Fall 8-1978

Reading ability and visual and auditory incidental learning in learning disabled adolescents

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READING ABILITY AND VISUAL AND AUDITORY INCIDENTAL LEARNING IN LEARNING DISABLED ADOLESCENTS

BY

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A THESIS
SUBMITTED TO THE GRADUATE FACULTY
OF THE UNIVERSITY OF RICHMOND
IN CANDIDACY
FOR THE DEGREE OF
MASTER OF ARTS
IN PSYCHOLOGY

AUGUST, 1978

RUNNING HEAD: INCIDENTAL LEARNING

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TABLE OF CONTENTS

Abstract 1

Introduction 2

General Discussion 18

References 22

Appendices 27

ACKNOWLEDGEMENTS

I would like to thank all persons who contributed to the development and completion of this research. Special appreciation is extended to Mrs. Julia Ann Greenwood and to the staff, faculty, and students of The New Community School who gave liberally of their time.

My fellow student, Deborah Moore, provided generous assistance in her drawings of materials for the visual tasks.

The guidance of a most constructive thesis committee was a primary benefit in the present study. The continuous direction and understanding from the chairman of the committee, Dr. Kenneth Blick, was especially supportive.

Abstract

The present study attempted to examine the relationship between reading level and central and incidental learning in the visual and auditory modalities. The central-incidental tasks were modifications of Hagen's (1967) visual central-incidental tasks. Twenty male and female adolescents who had identified learning problems were subjects. An equal number of good and poor readers were assigned to the visual and auditory tasks. The results of the research indicated that reading level was not related to incidental learning nor to central auditory performance. However, the research findings showed significant differences between reading level and visual central task performance. The simplicity of the tasks may have had an influence on the results.

Reading Ability and Visual and Auditory Incidental Learning in Learning Disabled Adolescents

Incidental learning may be defined as the process whereby an individual acquires information which is irrelevant to the central task designated by the experimenter. Broadbent's (1958) filter theory offers a possible explanation for incidental learning. Broadbent (1958) assumes that an individual is restricted in the amount of information he can process at a given time. When information in the stimulus complex exceeds the individual's limit, part of the information is selected for processing and part of the information is rejected. The selection is accomplished by attending to the task-relevant stimuli. If a task is extensively overlearned or very little information is involved, selective attention may not be necessary for effective task orientation.

Studies examining incidental learning in children suggest that the ability to reject extraneous stimuli increases with chronological age. Research has shown that young children have poorer recall of task related material and often have higher recall of task-irrelevant stimuli. Maccoby and Hagan (1965) engaged subjects in grades one, three, five and seven in a visual task. Cards of different pictures and different colors were shown to subjects and then placed face down in front of subjects. For the central task the subjects were asked to point to a card of a particular color.

Incidental learning was measured by having children locate the cards that had certain pictures with certain colors. The study found that the recall of the central task increased with age. In the incidental learning task there was a slight, but not significant increase in the recall of that material for subjects in grades one through five, but there was a significant decrease in the recall of task-irrelevant material for subjects in grades five through seven. Hagen (1967) using pairs of contiguous figures, one an animal and one a household object, tested for incidental learning. Retention was tested by having subjects recall the location of animals or household objects and the picture with which it was paired. Results similar to Maccoby and Hagen (1965) were found. Siegel and Stevenson (1966) examined incidental learning in subjects, ages seven, nine, eleven, and thirteen. Subjects learned a three-choice visual discrimination task and then were given presentations of the discriminative stimulus. Incidental learning was measured by recall of objects in the stimulus complex. A significant increase in incidental learning between ages seven and eight and and eleven and twelve years was found for subjects in the sample population used and a significant decrease between ages eleven and twelve and thirteen years. Crane and Ross (1967) also found greater incidental learning in younger subjects when second and sixth graders were compared on a visual discrimination task with color or form as the relevant dimension. After the relevant dimension was learned, the irrelevant dimension was paired with it. Subjects were then given a task where the irrelevant dimensions became relevant. The younger subjects profitted the most in the final task when

previously irrelevant information became relevant to the completion of the task. Siegel (1968) with eight and fourteen year old subjects found a decline in incidental learning with older children in a task where irrelevant cues were paired with a discriminative stimulus. Three irrelevant cues were paired with each discriminative stimulus, the irrelevant cues were presented in groups or alone. Incidental learning was greater when cues differed than with the use of the same cues seen repeatedly.

An auditory task examined central and incidental learning in second, fourth, sixth, and eighth graders with subjects discriminating between relevant and irrelevant stimuli (Hallahan, Kaufman, and Ball, 1974). Subjects were presented with word pairs, one an animal and one a food. Subjects were told to learn either the animals or the foods presented. Incidental learning was tested by recall of the irrelevant member of the pair. Again results similar to visual incidental learning studies were found with a significant increase in central task recall by older subjects and a significant increase in irrelevant task material recall by younger subjects. Earlier studies such as Maccoby and Konrad (1966) also found age differences in selective listening. These studies, however, could not be compared to visual studies of incidental learning because the methods were not comparable. Subjects were presented with two different stimuli simultaneously and then asked to recall one of the stimuli. In the earlier auditory studies, the amount of information to be recalled, the arrival of information to the sensory receptors, and the differences in the scoring procedures were incompatible

with the visual tasks.

Several studies proposed reasons for the decline in incidental learning with increasing age. Druker and Hagen (1969) suggested that older children disregarded or failed to label irrelevant stimuli whereas relevant stimuli were labeled. However, these findings were results of subjects' self-reports after completion of the learning tasks. Siegel and Stevenson (1966) attributed younger subjects' increases in incidental learning to excessive attention to incidental information. The decrease in incidental learning for older subjects was attributed to their abilities to disregard irrelevant stimuli. In a controlled study, Siegel (1968) also found older children did not attend to irrelevant stimuli. Maccoby and Hagen (1965) proposed that older children used cognitive processes to code, to label and to categorize relevant stimuli. Irrelevant information was disregarded or not labelled. Vurpillot (1968) found support for a Piagetian proposition which stated that developmental changes in the range of perceptual activities affected. incidental learning.

