that it is not a significant enough departure from conventional question answering techniques to make a difference in science achievement. Cloze procedure used as a culminating language arts

activity as suggested by Sinatra (1977) after science students have had physical involvement in activity and been exposed to associating word meaning with concrete experience may be a more effective instructional method. (See Appendix D).

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THE WORLD ABOUT YOU, Third Edition

Test 7—Units 8 and 9: Space; Living Things Need Food, Water, and Air

My score _____

Name _____ Date _____

A. On the blank in front of the word write the number of the statement which belongs with the word.

A	B
_____ Project Apollo	1. Its surface may be as hot as 800° F.
_____ TV cameras	2. Its surface has many craters.
_____ Glenn	3. They have given us better pictures of Mars than telescopes have.
_____ Nimbus	4. He was the first U. S. astronaut in orbit.
_____ Intelsat	5. It has landed explorers on the moon and brought them back to earth.
_____ Moon	6. They are weather-reporting satellites.
_____ Transit	7. Radio, television, and telephone can be handled by these satellites.
_____ Venus	8. They are satellites which help ships at sea find their way.
_____ Explorer I	9. This project orbited two men in a spacecraft.
_____ Gemini	10. It was the first U. S. satellite to orbit the earth.

(Each correct answer is worth 3 points.) Perfect score: 30 points

B. Find the correct answer. Write it where it belongs.

1. _____ means "not carrying a person."
2. A _____ is a plan of some kind to accomplish work.
3. A _____ is a pit formed by impact of some kind.
4. A _____ is a machine built to travel outside the earth's atmosphere.
5. _____ is a part of the universe lying outside the earth's atmosphere.
6. A _____ may be used for seeing far-distant planets or stars.

space	**crater**	**astronaut**	**unmanned**
telescope	**project**	**spacecraft**	**manned**

(Each correct answer is worth 3 points.) Perfect score: 18 points

C. Write the words **food, water,** or **air** in the blanks depending on the meaning in the sentences.

1. Green plants can make their own _____.
2. _____ is made up of several different gases.
3. Plants need _____ in order to dissolve food materials.
4. Materials such as _____ and milk are called liquids.
5. Plants need the gas, carbon dioxide, from the _____ in order to make food.
6. Plant-eating animals are _____ for meat-eating animals.
7. All animals depend on plants for _____.
8. Animals need oxygen from the _____ just as plants do.
9. Plants could not get materials from the soil if _____ did not bring them in.
10. _____ helps animals dissolve their food and get rid of waste materials.

(Each correct answer is worth 3 points.) Perfect score: 30 points

D. Draw a line under the correct answer.

1. You can make your own food in your body.	Yes	No
2. You cannot live without food.	Yes	No
3. You need food for growth and energy.	Yes	No
4. You are always using up energy except when you are sleeping.	Yes	No
5. All foods are made of the same materials.	Yes	No
6. You need to drink about six glasses of water every week.	Yes	No
7. You need to drink about four glasses of milk every day.	Yes	No
8. You need to eat meat, fish, chicken, or cheese every day.	Yes	No
9. You need to eat at least four eggs every day.	Yes	No
10. You need to eat a vegetable or fruit once every week.	Yes	No
11. You need to eat meat three times every day.	Yes	No

(Each correct answer is worth 2 points.) Perfect score: 22 points

APPENDIX B

Cloze Exercise No. 1

Have you ever picked up a rock to see what was under it? Have you ever opened the covers of a book to see what it was about? Have you ever climbed a wall to see what was on the other side?

Man has always been _____ about the things around him. He opens doors, _____ holes, lifts rocks, and finds ways to do difficult things. He _____ built machines to let him move _____ over the ground and has made others to help him dig into _____ earth. He has built ships and submarines to take him over and _____ the waters of the oceans. He has built _____ to fly through _____ air. Now he is building rockets to take him out into space. Why? Because man is _____. He wants _____ know more about what space is like. He wants to know more about the _____. He would like to answer his _____ about the other planets in our solar system.

