Effects of Developmental, Individual,
and Classroom Differences on
Visual Search Strategies

Ryan Adams
University Undergraduate Research Fellow, 1994-95
Texas A&M University
Department of Psychology

APPROVED

Undergraduate Advisor

Exec. Dir., Honors Program

Abstract

This study focused on the visual search strategies adopted by a sample of 328 five through eight year olds. Developmental trends in children's search efficiency were systematically related to their general metacognitive competencies using a visual persistence paradigm. The children were being schooled in either a mixed-age or traditional classroom. This enabled a comparison of children's classroom atmosphere. In addition children were given a variety of standardized tests of academic abilities and self- concept. The results suggested strong developmental trends in search efficiency. These trends were largely moderated by classroom type.

Effects of Developmental, Individual, and Classroom Differences on Visual Search Behavior

Understanding what one does and does not know is natural to the processing of any task's demands. Knowledge about one's own cognitive processes and products can be referred to as metacognition (Flavell, 1976). Brown (1978) delineated two general categories of metacognition: (a) thoughts that deal with reflections on one's own cognitive abilities and (b) thoughts that deal with self-regulatory processes during learning or problem solving. An example of the first category is when you know that you are better at math than your friend. In contrast, an example of the second category is when you know that you have come to a correct solution and can quit a problem solving task.

Flavell and Wellman (1977) described three basic areas of metacognitive knowledge: person, task, and strategy. The person dimension refers to a person's knowledge of his or her own thinking abilities and the thinking abilities of other people. This category is very similar to Brown's (1978) first category described previously. The task dimension of metacognition involves knowledge of the requirements of the task. An example of this category is when you decide if you have enough information to solve a problem. The last dimension, strategy,

reflects the knowledge of what techniques are available to solve a problem and which techniques would be most appropriate for the task at hand. An example is when you pick a specific mnemonic device to memorize a list.

After a little reflection on the topic of metacognition, one can clearly see that it plays an important role in any cognitive task because it can be applied in any domain of knowledge, and its normal development would parallel or even precede the development of areas of domain-specific knowledge (Flavell, 1985). Previous research suggested that as age increases children become more aware of and take advantage of metacognitions in all three areas of metacognitive knowledge (Schneideer, 1985; Wellman, 1977; Yussen & Levy, 1975). This developmental increase in metacognitive abilities is reflected in the findings that younger children tend to over estimate their memory abilities and give themselves higher ratings of competency for cognitive task than older children (Yussen and Levy, 1975; Kreutzer, Leonard, & Flavell, 1975).

One area in which metacognitive processes play a substantial role in is the area of help seeking. Although many areas of interest exist in the topic of help seeking (See Nelson-Le Gall, 1981) this review will focus on seeking and using help on a cognitive task. It is apparent that people are more likely to seek help when they do not know the correct solution to

a problem. However, subjectively assessing whether solutions are right or wrong is problematic in itself. The use of metacognitive processes, therefore, is needed. One would first have to come to a point in the problem-solving task where it is apparent that the approach to the problem's correct solution is in question. To do this a person would need to be able to reflect on what he/she does and does not know about the problem and it's solution. This would be a difficult task for a novice to the problem. So, it is not surprising that making correct assessments of the one's own knowledge appears to be a function of both age and experience (Brown, Bransford, Ferrara, & Campione, 1983), and with this increase in accurate assessment comes an increase in the ability to know when one needs help on a task (Nelson-LeGall, Kratzere, Jones, & DeCooke, 1990).

After arriving at the conclusion that you need help and have received help, you might then evaluate the help given to you before implementing it. You might ask yourself if this new information given to you through the helper is useful or not. Evaluating help would be easy if you always were able to ask an expert in the area of your need for help, but in most instances this is not the case, especially with children who must seek help in most cases from other children who are also novices at the task.

One strategy that children might use to subjectively evaluate the usefulness of help would be to look at characteristics of the helper. In a school setting one of the most obvious characteristics that separates children is that of age or grade level in school. Although increases in age does not always equate to increases in abilities (Hartup, 1983), children tend to believe strongly in this heuristic. It was found in children that giving help was more often ascribed to older children than to same agemates (Edwards & Lewis, 1979), and seeking assistance and other dependent behaviors was directed most often to older children (Whiting & Whiting, 1975). Children's attitudes of older and younger children also vary similarly. In one study children attributed positive trait names such as "best", "strong", and "smart" to children identified as 2 years older than the subjects and attributed more negative trait names such as "dumb", "worst", and "weak" to same-age or younger children (Graziano, Musser, & Brody, 1980). Given these findings on the attitudes of children one would follow the assumption that children hold stereotypes concerning the competence of older and younger peers. Specifically, children see younger children as being less competent than themselves and that they see older children as more competent than themselves (Musser, Brody, & Graziano, 1979).