Incidental learning in the learning disabled child has also been studied. Anderson, Halcomb, and Doyle (1973) had normal and learning disabled children perform a vigilance task where they were seated in a booth before a console containing a line drawing. The subjects were instructed to attend to the flashing lights coming across a console and to press a button when the red-green combination appeared. Normals performed significantly better on the vigilance task. Learning disabled subjects had more difficulty attending to

the monotonous task and gave more responses to extraneous stimuli. Hallahan, Kaufman, and Ball (1973) used the Hagen (1967) incidental learning task with continguous figures with sixth grade males classified as learning disabled children and normals or low and high achievers. It was found that normals were significantly better at attending to the central task than the learning disabled subjects. Mercer, Culliman, Hallahan, and LaFleur (1975) examined modeling and attention-retention in twenty male subjects, ages nine to fourteen years who were identified as learning disabled. The Hagen (1967) task was again used to test for incidental learning and the subjects were then shown a videotape. Subjects were told that money would be paid for performing the activities on the tape. Attention and retention of relevant and irrelevant information was tested by examining modeling behavior of subjects. Those who were the best modelers were those who attended and recalled the relevant stimuli. These subjects were not distracted by the irrelevant stimuli. Modeling performances had significant positive correlations with vocabulary, spelling, and arithmetic measures on the subjects.

Some research has indicated a relationship between incidental learning and reading ability. Siegel (1968) found a significant negative correlation between reading ability and incidental learning with eight year old subjects. Poor readers had higher incidental learning and better readers had low rates of incidental learning. Selective attention and reading ability have been studied by having subjects read passages aloud that had irrelevant words between the lines of the passage material (Willows and MacKinnon, 1973;

Willows, 1974). These studies found that subjects could not recall irrelevant words, however, subjects' responses to question related to the central reading passage showed that the irrelevant words had been incorporated into the comprehension of the reader. Willows (1974) compared good and poor readers in grades four, five, six, and eight on a reading task similar to that of Willows and MacKinnon (1973). Poor readers made more errors on the central reading task in the control and selective attention groups. Poor readers were impaired in their oral reading in the selective attention group because of the adjacent irrelevant words in the reading material.

Birch and Belmont (1964) have stated that reading involved the integration of visual and auditory stimuli. If there were difficulties in learning in the visual and auditory modalities then there would be difficulties with reading. Research which has related the children's abilities to learn in these modalities could be relevant to their reading performances. Kinsbourne (1973) gave first-grade children visual, auditory, and associative tasks and readministered the tasks two years later. Discrimination of forms was the visual test, auditory tests required subjects to repeat speech sounds, and three phonemes and to indicate whether the sounds were alike or not. A nonsense syllable and a shape had to be learned for the associative task. Improved performance on the auditory tasks from the first to second testings differentiated good and poor readers. Rosner (1973) had first- and second-grade subjects

to copy designs for a visual analysis task and repeat a meaningful word with a sound omitted for the auditory task. The auditory task was found to be related to the subjects' abilities in word reading, paragraph meaning, spelling, and word study skills.

Incidental learning has been found to be higher in younger subjects than older subjects (Maccoby and Hagen, 1965; Siegel and Stevenson, 1966; Hagen, 1967; Hallahan, Kaufman, Ball, 1974), and higher in learning disabled children than normals in several studies (Anderson, et al, 1973; Hallahan, Kaufman, Ball, 1973; Mercer, et al, 1975). Also there have been indications of the relationships between incidental learning and reading ability (Willows and MacKinnon, 1973; Willows, 1974), as well as visual and auditory performances and reading ability (Kinsbourne, 1973; Rosner, 1973). Studies involving visual and auditory incidental learning in the learning disabled child may further explore the relationship between incidental learning and reading. In the present study there will be an investigation into the relationship between visual and auditory incidental learning in learning disabled adolescents. This study will examine more specific dimensions of reading than the studies relating selective attention and reading ability where subjects had to extract and to recall information from a reading passage (Willows and MacKinnon, 1973; Willows, 1974). Visual and auditory modalities were utilized in the reading tasks, but their effects were not differentiated. Since earlier research has indicated that normal adolescents have reached a developmental stage where there is less incidental

learning (Maccoby and Hagen, 1965; Siegel and Stevenson, 1966; Hagen, 1967; and Hallahan, Kaufman, and Ball, 1974), adolescent subjects will be used in the present study to examine incidental learning and reading ability. If factors relevant to increasing chronological age offer explanations for lowered incidental learning, these factors may also provide information if there are differences in incidental learning in good and poor readers.

In the present study, it was hypothesized that there would be greater recall of task relevant material by good readers and less recall of task irrelevant material. Poor readers were expected to have lower recall of task relevant stimuli and higher recall of task irrelevant stimuli. It was further hypothesized that there would be an interaction between auditory central task learning and good readers and auditory incidental task learning and poor readers.

Postman (1964) has indicated that there are two procedures for investigating incidental learning. The first type (Type I) involves exposing a subject to materials without instructions to learn. After the exposure, the subject's retention of the stimulus materials is examined. In the second experimental design (Type II) the subject is given a specific learning task, but is also exposed to stimuli not referred to in the instructions for the central task. Incidental learning is measured by the subject's recall of these stimuli which are irrelevant to the central task. Most of the research examining incidental learning in

children have used the Type II paradigm (Maccoby and Hagen, 1965; Siegel and Stevenson, 1966; Hagen, 1967; Hallahan, Kaufman, and Ball, 1974). The Type II paradigm will also be used in the present study.

Method

Subjects. Subjects were 20 male and female adolescents who attended a private community school for learning disabled adolescents. The subjects ranged in ages from 13 to 19 years. Letters requesting permission for subjects to participate on the research and explaining the purpose of the research were sent to the parents of each subject. Subjects were identified as good or poor readers according to an operational definition of reading adequacy. Potential reading ability was measured by subjects' Verbal WISC-R scores. Reading performance was determined by subjects' Reading Power scores on the Iowa Silent Reading Test.

