

INCIDENTAL LEARNING FROM CLASSROOM VISUALS  
AMONG FOURTH GRADE STUDENTS

THESIS

Submitted to the Graduate Committee of the  
Department of Education and Human Development  
State University of New York  
College at Brockport  
in Partial Fulfillment of the  
Requirements for the Degree of  
Master of Science in Education

by

Alan D. Van Camp

State University of New York  
College at Brockport  
Brockport, New York

December 1991

SUBMITTED BY:

Alan W. Van Camp

APPROVED BY:

James J. Bezy 12/18/91  
Project/Thesis Advisor Date

Arthur E. Smith 1/6/92  
Second Faculty Reader Date

Harold Zimmerman 1/29/92  
Chairman, Graduate Policies Committee Date

## ABSTRACT

This study investigated whether fourth grade students can recall information to which they have been visually exposed in their classrooms without the teacher ever having directly taught the information. Two hundred and eighty-one students in fifteen classrooms were given a pretest on the names of the countries of South America and the names of twelve western state capitals. The month long treatment consisted of a map and a chart mounted prominently on the walls. At the end of the treatment, the pretest was readministered as a posttest. A t test indicated that the students exhibited a significant growth in the amount of information they knew. They recalled information that they had been exposed to only in an incidental manner.

## Table of Contents

Chapter I	Page
Statement of the Problem .....	1
Overview .....	1
Purpose .....	2
Question to be Answered .....	2
Need for the Study .....	2
Definition of Terms .....	3
Limitations of the Study .....	3
Summary .....	3
 Chapter II	
Review of the Literature .....	5
Overview .....	5
Learning from Visuals .....	5
Effective Classroom Visuals .....	12
Summary .....	16
 Chapter III	
Design of the Study .....	17
Introduction .....	17
Research Question .....	17
Methodology .....	17
Analysis .....	19

Table of Contents (Con't)

	Page
Chapter IV	
Statistical Analysis .....	20
Purpose .....	20
Findings .....	20
Analysis .....	21
Chapter V	
Conclusions and Implications .....	22
Purpose .....	22
Method .....	22
Conclusions .....	23
Classroom Implications .....	23
Research Implications .....	25
References .....	27

## Chapter I

### Statement of the Problem

#### Overview

Many people believe that they learn information best when it is presented visually. Believing this to be true, many teachers augment their verbal presentations and assigned readings with classroom visuals. Many classrooms can be seen in which the walls are covered with pictorial and printed information. Often, these photographs, drawings, maps, and wordlists are part of the curriculum and are used by the teachers and students. However, at times teachers have been known to post visual information in a classroom without making use of it. Do children learn from this visual information?

Hennigar-Shuh (1988) criticized the overwhelming emphasis on printed material in school learning. He felt that teachers were too dependent upon the printed page. He showed how a variety of visual stimuli can provide as much or more information as written statements. As examples, Hennigar-Shuh showed how to use historical photographs and a modern plastic food container to teach social studies.

### Purpose

The purpose of this investigation was to measure whether fourth grade students can recall information that they have been exposed to visually in their classrooms without the teacher ever having directly taught that information.

### Question to be Answered

Can fourth grade students recall information that has been presented to them visually without teacher reinforcement?

### Need for the Study

Teachers have a limited time in which to help students learn a great deal of information. Curriculum changes from state governments may increase the depth and breadth to which subjects are expected to be taught, putting teachers' time at a premium.

If teachers knew that students would learn information that was posted on the walls of a classroom without the teachers having to take the time to "teach" it, then some basic or supplementary knowledge could be imparted by using this method.

If students could memorize a map, a chart, or a list of facts they needed to know simply by seeing that

information each day, then it could simplify the task of teaching. The instructor would have more time to spend on the meaning and analysis of the information.

Other studies do not seem to have directly posed the question of students' independent learning from visual information.

#### Definition of Terms

Incidental learning- Learning which happens by chance or in the course of teaching something else.

Visual stimuli- Anything visible in the classroom environment from which the observer may learn something. Examples are: illustrations, photographs, charts, maps, signs, lists, and their explanatory captions.

#### Limitations of the Study

This study was limited to fifteen fourth grade classrooms in five different school districts in western New York State. The elementary schools were located in municipalities ranging from rural to small city.