The present study focused on the effects of developmental, individual, and classroom type differences on strategic search behavior specifically person, task, and strategy knowledge. It was believed that strategic search behavior would be a good indicator of general metacognitive competance. To measure children's search behavior a "Where's Lisa/Freddy" game was used. The Lisa/Freddy game was similar to the popular "Where's Waldo" games in that the children were asked to find an image of a specific girl (Lisa) or boy (Freddy) that was hidden in a scene. Six separate pictures had various themes and each having different numbers (0-4) of Lisas or Freddies hidden in the scenes. Before starting the search task the children were given clues. Two levels of uncertainty were introduced to increase the children's use of metacognitive faculties. One level of uncertainty was introduced by telling the children that some scenes might not contain any Lisas or Freddies and the other level of uncertainty was created by informing the children that the clues given by their peers may be wrong.

The effects of two types of classrooms on search strategies was explored. One classroom type was the mixed-age classroom. In these classrooms kindergarteners, first-graders, and second-graders are all taught together in the same classroom, similar to the one room school house. Children in the mixed-age classrooms are given more

opportunities to find that it is adaptive to seek help and are familiar with using help from others and spend a great deal of time in cooperative problem solving with other children (Ricard, Heffer, and Miller, 1993). The traditional classroom was the other type used. In these classrooms the children are all in the same grade. Children in these classes typically spend less time in direct contact with peers (MacIver, 1989).

In sum, the present study explores three hypotheses related to metacognitive reasoning of children during their first three years of formal schooling. The first hypothesis investigated developmental trends in search efficiency. Previous literature has consistently described increasing metacognitive competencies during the period from five to eight. However, the contexts in which these contributions to the literature vary considerably. In this study we used a strategic search task, the Lisa/Freddy task, to explore developmental trends in metacognition. Search efficiency was operationalized as the number of hidden figures found per unit of search time. Older children were expected to be more competent at regulating their search behavior according to task demands than younger children. That is, older children were expected to be more efficient when searching for an ambiguous number of hiddden figures.

Second hypothesis examined developmental trends in the association of search efficiency and achievement. Theories of metacognition have consistently focused on the adaptive value of accurate self-cognitions for one's ability to perform a given cognitive task (Pressly, 1977)).

However, the association between efficiency and achievement has received surprisingly little attention . The work on search behavior has been dominated by either very young children (less than three or four years of age) or older children (nine to eleven; Vullpillot, 1978). In addition, these previous studies have focused mostly on cognitive style differences (Kagan, 1966). I expected efficiency to be increasingly related to academic achievement and intellectual performance because these are reflections of metacognitive ablities, and these metacognitive ablilites are useful for successful completion of many academic task such as reading and mathematics (Siegler & Schager, 1984).

Method

Subjects

Children (n=328) from two different elementary schools served as subjects, including 116 kindergarteners, 112 first-graders, and 100 second-graders. As shown in table 1, children (n=198) from the mixed-age classrooms and from the traditonal classroom (n=97) were sampled. Gender break-down was as follows: 64 boys and 52 girls in kindergarten, 61 boys and 51 girls in first-grade, and 51 boys and 49 girls in second-grade. Of the 328 children who participated 29% were Hispanic-American, 19% African-American, 49% European-American, and 3% Asian-American. As an indicator of economic status, 34% of the students

in the sample qualified for the free or reduced lunch program based on family income (see table 2).

Insert Tables 1 and 2 about here

Measures

Visual Closure Pretest. The Visual Closure subtest of the *Illinois Test of Psycholinguistic abilities* (1968) test was used as a pre-test of the visual search effecency. The test consists of five picture strips which has objects hidden in a scene. The test was administered in the standard way. The subjects are given 30 seconds to find as many hidden objects as possible in each of the five different scenes. The number of hidden objects found in all the strips are added together for a composite score. The scores for the test are normed for children between the ages of 2 years 4 months to 10 years 3 months. These scores were used as a covariate to minimize the effects of the pre-existing differences in search efficiency.