Good readers were classified as subjects whose reading potential and reading performance were comparable. Good readers were identified as having high or average verbal potential as measured by their percentile scores on the Verbal WISC-R. High Verbal WISC-R percentile scores ranged from the 75th to 99th percentiles. Average reading potential percentiles ranged from the 40th to the 60th. Good readers' Reading Power percentile scores will be 15 percentile points or less below the subjects' Verbal WISC-R scores or the Reading Power scores will be greater than the Verbal WISC-R scores, thereby indicating good reading performance.

A discrepancy between reading potential and reading performance determined poor readers. Subjects were again identified as having high or average reading potential as measured by the Verbal WISC-R scores. The percentile ranges for high and average potentials were the same as the good reading group. The Reading Power scores for subjects in the poor reading group were 30 points or more below in percentile scores than the subjects' Verbal WISC-R scores.

Analyses of variance showed no significant differences in the ages, $F(1,18)= .96$, $p > .05$, nor in the Verbal WISC-R scores, $F(1,18)= 3.38$ $p > .05$ for the two groups. A significant difference was found, however, in the Reading Power scores of the two groups, $F(1,18)= 7.31$, $p < .05$.

Apparatus and Materials. One set of white cards measuring 5" x 8" with two black line drawings on each card were used for the visual tasks. The set consisted of four cards with a pair of drawings on each card. There were four duplicates of each card in the set. The set contained drawings divided into two conceptual categories, furniture and animals, with the animal picture at the bottom of each card. These pairings include: lamp-cat, chair-horse, desk-bear, sink-cow.

White cards, 5" x 8" with only one class of pictures on each, either furniture or animals, were used. There were four cards in each of these classes. Each of the four cards were identical to the respective picture pair card except for the absence of the irrelevant-class picture.

The stimulus materials for the auditory tasks consisted of one set of words containing four word pairs. The set contained words from the conceptual

categories of furniture and animals. These word pairs were the same as those conceptual pairs used in the visual tasks.

The word pairs were selected from the conceptual categories found in Battig and Montague (1969). Each of the words had an AA or A classification according to Thorndike and Lorge (1944). An AA classification indicated that a word occurred at least one-hundred times in a million words and a A classification word occurs between fifty and ninety-nine times per million words.

Four words from each of the conceptual categories in the word pairs were presented. These four words were presented identical to the word pairs without the irrelevant class stimuls word.

Procedure. The procedure which was used was a modification of Hagen's central incidental task (Hagen, 1967). The task had been identified as measuring selective attention(Hagen, 1967; Hallahan, Kaufman, and Ball, 1973). It had also been called a memory task (Hagen and Hale, 1972). Mercer et al. (1975) stated that it was an attention and retention task. For the present study the tasks were considered an index of the combined processes of attention and memory.

Subjects were tested individually and were told that the tasks to be performed were memory games. An equal number of good and poor readers were randomly assigned to a visual or an auditory task. Five subjects in each group (good and poor readers) were given a visual central-incidental task and five in each group were given the auditory central-incidental task.

For the visual central task, two practice trials were given using three picture pairs not used in test trials. The practice pairs were clothes and toys and included hat-plane, shoe-car, dress-boat. Each of the cards was presented separately and placed down before a subject from his left to rights. Each card was identified as one, two, or three when it was presented. A cue card identical to one of the pairs was shown to the subject and the subject was asked to point to the card it matched in the array. After the two practice trials, the subject was asked if there were any questions and then told the experiment would begin. Subjects were told the only difference would be the presentation of four instead of three pairs.

In the test trials, one trial consisted of the presentation of four cards from the set of furniture and animals. Each of the cards from the array were presented to the subject for approximately two seconds and the card was identified as one, two, three, or four. Cards were placed face down from subject's left to right. After the completion of the presentation of the four cards the experimenter presented a cue card identifical to one of the cards. For the central task, the subject was asked to point to the card in the array that matched the cue card. The subject was asked if it matched card one, two, three, or four in the array. When the subject had made his selection, he was shown the entire array again beginning with the card on the subject's left. This gave each subject equal exposure to the incidental learning cues regardless of central task performance. This procedure was repeated for twelve trials and the directions were repeated

for twelve trials. The central learning was the number of trials where the subject correctly matched the cue card to its corresponding card in the array. The picture pairs appeared in successive trials, but the position in the displays was varied randomly.

The central visual task was repeated for twelve trials as described above and then the visual incidental task was given. After the completion of the central task, the subject was shown a card containing animal picture identical to the drawing in the picture pairs without the irrelevant class picture. The subject was then shown four cards each with a black line, drawing of furniture identical to the drawings in the picture pairs. The subject was then instructed to match the animal with the furniture object with which it was previously paired. Every time the subject matched an animal with its corresponding picture of furniture, he made the selection from the entire set of drawings. The number of correct matches out of the four was the measure of incidental learning.

In the auditory task, the subject was presented with four word pairs from a set of word pairs. The word pairs were furniture and animals and were identical to the picture pairs used in the visual task. The auditory procedures were also the same as the visual except that the experimenter was seated behind the subject. This arrangement was designed so that the subject could avoid receiving any visual cues from the experimenter's pronuniciation of the words.

Two practice trials were given using three pairs not used in the test trials. These word pairs were the same as those in the visual practice trials: hat-plane, shoe-car, dress-boat. The subject was given the three pairs and then presented with a cue pair like one of the three. He was asked to identify where the pair appeared in the array. When the practice trials were completed, subjects were asked if there were any questions and told that the experiment would begin using four pairs instead of three.

In the auditory central experimental trials, the experimenter instructed the subject to attend to the animal word in each word pair. One trial consisted of the presentation of four word pairs from the set. Each word pair was identified as word pair one, two, three or four. The two words composing a pair were said in immediate succession. Two seconds elapsed between the word pairs. After four pairs were presented, the subject was presented with a cue word pair and asked to identify where it appeared in the four word pairs. The subject was asked to identify the cue word pair's position in the array as one, two, three, or four. After the subject made the selection, the word pairs were repeated in the order in which they were presented in that trial. This procedure was repeated for twelve trials and the number of correct choices in the twelve trials was the central task performance score. The same pairs appeared in every trial, but their positions were randomized.