#### Summary

This investigation was concerned with students' incidental learning from visual stimuli in the class-



room. Time could be saved if teachers could expect students to learn material posted on the walls. How much visual information do students recall? This study tried to answer if and how much students learned.

## Chapter II

### Review of the Literature

#### Overview

In reviewing the literature on visual aids, it became apparent that there were two areas which needed to be investigated for this study. First, literature pertaining to learning, and more specifically incidental learning, from classroom visual aids was the obvious focus of this study.

A secondary area of investigation developed. Methods of designing and displaying effective classroom visual aids that will gain students' attention, thereby enhancing the opportunity for learning to occur, are reviewed. This investigation aided in the design of the visual aids used in the study.

#### Learning from Visuals

Hurt (1989) said:

The fact that learning from pictures can take place without any formal training in picture use is a predicator of the tremendous potential that continued exposure to and directed instructional experience with pictures has as a limiter of cultural differences in all aspects of learning. p.26

Linker (1968) explained his reasons for using instructional visuals. Visuals present messages to the

most highly developed sense (the visual sense) and arouse interest and attention. Visuals can relate abstract principles to concrete objects, and clearly illustrate relationships. Visuals can communicate messages that are difficult or impossible to put into words. Visuals can also be made abstract or realistic, whichever best suits the learning objective.

Based on the experience and advice of numerous educators, and research conducted in the field, Randall and Haines (1961) said that the properly planned bulletin board or display can be educational. It can visualize abstract concepts which are difficult to grasp verbally. They noted that color and shapes arouse interest, and make the learning environment more exciting.

Considering the values of bulletin boards, Mugge (1970) agreed that learning is enhanced through involvement, discovery, and participation. Opportunities to learn by observation, critical and creative thinking, following directions, problem solving, classification and categorization, self-evaluation, responsibility, and reading are all presented in a well-designed bulletin board that involves the reader.

Children learn words and build vocabulary quicker when the words are accompanied by pictures which illus-

trate the word or activity (Debes & Williams, 1974). Words can be lettered on posters with the picture and placed around the room to add to the "word bank." Children see and use them in their spoken and written work.

Debes and Williams go on to list a number of reasons why visuals are so important to learning. They say that visual communication is fundamental to humans in both an evolutionary and developmental sense. Evidence mounts up that humans communicated with gestures of body and objects (visual language) before developing verbal language. One important way infants gain information is through their eyes. More than one-tenth of the cerebral cortex is directly interrelated to the eye, and eighty percent of all information comes to us visually. Perhaps thirty percent of all children can learn more efficiently visually than verbally, which makes it only reasonable that we find visual communications clear, direct, and appealing. Also importantly, children have spent so many thousands of hours in front of a television that they have developed a skill in "reading" pictures.

In school, students are instructed in decoding and composition of the printed page. However, out-

side the class, the majority of their time is spent interpreting the visual images of advertisements, illustrations, and television (Goldstone, 1989). Visual images play an increasingly dominant role in knowledge acquisition and life in general. Educational programs need to promote visual literacy by teaching students how to interpret the visual.

Goldstone says that children come to school with the ability to interpret visuals on a literal level and perceive the image as a whole. But, the higher order thinking skills of analyzing, synthesizing, and interpreting the visual image do not come naturally. To interpret visual images from pictorial or media sources, viewers must use abstract thinking skills. The educational system needs to make students understand that illustrations are more than decorations. They are art and have the potential for producing meaning. The reader or viewer can gain information which was inaccessible due to the abstract or complex nature of the concept or written description.

Ghatala and Levin (1981), in a study which tested third graders on recall of pictures, showed incidental memory for pictures was increased when an orienting task that emphasized the organization of the picture

was employed. The children were asked to name each picture viewed. By asking the children to name the pictures, they were first required to process the visual features, gain meaning from them, and then formulate a name. It was concluded that three types of features (visual, meaning, and phonemic) are likely encoded for pictures. The researchers believe that the processing of pictures begins with visual features and proceeds to meaning features, with phonemic features assessed only after processing of meaning has occurred. Requiring the naming of the pictures enhanced the likelihood of meaningful identification and understanding which would allow the phonemic assessment. However, if the pictures were not meaningful or familiar to the subjects, little meaningful processing would be expected to occur.