Man has already sent spacecraft out to the planets _____, and Mars. As Mariner spacecraft passed by _____ planet Venus, messages were sent back to earth. Some of those _____ told us that the surface _____ Venus may be as hot as 800 degrees _____. It was also discovered that the bank of _____ that covers Venus is about 15 miles thick. Other Mariner spacecraft have given us some _____ information about Mars. _____ pictures of this planet show that like our moon, it has many holes or _____ called craters. Mars has

_____ of 60 degrees Fahrenheit to minus 190 degrees Fahrenheit. The planet's polar caps appear to be _____ carbon dioxide.

Cloze Exercise No. 2

Man is sending more _____ to land on Mars and to explore the other planets. He hopes _____ discover things that the best telescopes do not show. _____ are happening fast in our _____ program. Be sure to watch the newspapers and TV, listen to _____, and keep up with what is going _____.

In 1962 astronaut John Glenn made three _____ in space in a Mercury flight. _____ July 20, 1969, a little less than seven years later, _____ Neil Armstrong and Edwin Aldrin landed _____ walked on the moon. Millions of people in the world watched on _____ as this important and exciting event _____ man's history took place. Later in 1969 another _____ of Project Apollo astronauts made the same kind of trip _____ no ill effects. Never before had man set _____ on another heavenly body.

The astronauts brought back moon _____ to the earth. They carried out experiments and left instruments on _____ moon. It will take astronomers, geologists, and other _____ several years to study all the new _____ about the moon.

The United States Space Program has _____ for more manned space flights. There will _____ mor Apollo trips to visit other places on the _____ surface. The National Aeronautics and Space Administration plans to have a space _____ for three men in orbit around the _____. The men may stay in space for several _____. The space station will be a laboratory to find out more _____ space,

man in space, and the stars. A _____ trip to Mars using a _____ may be possible before many years. A _____ to Mars and back will take almost two _____ to complete.

Cloze Exercise No. 3

The manned space program has _____ successful because of the careful _____ of many men. Project Mercury and Project Gemini have been _____. These projects found out how man's body could _____ the flights. They found out what a _____ could and could not do while he was in orbit _____ a spacecraft. They made sure that astronauts could be _____ safely back to earth. The ways that _____ could be flown were improved. Men of the Mercury, Gemini, and early Apollo projects _____ the way for the trips to the moon. Many scientific _____ about space have not been _____. Man out in space can find the answers.

Unmanned spacecraft have _____ to increase man's knowledge of space. Many of these helped to make possible the _____ spacecraft capsules about which you have just read. _____ United States has sent many _____ of spacecraft into space for many reasons.

Although Russia was successful in putting the _____ satellite into orbit around the _____ and in sending a manned capsule into _____, the United States has sent many more spacecraft into space. All of these have reported _____ conditions to be found beyond the earth's _____.

Explorer I, launched _____ the Army on January 31, 1958, was the first United _____ satellite to orbit the earth. Since then

there _____ been so many it is _____ to keep track of them.

Satellites carrying _____ cameras and heat-sensitive cells are made _____ send information back to Earth which will help _____ weather predictions. Farms and industries are affected by the _____. If men in these _____ could know ahead of time what weather to expect, it would help _____ to prepare for an emergency.

APPENDIX C

Unit 8 -- "Space"