The central auditory task was repeated as described above for twelve trials and then the incidental learning task began. The subject was read a cue word, an animal word. The entire array of furniture words was then read with no deliberate pause between each word. The subject was asked to match the cue word with the furniture word with which it had been paired. This procedure was repeated until all four animals were presented. Each time the entire array of furniture words was read. The number correct out of the four was the measure of incidental learning.

Results

For the central task the independent variables were the visual and auditory tasks and the reading level of the student, while the dependent variable was the number of correct trials out of a total of twelve. A significant interaction was found between modality and reading level, $F(1,16)= 12.08$, $p < .05$, using a 2 x 2 independent groups analysis of variance. These data are presented in Figure 1.

Insert Figure 1 about here

An examination of the simple effects found a significant difference between good and poor readers on the central visual task $F(1,16)= 9.26$, $p < .05$, however, no significant difference was found between good and poor readers

on the central auditory task, $F(1,16)= 3.51$, $p > .05$. A significant difference was found between the performance of good readers on the visual and auditory central task [$F(1,16)= 7.89$, $p < .05$]. On the other hand, no significant difference was found in the visual and auditory performances of poor readers, $F(1,16)= 4.38$, $p > .05$.

For the incidental task the independent variables remained the same while the dependent variable was the number of correct matches out of four. A 2 x 2 independent groups analysis of variance yielded no significant interaction, $F(1,16)= 2.85$, $p > .05$ nor significant main effect between good and poor readers, $F(1,16)= .11$, $p > .05$. Neither was significant main effect found between the visual and auditory performances on the incidental learning tasks, $F(1,16)= .9$, $p > .05$.

Post hoc comparisons with the twenty subjects using the Pearson Product moment correlation found that central task performance was not significantly related to subjects' Reading Power scores, $r= .42$, $p > .05$. Neither was a significant relationship found between incidental learning and Reading Power scores, $r= .18$, $p > .05$. A significant relationship was found between subjects' central task scores and their Verbal WISC-R scores, $r= .58$, $p < .05$. The Verbal WISC-R scores were not significantly correlated with incidental learning scores, $r= .34$, $p > .05$.

Individual data for Verbal WISC-R percentile scores and Reading Power percentile scores, as well as central and incidental task performances, are presented in Appendix C.

Discussion

The present study supports the findings of Willows and MacKinnon (1973) and Willows (1974) in that differences are found in the visual task-relevant performances of good and poor readers. Also in the present study a post-hoc comparison found a relationship between task-relevant recall and subjects' Verbal WISC-R scores. Subjects with high potential as measured by their Verbal WISC-R scores, therefore, had higher central task performances. Like Siegel (1968), no relationship was found between incidental learning and standardized intelligence scores.

Although significant differences in incidental learning between the reading levels were hypothesized, no significant differences were found, Mercer et al. (1975) found no relationship between task-relevant modeling behavior and incidental learning. Subjects in the Mercer et al, (1975) study were given the Hagen (1967) central and incidental tasks. Subjects' incidental learning on these tasks were unrelated to another task where subjects were to model task-relevant behavior presented to them on a videotape.

Good and poor readers may have differed on incidental tasks if the relationship between age and incidental learning had been considered. Siegel (1968) found that 8 year old subjects who were better readers had lower incidental learning. Siegel (1968), however, did not find this relationship with 14 year old subjects. The relationship between reading ability and incidental learning was not found in the present study with subjects in the 12 to 18 year age bracket. Previous research had found that

there were decreases in incidental learning with increasing chronological age (Maccoby and Hagen, 1965; Siegel and Stevenson, 1966; Hagen, 1967; Hallahan et al, 1974). These changes in incidental learning with subjects of different ages may offer an explanation for the failure to find a relationship between incidental learning and reading in older subjects.

Another explanatory factor may be that learning disabled subjects have higher rates of incidental learning than subjects without identified learning problems as indicated in studies by Anderson et al. (1973), Hallahan et al. (1973), and Mercer et al. (1974). Learning disabled subjects, who were either good or poor readers in this study, also had high scores on incidental learning tasks. If learning disabled subjects are characterized by high incidental learning, it may not be possible to identify differences in incidental learning that are relevant to reading ability in learning disabled persons.

The failure to find significant differences in incidental learning or in central auditory task performances may be related to the simplicity of the task. Hagen (1967) had used arrays of three to six pairs of pictures. In the current study, only four pairs of pictures or words were used in each array. For both good and poor readers, there was a high level of central task performance with the mean score of 9.05 out of 12. Maccoby and Hagen (1965) suggested that if a task were too simplistic that it may not approach the limit of information processing. With a task that is too easy, central and incidental information may be processed simultaneously;

and consequently incidental learning would be greater.

Differences between good and poor readers on the central auditory task may have been found if reliability and validity of the auditory materials had been examined. Since the central auditory task was a modification of Hagen's (1967) central-incidental task for the visual modality, there may have been methodological errors related to the auditory materials. Pictures were used to present the visual tasks and words identical to the pictures were used in the auditory tasks. However, it may not be possible to equate visual and auditory concepts when measuring task performance. No previous research had been reported which had examined the reliability or the validity of the auditory materials.

Finally subjects' utilization of mnemonics may have also increased central and incidental scores. Self-reports and the experimenter's observations during the task performances indicated that mnemonics such as associating the first letters of the members of picture or word pairs or the subvocalized repetition of the pairs were used. Since these were subject-originated mnemonic aids, they may have significantly affected central and incidental recall. Garten and Blick (1974) reported a significant difference in retention of words between subject-originated and experimenter-supplied mnemonics in that retention was higher when subject-originated mnemonics were used.

The analysis of central task performance revealed that there was a significant difference between good and poor readers on the visual task. According to previous research, auditory task performance is a better discriminator of reading ability than visual performance (Kinsbourne, 1973; Rosner, 1973). An analysis of central task performance scores indicated a significant difference in good readers' visual and auditory learning, but no differences were found in the poor readers' visual and auditory performances. These findings are supportive of Kinsbourne (1973) and Rosner (1973) in that good readers had higher auditory than visual scores.