Visual Search Task. An experimental task, the Lisa/Freddy task, was created specially for this study. Task stimulus material consisted of two sets of six separate pictures. Each picture was a scene and each

picture varied in the theme of the scene. A figure was hidden in the scene; depending on the picture, the figure was either a girl (Lisa) or a boy (Freddy). Children were oriented as to which figure was to be found by showing them that in the top left-hand corner of each picture was the figure of Lisa or Freddy, which was circled and this determined which figure was to be found in each individual scene. Also each picture varied in the number of figures that was hidden in it. Two out of the six scenes were designated as being impossible because there are no figures hidden in the scenes. The other four pictures had either two or four figures hidden in them. On the left-hand side of the pictures was a sleave containing a slip of paper on which a number was written. The number was clue as to how many Lisas or Freddies were hidden in the picture. Appendix 1 shows a sample stimulus.

Experimental conditions: The two sets of six picture scenes were used to create seprate experimental conditions on 2 dimensions: number of hidden figures (0,2,4) and clues about the number of hidden figures left by other kids (1,2,3,4). Experimental conditions were specified according to the conditions of hidden figures and clues conditions (see table 3). The zero hidden figure conditon was refered to as the impossible condition. All others were possible conditions.

Insert Table 3 about here

Clue conditions: Clues were defined as true or false. True clues were those clues which reported the actual number of figures hidden in the scene. False clues were those clues which reported one less or more figures hidden in the scene than was actually present.

Data coding: To evaluate children's performance the experimenter timed the children as they searched and recorded the number of figures found by the child as they pointed to the figure. Children were given 120 seconds to complete a search before they were stopped. When finished searching the experimenter ask the children to evaluate the correctness of the clue ("do you think the clue was right or wrong?"). Then the experimenter asked" do you want to search some more?" Experimenters recorded the number of additional figures found and the length of any additional search. If the child wanted to search longer the child was given an additional thirty seconds to search. The experimenter then recorded the amount of time the child searched and the amount of figures found by the child with the extra time.

Achievement. Standardized ($M=100$, $SD=15$) Mathematics Reading, and Spelling scores were obtained from the *Weschler Individual*

Achievement Test: Screener (*WIAT*; The Psychological Corporation, 1992), an individually adinistered screening test of academic achievement. Age based (5 to 18 years) norms are available. The scores of students in this study were compared to *WIAT* age-based norms.

Intellectual Ability. To provide an interpretive context for the achievement scores, standardized (M = 100, SD = 15) intellectual ability scores were obtained from the *Test of Non-Verbal Intelligence-2* (*TONI-2*; Brown, Sherbenou, & Johnsen, 1990). The *TONI-2* is a quickly administered, nationally normed, language-free test of reasoning ability, with norms available for individuals aged five years through adulthood. The *TONI-2* was used because it provides a brief screening of abstract/figural problem-solving and is less dependent on verbal-cognitive skills than other measures of intellectual abilities (Coleman, Scribner, Johnsen, & Evans,1993). These qualities were important in this study for two reasons: (a) because of the diverse cultural and linguistic background of the subjects and (b) because the age of the children necessitated conserving testing time as much as possible.

Knowledge of Self. The *Self-Description Questionnaire* (*SDQ*; Marsh, 1990) is a standardized self-report instrument that measures children's academic, nonacademic, and general self-concept. The *SDQ* is comprised of 76 items that assess children's perceptions about their

personal functioning in a variety of domains. A shortened version was given with the subscales of school, reading, self, and peers.

Procedure

The experimenter worked individually with children in a quiet room. Children completed the four tasks and the Lisa/Freddy task in one session or in some cases two if the child got tired. The children were rewarded for their participation with stickers.

Lisa/Freddy Task. Participants were told that they were to look at six pictures and with each picture they were told, "Try and find as many Lisas or Freddies as you can in this picture." Subjects were warned, "Some scenes might not have any Lisas or Freddies hidden in them and some might have many." Before starting on each scene, subjects were given clues as to how many Lisas or Freddies were in each scene. The subjects were told, "Some children have already looked at these pictures and have left clues telling you how many Lisas or Freddies they found hidden in the picture, but sometimes the clue is wrong."

The subjects were told that when they found a Lisa or Freddy they were to point to the figure so the experimenter could verify and record a correct response. The subjects were then given up to two minutes to search the scene. After the search, subects were asked whether they thought the previously given clues were correct or not and if they wanted

more time to search for more Lisas or Freddies. Along with the child's assessment of the clues, the time the children spent searching for the figures and how many figures were found were recorded. After evaluating the clue, the child was asked if they wanted to look for more Lisas or Freddies. If they wanted to look longer they were give up to 30 seconds to look. Agian, time the subjects spent searching for the images and how many images were found was also recorded for the second search.