1. Why is man building rockets?

2. What other planets besides earth has man sent spacecraft to?

3. What was the title given to these spacecraft?

4. Name 5 things these spacecraft have found out for us:

   (1) _____

   (2) _____

   (3) _____

   (4) _____

   (5) _____

5. How can we keep up with what's going on?

6. In _____, astronaut _____ _____ made three orbits in space in a _____ flight.

7. On _____, _____, a little less than seven years later, astronauts _____, _____, and _____ landed on the moon.

8. Later in _____, another team of _____ _____ astronauts made the same kind of trip.

9. What does NASA stand for?

10. What is a space station?

11. How long will it take to go to Mars and back?

12. What was the purpose of Project Mercury and Project Gemini?

13. What things did Project Apollo do?

14. Give a meaning for the following words:

(1) dock =

(2) satellite =

(3) astronaut =

(4) crater =

(5) telescopes =

15. Which came first, manned or unmanned spacecraft?

16. What country was successful first in putting a satellite in orbit around the earth?

17. What country has sent the most spacecraft into space?

18. What was the name of the first United States satellite to orbit the earth?

19. When did this happen?

20. Name 3 weather satellites:

(1) _____

(2) _____

(3) _____

21. Name 4 things they do:

(1) _____

(2) _____

(3) _____

(4) _____

22. Name 4 communications satellites:

(1) _____

(2) _____

(3) _____

(4) _____

23. What do they help us with?

24. How are transit satellites different from the other communication satellites?

25. How have all these satellites helped scientists?

H. How well do you know your science vocabulary?

On the blank in front of the word write the word that belongs with the statement.

1	2
_____ space	a. a pit formed by impact of some kind
_____ satellite	b. a machine built to travel outside the earth's atmosphere
_____ crater	c. not carrying a person
_____ astronaut	d. that part of the universe lying outside the earth's atmosphere
_____ project	e. a person who travels in a spacecraft
_____ spacecraft	f. a natural or man-made object that revolves around another object such as the earth
_____ unmanned	g. a plan of some kind to accomplish work
_____ orbit	h. spacecraft joining and locking together
_____ dock	i. the path of one object around another

I. How much do you remember?

1. Finish these sentences by filling in the blank spaces.

Man has always been _____ about the things around him.

Venus is surrounded by a thick layer of _____.

Mariner spacecraft carried _____ to take pictures of Mars.

_____ was the first American astronaut to orbit the earth.

Tiros and Nimbus are unmanned _____ satellites.

Gemini spacecraft carried crews of _____ astronauts.

Project Apollo has landed men on _____.

The polar caps of Mars may be frozen _____.

_____ spacecraft were the first from the United States to dock in space.

2. Finish the sentences by filling the blanks with some of these words.

Explorer I	**rockets**	**Mercury 6**	**Mars**	**telescopes**
temperature	**Apollo**	**Transit**	**Intelsat**	**orbit**

a. _____ are used to see far-distant planets or stars.

b. _____ was the first United States satellite to orbit the earth.

c. _____ helps improve our communications.

d. _____ has craters like the moon's craters.

e. _____ are used to put satellites into orbit.

f. _____ satellites help ships at sea find their way.

J. Can you spell your science vocabulary?

In each column draw a circle around the one word that is spelled correctly.

1. satalite	satellite	satelight	sattelite
2. planet	planett	plannet	planat
3. tempreture	temperature	temperture	temperiture
4. astronaught	astranaut	astronout	astronaut
5. projeck	project	projecht	project

K. How much can you discover for yourself?

Here are some questions for you to think about. Select one or two that interest you most and try to find out all you can about the subject of the question. You may not have time to answer all of the questions. Encyclopedias and other books will help you answer them. You may learn some answers by talking with your teacher, your parents, or your friends.

1. Why must man use powerful rockets to send spacecraft away from the earth?
2. Why did man experiment with unmanned spacecraft before sending animals or men out into space?
3. Would it be possible for men to walk around on the surface of Venus as we do on the earth? Why?
4. Why is it important to plan to have more than one man at a time to land on the moon or any other heavenly body?
5. What does man have to take with him to stay on the moon for any length of time? Why?
6. Do scientists think that there may be life on other planets?

little calcium in such foods as cheese, oatmeal, and green vegetables. If you drink four glasses of milk and eat two or three green vegetables every day, you will take in just about the right amount of calcium. Iron is another important mineral. Your body needs iron to form blood. Lean meat, raisins, and eggs give you iron. There are other minerals your body needs, but if you eat meat and vegetables and drink milk every day, it is easy to get enough of them.