Since there were significant differences in good and poor readers' central visual performance and between visual and auditory performances of good readers, there may be suggestions for remediation skills in cross-modal integration may benefit both good and poor readers. For example, hearing and seeing syllables and then relating the spoken and written syllables may aid in reading improvement.

Future research with learning disabled subjects may find it necessary to use relational approaches such as correlations or to use single-subject research designs rather than dichotomies since many characteristics distinguish the learning disabled subject. Central and incidental learning may be examined using free recall and serial learning, thereby, allowing for difficulties in sequencing for the learning disabled subject to be reviewed. Cross-modal incidental learning tasks using the visual and auditory modalities may identify the separate contributions of these modalities to reading.

Cross-modal learning with the tactile and kinesthetic senses may also identify specific areas of learning where these minor senses may be effectively utilized in remediation for learning disabled subjects. Finally, new methods for studying auditory learning are needed since there are few studies using auditory central-incidental learning and the ability to learn auditorily seems to be significantly related to reading.

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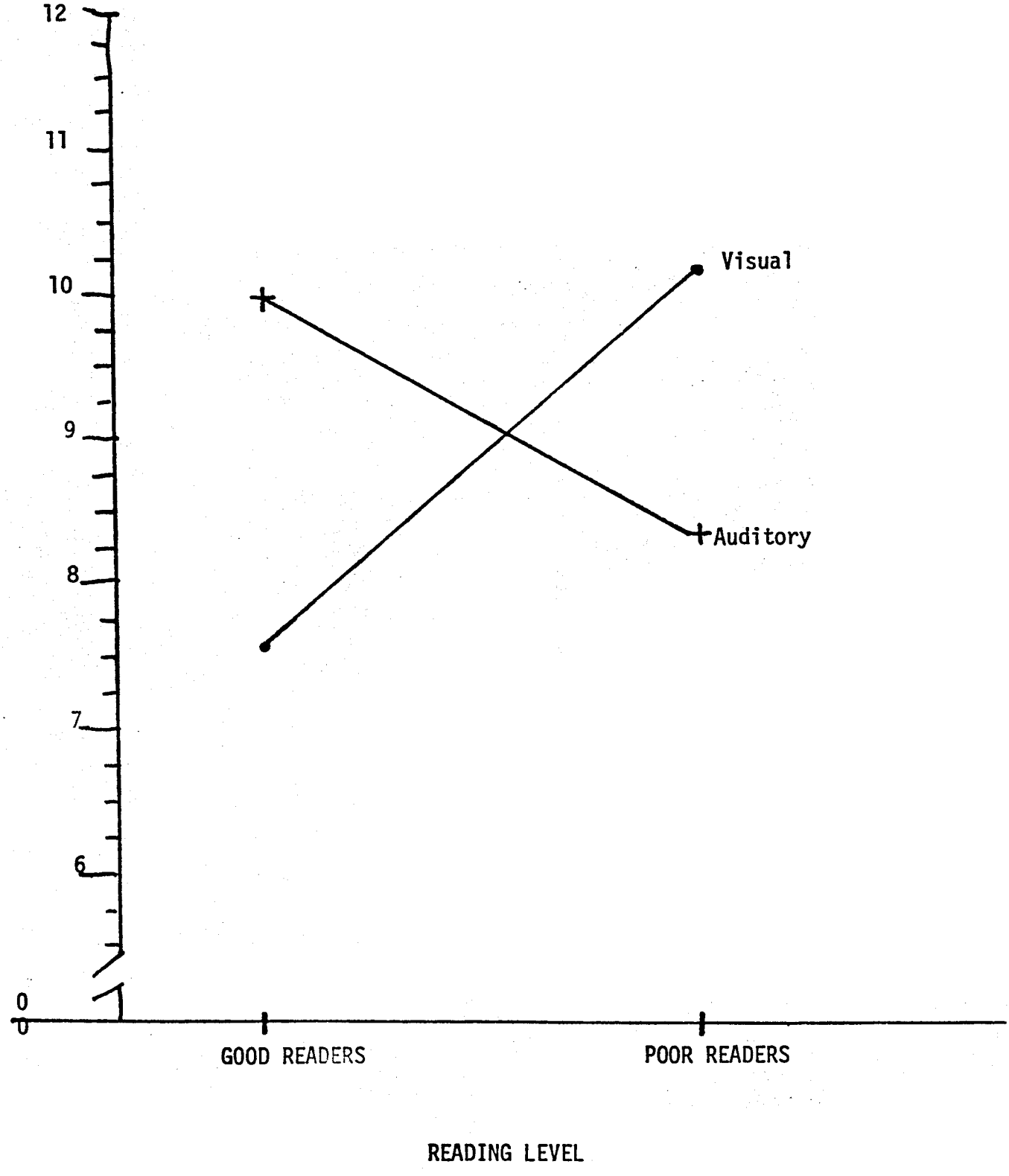
12
11
10
9
8
7
6
0
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Visual
Auditory
GOOD READERS
POOR READERS
READING LEVEL

Figure Caption

Figure 1. Mean number of correct responses on the visual and auditory tasks for good and poor readers.

Appendix A: Consent Form

Consent Form

I give permission for _____ to participate
(first) (last)
in a research project involving several learning tasks with picture pairs and word pairs. The purpose of the research is to study factors related to reading ability. I also give permission for the examination of his/her standardized intelligence and reading achievement scores. These scores will be used to place your child in certain groups for the study. The scores and the responses to the learning tasks will be confidential with only the researcher, Brenda Miller, and her supervisor, Dr. Kenneth Blick, receiving the information. Your child will be free to terminate his/her participation in the research at any time.

(Signed) _____

(Date) _____

Appendix B: Debriefing Interview

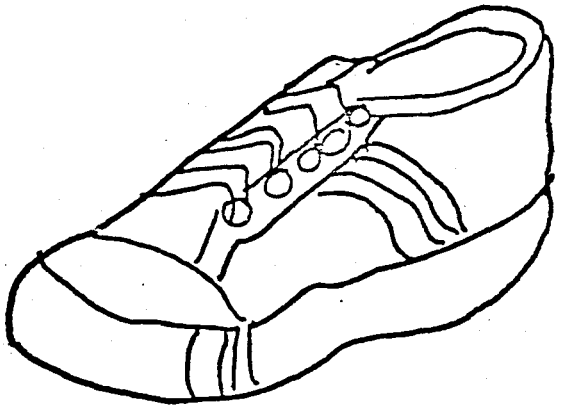
The following format was followed in the debriefing interview.