Plan of Analyses.

Descriptive statistics on variables are provided in tabular and text form. In addition commentary on the operationalization of variables and constructs is provided the reader with a richer interpretive context.

To explore individual and developmental trends in children's metacognitive awareness a series of multiple analysis of variance models (MANOVA) were conducted. The models were constructed using a General Linear Model approach (GLM), 3 (Grade: K,1,2) X 2 (Sex: Male, Female) X 2 (classroom type: mixed age, traditional). In three seperate MANOVAs academic achievement, multiple measures of self - concept, and search efficiency were used as dependent variables. Significant MANOVAs were followed up and interpreted using univariate F statistics.

A second set of analyses using a regression approach was employed. A series of regression models were run in an effort to predict search

efficiency. Finally a second a series of analyses was run to predict achievement from search efficiency.

Results

Preliminary Analyses and Descriptive Statistics.

Academic achievement: As expected the results suggest that in general children were functioning at their expected level. However there were some differences, significant ANOVAs revealed that children in mixed age classrooms scored slightly below children in traditional classroom ($\underline{x}$ traditional classroom=97 and $\underline{x}$ mixed-age=93). This was only on the spelling acheivement; something that the mixed-age classrooms emphasize litte because of a whole language philosopy. Secondy, we might have expected mixed-age classes to be slightly lower because of the larger distribution of younger children.

Self -Concept: Preliminary analysis of self-concept scores was done to evaluate person knowledge (Flavell & Wellman, 1977). In contrast to academic achievement results, there were many more significant diferences in self-concept. There was a consistent significant effect of sex on self-concept with girls scoring higer than boys on school ($\underline{x}$ girls=49.4 and $\underline{x}$ boys=48.6; $F(1,280)=5.5$, $p\leq.03$), reading ($\underline{x}$ girls=51.8 and $\underline{x}$ boys=48.4; $F(1,280)=6.0$, $p\leq.01$) , self ($\underline{x}$ girls=51.6 and $\underline{x}$ boys=48.5; $F(1,280)=5.5$, $p\leq.02$) There was also a significant effect of classroom type on SDQ reading scores ($F=3.7$, $p\leq.05$) with children in traditional classrooms scoring higer than children in mixed-age

classrooms ($\underline{x}$ traditional classroom=51.5 and $\underline{x}$ mixed-age classroom=49.0). As might be expected there was also a significant sex by classroom type interaction on the self-concept of peers $F(1,280)=4.0$, $p\leq.04$. This might be occuring because of the increased opportunity for girls expecially in mixed-age settings to experience satisfactory peer contacts than their counterparts in the traditional classroom.

Main Analyses.

Search efficiency. The ability to find hidden pictures in a given amount of time was operationalized as search efficency. Significent effects of visual closure justified it as a covariat ($F(1,302)=10.63$, $p\leq.001$). In general developmental trends in search efficiency were confirmed. Significant grade effects suggested that older children were more efficent in their search behavior than younger children ($F(2,302)=7.05p\leq.001$).There was also a grade by classroom type interaction on search efficency. The results suggest the first and second graders were more efficent than kindergarteners, especially those in mixed-age classrooms. ($F(2,302)=6.21p\leq.001$). The development increases of metacognitive abilities would explain these findings.

Insert Table 4 about here

Possible & Impossible Conditions. A 2 (Grade) X 2 (Class type) X 2 (Condition: impossible and possible) ANOVA with Visual Closure as a covariate was used to compare efficiency in possible and impossible conditions. Significant effects suggest that children were differentiating between the two conditions ($F(1,290)=21.6 p \leq .003$). There were however developmental differences in this adjustment revealed by a significant grade X condition interaction $F(2,290)=4.44 p \leq .012$).

Accuracy of Search The number of trials on which children found all hidden figures was operationalized as accuracy. As in the general efficiency results developmental trends were of interest for this measure of accuracy. Significant effects of grade revealed the existence of developmental trends in accuracy. Older children scored higher on accuracy than younger children ($\underline{x}$ Kindergarten=3, $\underline{x}$ 1st=3.62, $\underline{x}$ 2th= 4.0; $F(1,308)=18.98$, $p < .001$).