In a study by Kau and Winer (1987), children ages three to five were tested for their incidental recall based on oral presentation of words or oral words plus pictures as stimuli. Their recall of the words was higher for the words plus pictures than for the words presented alone. The researchers noted that these findings were consistent with other studies which had shown that when stimuli is processed in two modes, it

is recalled at higher rates.

In a study of spelling errors (Bruck and Waters, 1988), it was found that the visual memory of orthographic sequences in spelling helped to explain the differences between poor and good spellers.

Vašu and Howe (1989), in a study of first and fourth grade children, reported that children who received information in both visual and verbal forms scored significantly higher on both immediate and long-term retention of the information than those children who received information in either form alone. Importantly, they noted that on long-term retention, children in both the visual and visual plus verbal treatment groups could recall and represent more information in pictorial form than in verbal form. The researchers suggested that more information was coded in the imagery system than in the verbal system. The consistently higher scores on the drawings suggested that the information was stored and retrieved in nonverbal form.

In a demonstration of incidental learning, Raphelson (1987) used slides as part of a lecture course on the history of psychology. His results showed a significant correlation between scores on an unannounced slide recognition test and scores on other course exams. This suggests that the visual stimuli may have helped

students retain the information for their other exams.

Analyzing all the visuals (photos and illustrations) from three newsmagazines (U.S. News and World Report, Time, and Newsweek) of the presidential and vice-presidential candidates between Labor Day and one week post-election day in 1988, Moriarity and Popovich (1989) concluded that the candidates with the better visual coverage won the election. Their analyses showed that the three magazines showed no difference in how they covered the campaign, each of them consistently showing the Republican candidate in more visuals than the Democrat. Bush's pictures were larger, had better page position, were more cheerful, and had better camera angles than Dukakis' pictures. Bentsen had hardly any visuals. Could this lack of visual reinforcement have affected the results of the campaign?

Reese (1984) studied television news for its ability to teach. He found more learning, as evidenced by improved recall and a reduction of errors, when the audio (script) was accompanied by redundant visuals. They reinforced each other. His study showed that the visual information must be closely synchronized with the audio to be most effective.



### Effective Classroom Visuals

Creekmore (1987) claims that the classroom environment has too many distractors rather than facilitators for learning. He says too many visual displays distract from teaching. Creekmore proposed using the main wall of the classroom as a "acquisition wall" where the current lesson is taught. After the lesson, materials should be moved to the "maintenance wall" at the side of the room, where they can reinforce the lessons. Finally, he suggests a "dynamic wall" on the other side or rear of the room. This wall would hold the usual seasonal displays, student work, helper charts, and announcements. The dynamic wall should be constantly changing. Researched with two groups of students in two classrooms with two teachers who used the same lesson plans and materials and rotated to avoid teacher bias, Creekmore obtained results that indicated that a substantially higher percentage of acquisition and generalizations was reached in his "learning wall" situation, as opposed to a traditional classroom. He concluded that overstimulation increased off-task behavior and reduced learning, while the use of uncluttered, relevant material enhanced learning.

Thompson (1969) wrote that the teacher must ana-

lyze what he wants students to learn from visuals and then present only that information as simply as possible. Thompson also stated that when constructing graphics for primary-age children, warm, brilliant colors should be used. With older children, legibility becomes the critical factor. He found that color legibility demands high contrast between the foreground lettering and the background.

Dwyer (1972) also believed that the use of color in visuals could be an important variable in helping to improve student achievement. After a number of studies, he concluded that using visuals to complement oral instruction is an effective way to improve student achievement. Dwyer also found that different grade levels respond better to different types and complexities of visuals, and that the educational objectives needed to be considered in choosing the best visual aid.

Linker (1968) stated that language is very redundant. Often, one or two words can transmit a message as efficiently as a complete sentence. The minimum copy necessary to accomplish the purpose of the visual should be the only copy in the visual. Randall and Haines (1961) also believed in the importance of simplicity. They advised that one should simplify lines,

shapes, spaces, and colors to make visuals more readable. They also cautioned against putting too much material in one space, crowding the visuals and distracting the reader's attention.