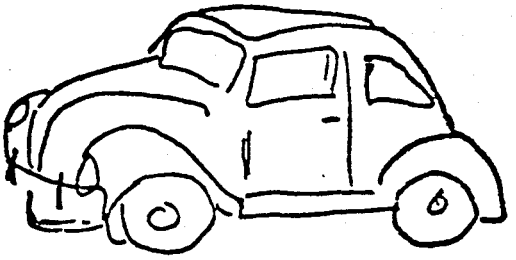
1. Explanation of research.
2. I will send you a copy of the results of the research when it is concluded.
3. Please do not discuss this experiment with your peers.

Appendix C: Individual Data

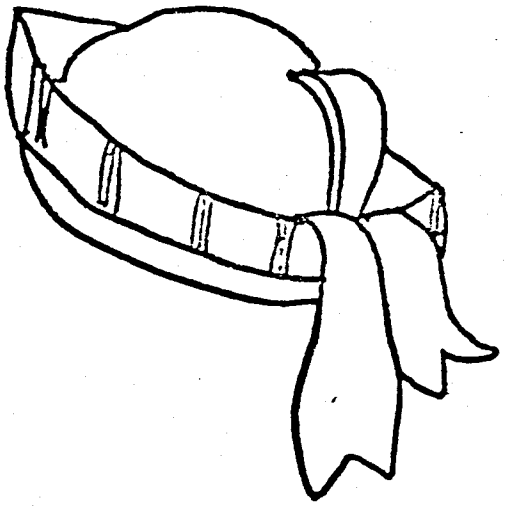
	SEX	AGE	% ile WISC-R(V)	% ile READING POWER	(0-12) CENTRAL	(0-4) INCIDENTAL
Auditory						
1.	F	14	79	39	9	2
2.	F	18	42	19	8	2
3.	M	15	50	10	6	2
4.	M	18	81	36	11	2
5.	M	15	82	2	8	1
6.	F	18	77	61	11	4
7.	M	17	55	67	10	4
8.	M	16	57	64	11	4
9.	M	16	99	86	11	4
10.	M	14	58	42	7	1
Visual						
1.	M	15	92	32	10	2
2.	M	15	84	45	10	1
3.	M	16	91	61	11	4
4.	M	14	97	41	11	4
5.	M	15	94	63	9	2
6.	M	12	99	94	8	1
7.	M	15	40	43	8	4
8.	F	14	50	45	7	0
9.	F	14	50	45	7	2
10.	F	16	40	39	8	4

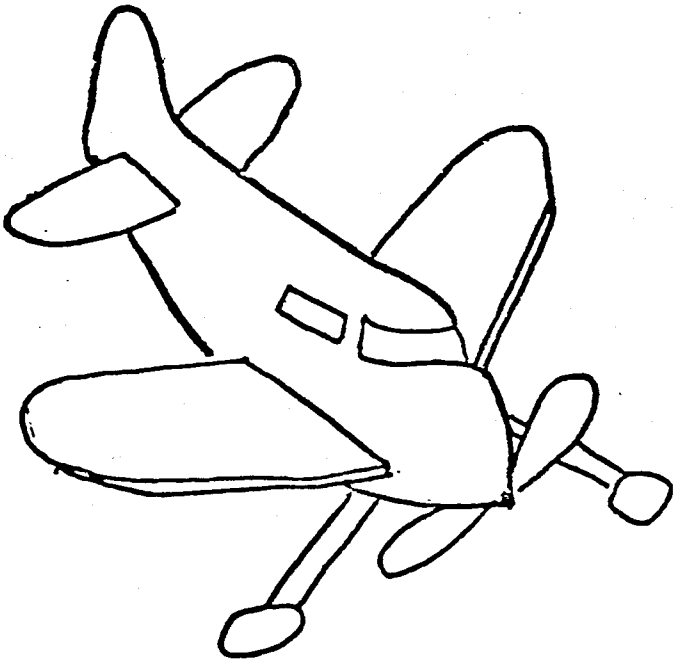
Appendix D: Practice Visual Central Materials



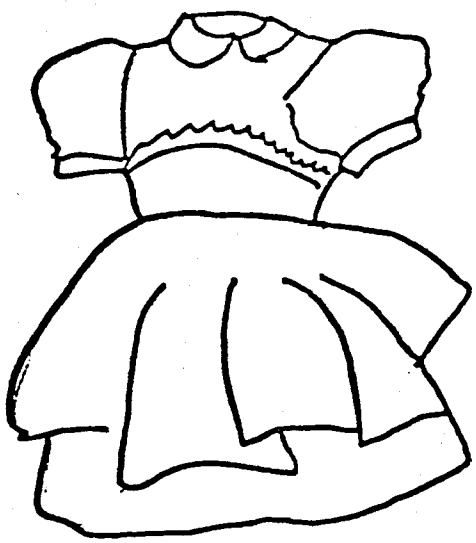


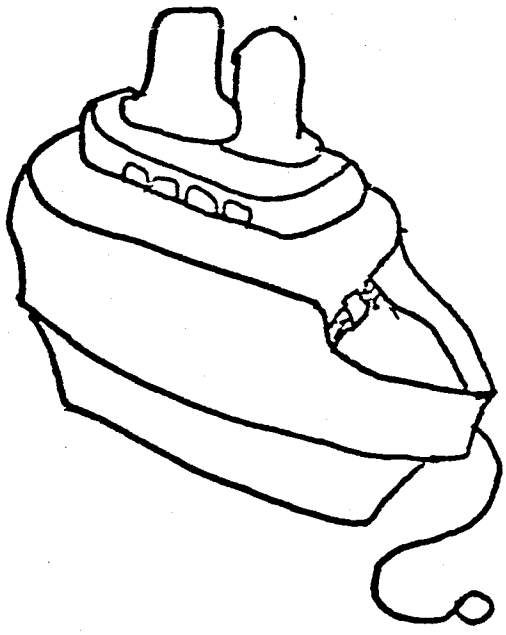
Appendix D: Practice Visual Central Materials