There was also a significant effect of classroom type. Children in mixed-age classrooms scored higher ($\underline{x}$=3.6) than children in traditional classrooms ($\underline{x}$= 3.37; $F(1,308)=5.89$ $P<.01$). The influence of grade and classroom type interacted significantly. The pattern of means revealed that second grades in mixed-classroom out scored all other children ($\underline{x}$= 4.26 vs. 3.34; $F(2,308)= 3.43$, $p<.03$.)

Sex differences were also observed. Consistent with the self concept differences girls scored significantly higher ($\underline{x}$=3.6) than boys ($\underline{x}$=3.4; $F(1,308)=3.81$, $p<.05$).

Regression analyses provided information similar to that discussed above in MANOVA and univariate statistics section. The regression results provide little support for the hypothesized relationship between search efficiency or accuracy and academic achievement.

Discussion

The results of this study are generally supportive of the hypotheses. First developmental trends in search efficiency were observed. Older children tended to be more proficient at finding the figures. Older children also responded to clues over and above any differences the children came to the task with as we partialed out individual differences in search effectiveness as measured by the visual closure task. Since this is true, the developmental increases of metacognitive abilities could explain these findings. Since it is not visual search ability that is causing the change, some process that would evaluate the clues and the ambiguity of the task would play a role in the performance on the task. I would say that these processes are metacognitive.

The developmental trends interacted strongly with classroom enironment. It seems as though the mixed-age classroom with its considerable demands for interaction and cooperation among kids may have predisposed the children to be differentially intuned to clue information. Children in traditional classrooms tended to be more or less skeptical of the clue informantion, that is they tended to be more likely to take advantage of searching after their first try at the task in order to try

to confirm the clues. This might come from the fact that the children in the mixed-age classrooms have more opportunities of recieving help like the task, and with the increased interaction of this type the mixed-age children might be more accepting of the help. Where as the children from the traditional classroom might be more likely to see the clue as cheating as to see it as help.

One reason for the lack of findings in the relationship between search efficiency and academic achievemnt could be in the way the two measurements are given. The acheivement and intellegence test are not timed and the search task is timed. Those children who do well on the academic test do not have the constraint of thinking quickly. Thinking quickly is a trait that would increase the children search efficiency and this could be one construct that is being measured by the Lisa/Freddy task.

Reference

Brown, A.L. (1978) . Knowing when, where, and how to rember: A problem of metacognition. In R. Glaser (Ed.), Advances in instructional psychology. Hillsdale, NJ: Erlbaum.

Brown, A.L., Bransford, J.D., Ferrara, R.A. & Campione, J.C. (1983). Learning, remembering, and understanding. In P.H. Mussen (Ed.), Handbook of child psychology: Vol III. Cognitive development (pp. 77-166). New York: Wiley.

Brown, L., Sherbenou, R.J., & Johnsen, S.K. (1990). Test of Nonverbal Intelligence, second edition: A language-free measure of cognitive ablility. Austin, TX: Pro-Ed.

Coleman, M., Scribner, A.P., Johnsen, S., & Evans, M.K. (1993). A comparison between the Weschler Adult Intelligence Scale-Revised and the Test of Nonverbal Intellegence-2 with Mexican-American secondary students. Journal of Psychoeducational Assessement, 11, 250-258.

Edwards, C.P., & Lewis, M. (1979), Young children's conceptsof social relations: Social functions and social objects. In M. Lewis & L.A. Rosenblum (Eds.), The Child and its family: Genesis of behavior (Vol. 2). New York: Plenum.

Flavell, J.H. (1976) . Metacognitive aspeects of problem solving. In L.B. Resnick (Ed.), The nature of intellegence (pp. 231-235) . Hillsdale, NJ: Lawrence Erlbaum Associates.

Flavell, J.H., (1985). Cognitve development (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall, Inc.

Flavell, J.H., & Wellman, H.M. (1977). Metamemory. In R.V. Kail, Jr. & J.W. Hagen (Eds.), Peerspectives on the development of memory and cognition. Hilsdale, NJ: Erlbaum.

Graziano, W.G., Musser, L.M., & Brody, G.H. (1980). Children's social cognitions and preferences regarding younger and older peers. Unpublished Manuscript, Univerity of Georgia

Kagan, J. & Kogan, N. (1976). Individual variation in cognitive process. In P.H Mussen (Ed.), Carmichael's manual of child psychology.

Kreutzer, M.A., Leonard, C., & Flavell, J.H. (1975). An interview study of children's knowledge about memory. Monographs of the Society for Research in Child Development, 40 (Serial No. 159).