Assessing the effect of the amount of physical detail in pictures on picture recognition memory, Pezdek (1989) found that recognition accuracy was significantly higher for pictures presented in simple rather than in complex form. Pezdek studied seven year olds, nine year olds, young adults, and adults over the age of sixty-eight. The subjects were presented with simple and complex line drawings. She concluded that visual information that communicates the central idea of each picture is more likely to be encoded and retained in the memory than information which is not central to the idea of the picture.

Testing for long-term memory of pictures, Mandler and Ritchey (1977) presented complex pictures in organized and unorganized versions. They found that the organized versions, which conformed more closely to reality, were remembered far longer. This agreed with past research which had shown that stimuli that can be organized is better recalled than random stimuli that cannot be visually grouped in the memory.

When using visuals to teach, Hurt (1989) also

advised against using pictures that are overly complex. Detailed pictures with many objects in them make it harder for less experienced children to gain information from them. Hurt stated that if complex pictures are to be used with inexperienced children, the children need verbal or visual cues to direct them to the important information.

On the other hand, Hurt cautioned against using pictures that are too simple. As readers become more experienced, they tend to prefer and learn faster from more complex visuals. Overly simple visuals are considered boring and not taken seriously as a source of information.

Hurt also suggested that pictures should contain recognizable objects. He states that inexperienced readers cannot gain knowledge if they can't relate to the picture. Hurt has found that pictures that do not relate to the real world are easier to misinterpret and require more time to internalize and interpret.

Linker (1968) divided the symbols used in instructional visuals into three categories. He defined pictorial symbols as combinations of lines, shapes, colors, and textures. He said they were the most realistic and visually appealing, but used more space. Language symbols are letters and numbers, the characters of

printed language, and are lacking in visual appeal. Graphic symbols are adaptations of language and pictorial symbols which are used to transmit large amounts of information quickly. They are most useful in situations calling for swift interpretation and the showing of relationships.

Writing about bulletin boards which encourage student involvement, Mugge (1970) stated that a good caption can grasp the theme of a visual and promote the learning of the objective. A thought-provoking caption attracts attention, captures the essence of the main idea, poses a question, personalizes the learning by using the word "you", and involves the child immediately.

#### Summary

There is research which shows that visual aids in classrooms can aid the process of learning. Some research has been conducted on incidental learning from visuals. Other research has been conducted on the best types of visual aids. Using this research, teachers should be able to design and use visual aids to increase children's ability to learn from classroom visuals incidentally.

## Chapter III

### Design of the Study

#### Introduction

The purpose of this investigation was to measure whether fourth grade students can recall information that they have been exposed to visually in their classrooms without the teacher ever having directly taught that information.

#### Research Question

Was there a statistically significant difference between the mean pretest scores and the mean posttest scores on identical tests of student knowledge?

#### Methodology

##### Subjects:

The subjects for this study were 281 fourth grade children from fifteen classes in five school districts in western New York State. Any student who missed either test was eliminated, as was anyone who missed a week of school during the treatment.

##### Materials:

The materials included two posters, both of which measured over two feet by three feet. The words on

both were printed in black marker with letters two inches tall.

The first poster was an outline map of South America, with the thirteen counties brightly outlined and the names printed boldly in black ink.

The second poster was a list of twelve randomly selected western states matched to their capital cities.

#### Instruments:

The test was identical in both pretest and post-test form. It asked students to write the South American countries, and to write the capital cities that matched the orally named states.

#### Procedure:

For the pretest, on the front of a paper each student was asked to write a list of South American countries. Then on the back of the paper, as the teacher orally named the states, the students were asked to write the matching capital cities.

After waiting approximately two weeks, to allow student recollection of the pretest to fade, the map and chart were posted in each classroom. A prominent place was chosen, where all the students could read them from their seats and would have reason to be nearer to them in the course of the day.

The teachers did not teach the material on the map and chart. If asked why they were on the wall, the teachers responded that they were only something different to put on the bulletin boards for a change.

After leaving the map and chart posted for approximately four weeks, the teachers removed them from the wall and administered the posttest, which asked the same questions in the same way as the pretest.

#### Analysis

The pretest and posttest scores of the students were analyzed for significant difference using a correlated t test.



## Chapter IV

### Statistical Analysis

#### Purpose

The purpose of this investigation was to measure whether fourth grade students can recall information that they have been exposed to visually in their classrooms without the teacher ever having directly taught that information.