Vitamins (VI-ta-mins) are needed to keep your body in good running order and to help the body use the other foods in the proper way. There are several different kinds of vitamins. Each kind does something different for your body. Some foods have one kind of vitamin in them. Some have other kinds. Here are some of the kinds of foods that have the vitamins you need: vegetables and fruits of all kinds, wholewheat bread, and milk. If you eat plenty of these foods every day, you will probably get enough vitamins. Some people think that they need more vitamins than they are getting in the food they eat so they take vitamin pills. Not many people who eat the right amounts of vegetables, fruit, and milk have to take vitamin pills.

Water is not a food, but it is very necessary to your body. About two thirds of your body is water. If you weigh 60 pounds, about 40 pounds of that weight is water. Your body must have water in order to do its work well. Water helps you digest your food. The blood, which is mostly water, carries food to all parts of the body. Water helps your body get rid of waste materials. The water that leaves your body carries waste materials away with it. These waste materials cannot get out any other way. You get some of the water you need in the foods you eat. Some of it comes from fruits, vegetables, and milk. But you do not get enough water in your food. You need to drink about six glasses of water a day.

How can you be sure that you eat enough of each food material? You can be sure by eating the right things each day. Here is what you need each day as food:

1. Four glasses of milk (Grown people do not need as much as you do.)
2. A good serving of at least one of these: meat, fish, cheese, or chicken
3. Fresh fruit
4. At least 2 vegetables—one raw
5. A little butter or margarine
6. Some bread, a cereal, and potatoes
7. At least 6 glasses of water
8. At least 4 eggs in one week (You do not need one every day.)

G. How well do you know your science vocabulary?

Each statement in column 2 tells about one of the words in column 1. On the blank in front of the word, write the letter of the statement which belongs with the word.

1	2
_____ vitamin	a. special substance needed to help the body use other foods
_____ calcium	b. food material found in cake and cookies
_____ sugar	c. body-building food material
_____ protein	d. food material found in bread, spaghetti
_____ starch	e. mineral found in milk

1	2
..... oxygen	f. process of using oxygen and giving off carbon dioxide
..... dissolve	g. that which cannot be seen without using a microscope
..... microscopic	h. gas in the air without which plants and animals cannot live
..... carbon dioxide	i. make liquid
..... respiration	j. gas in air needed by plants to make food

H. How much do you remember?

1. See if you can fill in the blanks with the right words.

a. Tiny plants and animals too small to see without a microscope are called ..... plants and animals.

b. Tiny plants and animals furnish ..... for larger animals.

c. Large animals furnish food for still ..... animals.

d. Land animals depend on ..... plants for food.

e. People eat plants and ..... for food.

2. Your body needs food for three main reasons: to ....., to make .....,
and to give ..... for your work and play.

3. There are four main food materials in the things we eat. They are:

a. ..... b. ..... c. ..... d. .....

Foods that supply the material above are:	This is found in these foods:	We get much of this from:	We get this food in:

4. Copy on these lines the four **food materials** you wrote. Tell what each one does for the body.

a. _____ gives the body _____.

b. _____ gives the body _____.

c. _____ gives the body _____.

d. _____ gives the body _____.

5. Water is as important to animals as it is to plants. You could live for about a month without food, but you would die in less than a week without water. Water helps you use food. The food you eat has to be dissolved before you can use it. Your blood, which is mostly water, carries food to the places in the body where the food is used.

Water helps plants and animals in important ways. What are some? _____

_____

_____

_____

_____

6. Look around your schoolroom.

a. Write the names of three solids that you see.

(1) _____ (2) _____ (3) _____

b. Is there a liquid in your room? _____

c. Is there a gas in your room? _____

d. Can you find something in your room that is not a solid or a liquid or a gas? _____

7. How can you tell the difference between a solid and a liquid? _____

_____

_____

_____

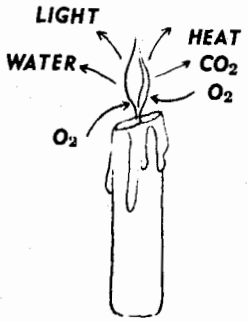
8. Can you see the gases in the air? _____