Hartup, W.W. (1983). Peer relations. In P.H. Mussen (Ed.), Handbook of child psychology: Vol IV. Socialization, personality, and social development (pp. 103-196). New York: Wiley.

Musser, L.M., Brody, G.H., & Graziano, W.G. (1975, March). Children's social cognitions and preferences regarding younger and older peers. Paper presented at the Annual Meeting of the Southeastern Psychological Association, New Orleans, LA.

Nelson-LeGall, S. (1981). Help-seeking: An understudied problem-solving skill in children. Developmental review, 1, 224-246.

Nelson-Le Gall, S., Kratzer, L., Jones, E., & DeCooke, P. (1990) Children's self-assessment of performance and task-related help seeking. Journal of experimental child psychology, 49, 245-263.

Marsh, H.W. (1990). The Self-Description Questionnaire-I: Manual. Campbelltown, N.S.W., Australia: University of Wester Sydney, Macauther.

Ricard, R.J., Heffer, R.W., & Miller, G.A. (1993). Report of findings to Houston Independent School District. Unpublished manuscript, Texas A&M Univerity College Staion.

Schneider, W. (1985). Developmental trends in the metamemory-memory behavior relationship: An integrated review. In D.L. Forrest-Pressley, G.E. MacKinnon, & T.G. Waller (Eds.), Cognition, metacognition, and human pereformance (Vol. 1). New York: Acadmic Press.

The Psychological Corporation. (1992). The Weschler Individual Achievement Test: Screener. San Antonio, TX: Harcourt, Brace, Jovanovich, Inc.

Vupillot, R. (1968). Judging visual similarity: The development of scanning strategies and their relation to diferentiation. Journal of Experimental Child Psychology, 6, 632-650.

Wellman, H.M. (1977). Tip of the tongue and feeling of knowing experiences: A developmental study of memory monitoring. Child Development, 48, 13-21.

Whiting, B.B., & Whiting, J.W.M. (1975). Children of six cultures. Cambridge, MA: Harvard Univerity Press.

Yussen, S.R., & Levy, V.M., Jr. (1975). Developmental changes in predicting one's own span of short term memory. Jounal of Experimental Child Psychology, 19, 502-508.

Author Notes

I would like to thank Dr. Ricard for giving me the opportunity to see what the experimental process is all about first hand. It has not been easy but it has been an enjoyable (at times) learning experience. I know I come away from the experience with knowledge I never could have gained otherwise.

Table 1

Distribution of Subjects

	Classroom Type		
	Mixed Age		
Grade	Male	Female	Total
Kindergarten	44	29	73
1st Grade	39	31	70
2nd Grade	28	27	55
Totals	111	87	**198**
	Traditional		
	Male	Female	Total
	14	12	26
	17	16	33
	19	19	38
	50	47	**97**

Table 2

Socio-Economic Status

Lunch Type		Race			
		AsA	**AfA**	**EA**	**HA**
	Number of Students	**3**	**27**	**50**	**20**
Free and Reduced Lunch	% by Lunch	3.00%	27.00%	50.00%	20.00%
	% of Total Race	37.50%	46.55%	58.82%	13.89%
	% of Total Students	1.02%	9.15%	16.95%	6.78%
	Number of Students	**5**	**31**	**35**	**124**
Pays for Lunch	% by Lunch	2.56%	15.90%	17.95%	63.59%
	% of Total Race	62.50%	53.45%	41.18%	86.11%
	% of Total Students	1.69%	10.51%	11.86%	42.03%
Totals	**Number of Students**	**8**	**58**	**85**	**144**
	% of Total Students	2.71%	19.66%	28.81%	48.81%

AsA= Asian-American
AfA= African-American
EA= European-American
HA= Hispanic-American

Table 3

Lisa/Freddy Conditions

Red Set

Picture	# Lisa/Freddy From Clue	# Lisa/Freddy Actual Present
1	2	2
2	3	4
3	0	0
4	3	2
5	4	4
6	1	0

Blue Set

Picture	# Lisa/Freddy From Clue	# Lisa/Freddy Actual Present
1	3	2
2	4	4
3	1	0
4	2	2
5	3	4
6	0	0

Table 4

Efficiency of Search (Total Time in Seconds/Total Found)

	Type of Classroom	
	Mixed-age	Traditional
Grade		
Kindergaten	76	63
First	54	56
Second	50	59