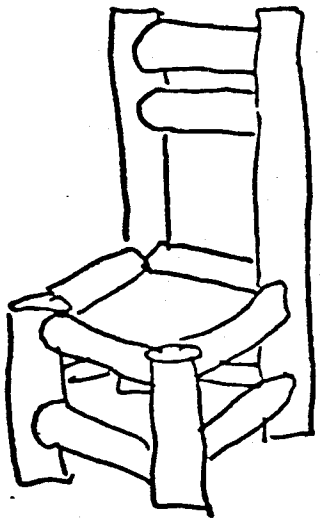


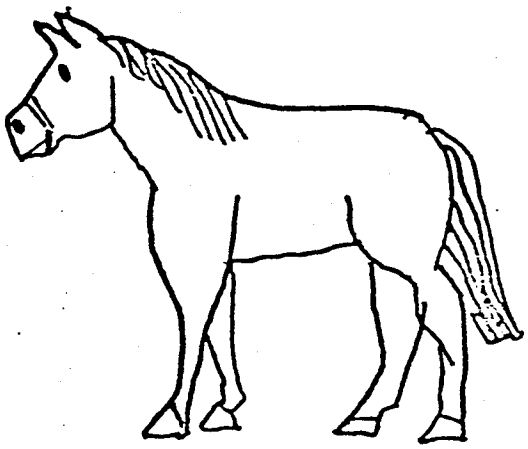
Appendix D: Practice Visual Central Materials