9. Oxygen in the air helps plants in important ways. What are some? _____

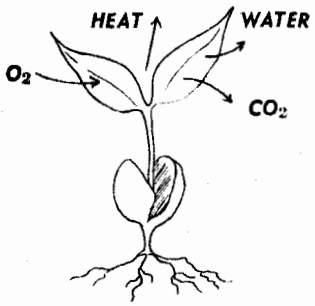
_____

_____

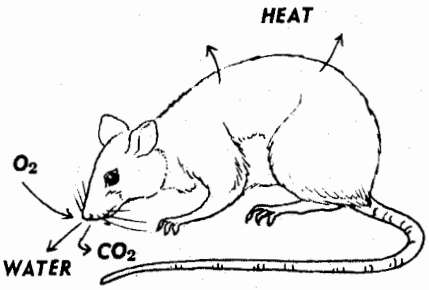
10. Plants give off carbon dioxide as well as use it. During the sunlight hours when plants are making food, they take in carbon dioxide and give off oxygen. As plants use the food, they take in oxygen and give off carbon dioxide. Animals always take in oxygen and give off carbon dioxide. We call the process of using oxygen and giving off carbon dioxide by plants and animals, **respiration** (res-pi-RA-shun). Respiration in plants and animals is similar to burning. Look at these pictures.



The candle is used up as it burns. It loses weight.



This is a bean seedling. If the plant did not make food, it would lose weight.



If the mouse does not eat more food, it will lose weight.

Think about these pictures. Can you find any differences between burning the candle and respiration in the plant and animal? What are they? _____

_____

_____

_____

_____

11. One word in each of the following groups of words does not belong with the others. Cross out the word which does not belong. Use the blank line to tell why it does not belong.

a. glass oxygen iron wood

_____

b. water milk stone orange juice

_____

c. sugar oxygen air carbon dioxide

_____

d. mouse cow rabbit tiger

_____

e. fox owl deer lion

_____

I. Can you spell your science vocabulary?

In each line draw a circle around the one word which is spelled correctly.

1.	oxigen	oxyjen	oxygun	oxygen
2.	resperation	respiration	respuration	respirasion
3.	disolve	dessolve	dissolve	dissolv
4.	microscopic	miscroscopick	microskopic	micrascopic
5.	calsium	cailsium	kalcium	calcium
6.	protein	proteen	protene	protine
7.	vittamin	vitamin	vitumin	vitamun

J. How much can you discover for yourself?

Here are some questions for you to think about. Select one or two that interest you most and try to find out all you can about the subject of the question. You may not have time to answer all of the questions. Encyclopedias and other books will help you answer them. You may learn some answers by talking with your teacher, your parents, or your friends.

1. How does a whale get oxygen?
2. How does an insect get oxygen?
3. Why can some plants and animals live in deserts?
4. How long could you live without air?
5. Is there any kind of gas that can be seen?
6. Can the same material ever be at different times a solid, a liquid, and a gas?
7. Has anyone ever seen oxygen?
8. Has anyone ever smelled oxygen?
9. How high above the earth does the air go?
10. After a heavy rain, why do you sometimes find earthworms on top of the ground?
11. Why do you have to take deeper breaths of air if you are up on a high mountain?
12. Why should we sometimes change the water in a fish bowl?
13. Is a fish drinking water every time it opens its mouth?
14. Where does the water go when wet clothes are put on a clothesline to dry?
15. Why are rains in the spring very important?
16. How does a camel store water?
17. Where does a cactus plant store water? A watermelon plant?
18. How do deep-sea divers and men in submarines get oxygen?
19. What do we mean by "fresh" air?
20. Why may eating between meals be bad for you?
21. A girl has orange juice, oatmeal, an egg, toast, and milk for breakfast. Do you think she eats a good breakfast? Why?
22. A boy eats a cheese sandwich, lettuce and tomato salad, a cookie, milk, and an apple for his lunch. Do you think he eats a good lunch? Why?
23. What do we mean by "protective" foods?
24. What do scientists say energy is?
25. Why may eating too much candy be harmful?
26. Do coffee and tea help you grow?