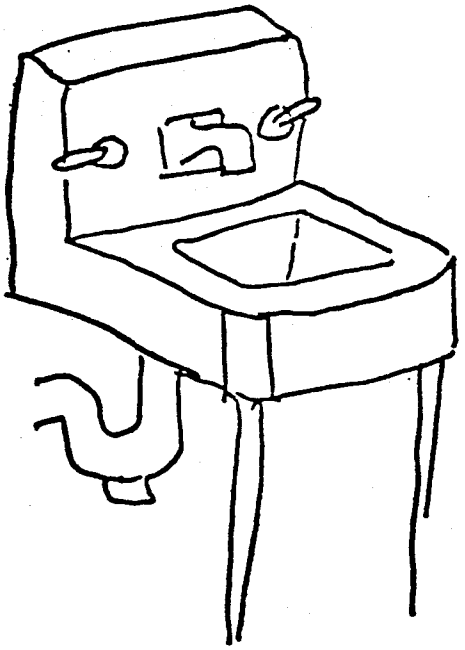


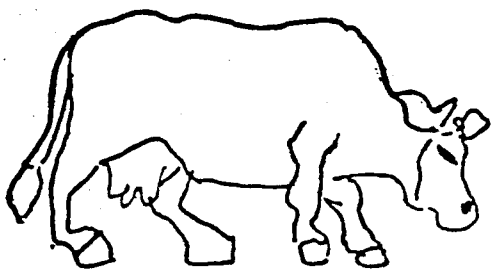
Appendix D: Visual Central Materials

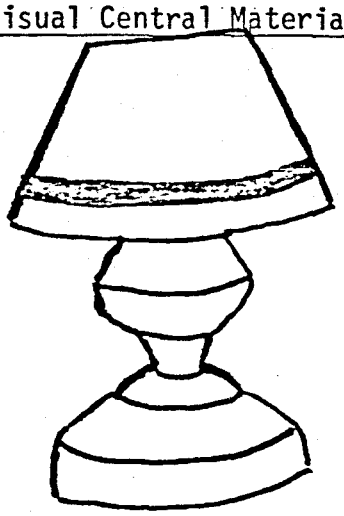


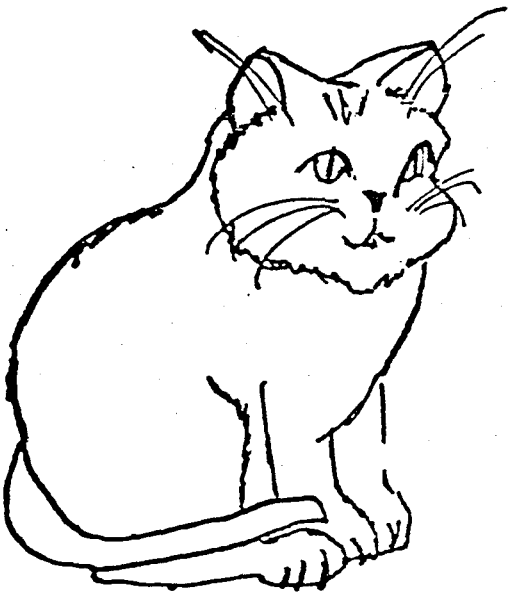


Appendix D: Visual Central Materials

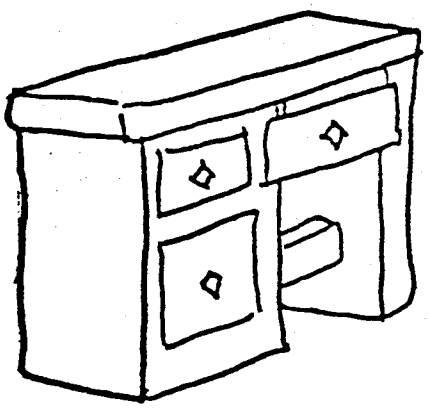


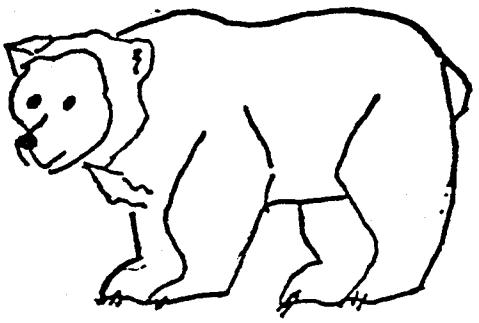




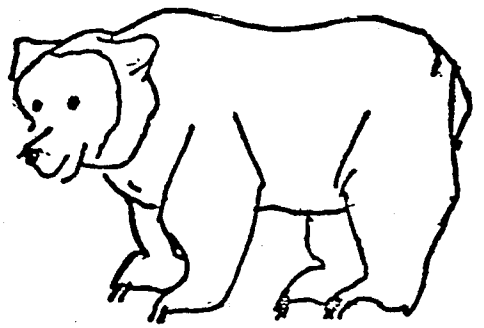


Appendix D: Visual Central Materials

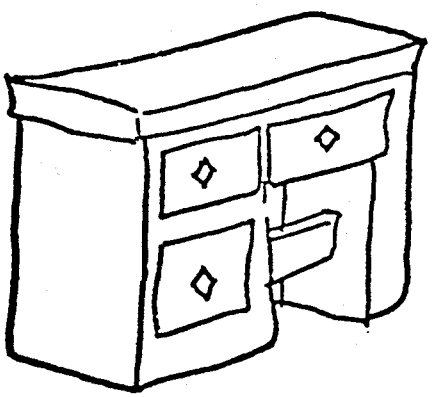




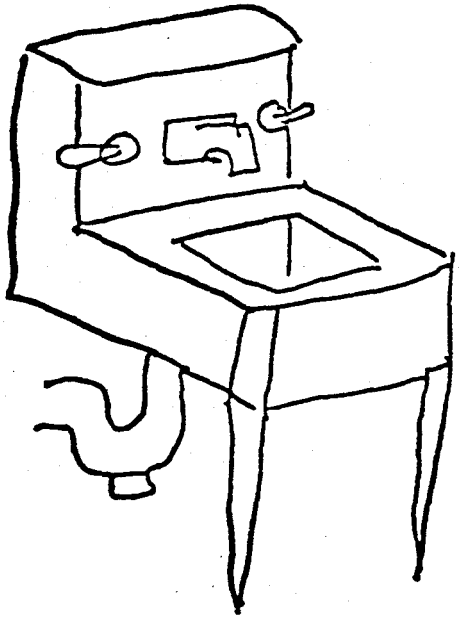
Appendix D: Incidental Visual Materials



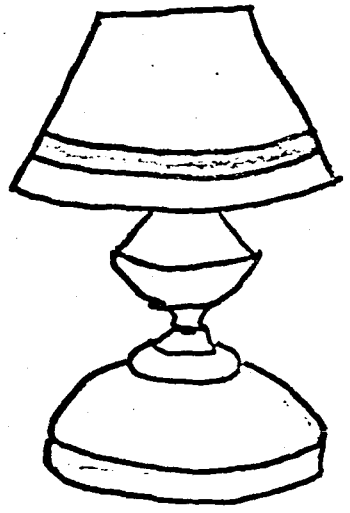
Appendix D: Incidental Visual Materials



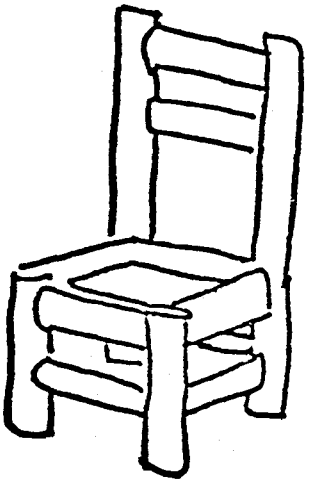
Appendix D: Incidental Visual Materials



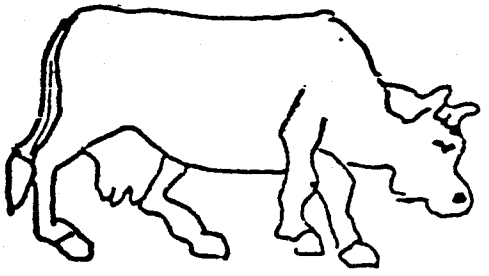
Appendix D: Incidental Visual Materials



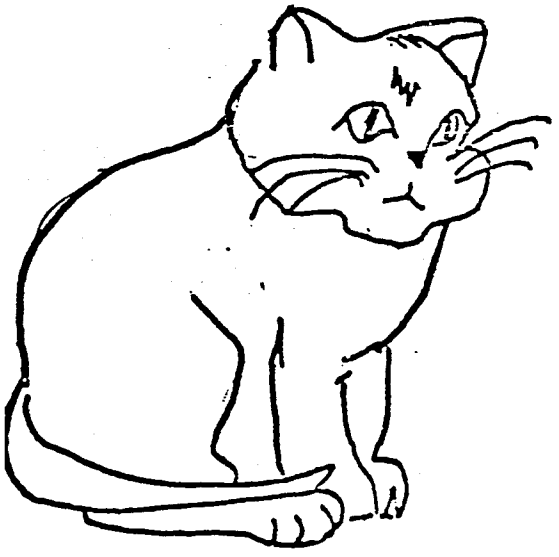
Appendix D: Incidental Visual Materials



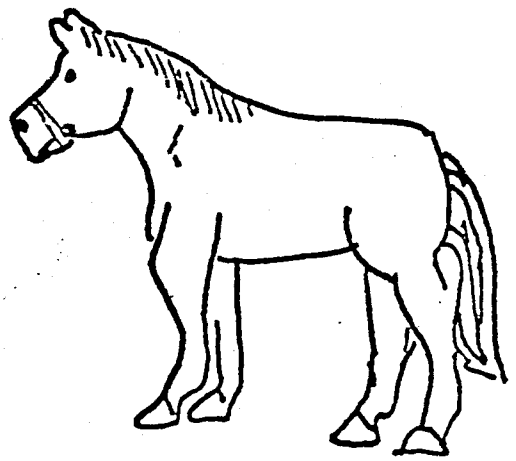
Appendix D: Incidental Visual Materials



Appendix D: Incidental Visual Materials



Appendix D: Incidental Visual Materials



VITA

I was born in Richmond, Virginia on March 14, 1955 and was reared in nearby Hanover County. In 1977, I was graduated from Westhampton College of the University of Richmond with a B.A. in Psychology and Sociology. My immediate plans are to work as a language therapist at The New Community School and to pursue studies in learning disabilities.