APPENDIX D

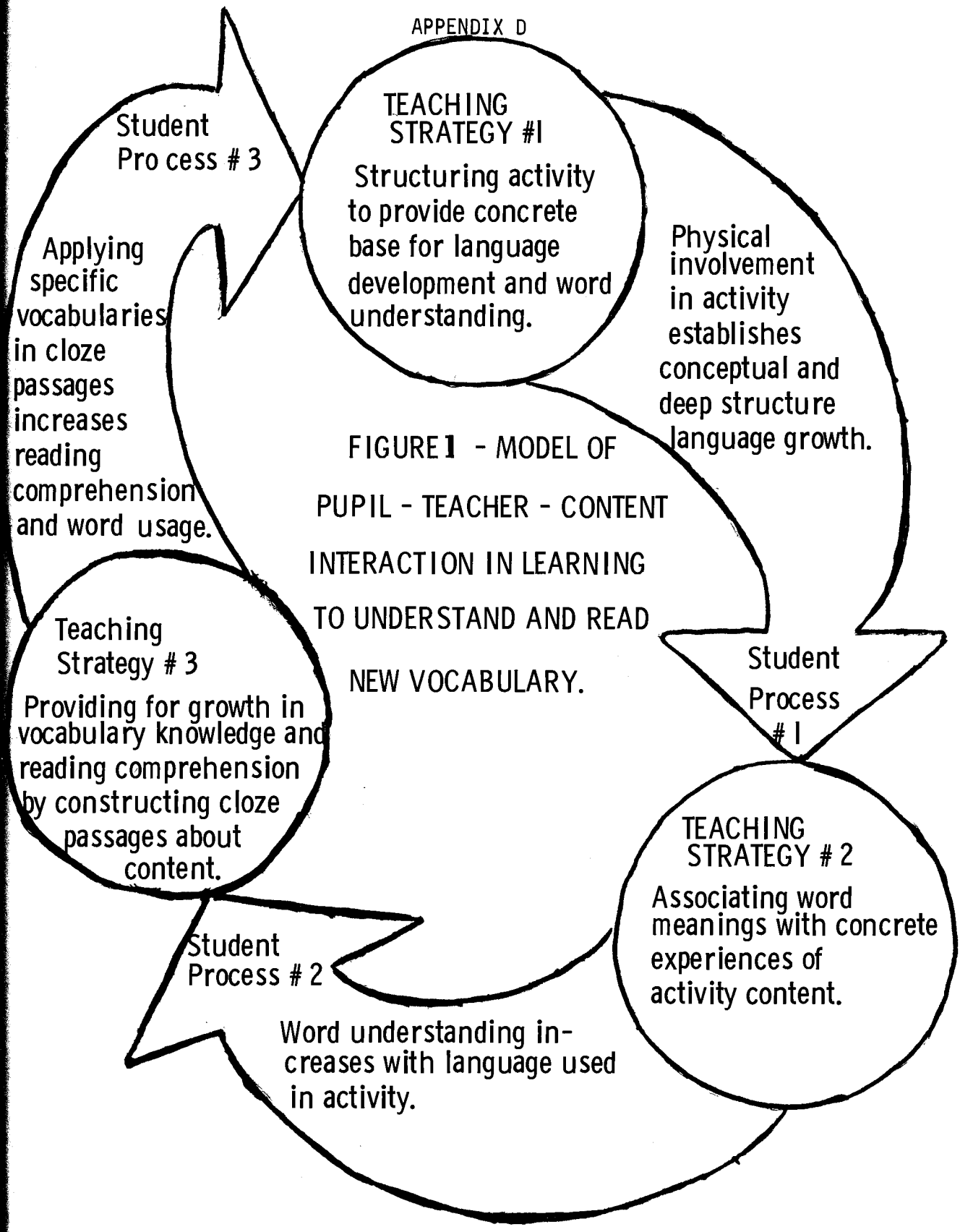


FIGURE 1 - MODEL OF PUPIL - TEACHER - CONTENT INTERACTION IN LEARNING TO UNDERSTAND AND READ NEW VOCABULARY.