#### Findings

On the pretest, students correctly answered from zero to nine questions of the possible twenty-five. On the posttest, students correctly answered from zero to seventeen questions.

The mean score on the pretest was 1.05. On the posttest, the mean improved to 2.76.

The median on the pretest was 1, while on the posttest the median was 2.

The standard deviation on the pretest was 1.43, and on the posttest it was 2.97.

Using a correlated t test, it was found that the correlation was 0.61, which is a significant correlation. At the .05 level of significance, 0.1946 is the critical value required for significance. On a t test pair,

the critical  $t$  required for the .05 level of significance is 1.960. The calculated  $t$  value of 12.02 indicates a significant  $t$  value.

Table 1  
Analysis of Test Scores

Test	Mean	SD	Calculated $t$
Pretest	1.05	1.43	
Posttest	2.76	2.97	12.02

#### Analysis

The correlated  $t$  test shows that there was a significant difference between the pretest and the posttest scores of the students. This indicates that the students did recall the information to which they were visually exposed without the teacher directly having taught that information.

## Chapter V

### Conclusions and Implications

#### Purpose

The purpose of this investigation was to measure whether fourth grade students can recall information to which they have been exposed visually in their classrooms without the teacher ever having directly taught that information.

#### Method

The students were given a pretest on their knowledge of the names of the countries of South America and the names of twelve selected western state capitals. These items were chosen because they are not taught in or before fourth grade, and it was expected that the students would perform poorly on the pretest. This would allow a greater chance for incidental learning to be observed.

After waiting about two weeks, a map of South America and a state capital chart were prominently mounted on the walls of each room. These were left up for four weeks. The teachers did not make use of them or direct attention to them. They were simply a part of the visual classroom environment.

At the end of the four week treatment period, the map and chart were removed and the same test was administered as a posttest. Mean scores were compared for a statistically significant difference.

### Conclusions

This study of 281 fourth grade students in fifteen classrooms from five different school districts showed that students did recall information to which they were exposed visually in the classroom even when the teacher never directly taught that information.

A statistically significant difference between pretest and posttest scores demonstrates that students did experience incidental learning from classroom visuals.

### Classroom Implications

This study indicates that educators should choose visuals for their classrooms which will enhance their students' learning experience. Information which needs to be learned should be boldly displayed in a prominent position in the classroom. Lists and maps that need to be memorized should become part of the students' visual environment.

Information which the teacher does not have the time or desire to teach can still be brought to the

attention of students by displaying visuals. Students can recall some of this information even though the teacher may not take the time to teach it. This information could supplement the regular classroom material.

At the primary level, a large map of the continents showing the oceans, major rivers and countries, and locating the school might be appropriate, as would a local city map which showed major buildings the students could recognize and visit. Classroom rules, school rules, and step-by-step instructions for activities would be appropriate at all levels. As students got older, large, colorful maps of nations and regions to be studied during the year could benefit student learning. Definitions, quotes, theorems, and any other information requiring memorization could be added.

This study showed that students can learn a significant amount of information incidentally from visuals. However, mastery of the information was not achieved. Teachers' involvement may be required to attain that goal. Teachers' use of visuals can enhance their students ability to recall information. Visuals should be used as often as possible.

### Research Implications

In future research, different populations could be tested using different types of visuals. The best type of visuals to use at various grade levels could be investigated. Colors, print size and amount, and complexity of the concepts could all be varied and tested.

Long term recall of the incidentally learned information should be studied. This study did not investigate that question. It may be different for incidentally versus consciously learned information.

Researchers might also study whether informing the students that they will be tested on the information contained in the visual will increase student recall. In this study, because it was desired to test incidental learning, the students were not told of the study or the posttest. It was feared that this knowledge would cause the students to consciously practice the material.

Whether visuals can increase recall of information that the teacher does teach could also be further investigated in normal classroom situations. Usually, this is the case in most classrooms. The visuals

reinforce material that has been taught. Do students gain from this visual reinforcement? Can visual reinforcement help students to recall information more fully and for a longer time period?

These and many other questions could be investigated by future researchers.

## References

- Bruck, M. & Waters, G. (1988). An analysis of the spelling errors of children who differ in their reading and spelling skills. Applied Psycholinguistics, 9, 77-92.
- Creekmore, W.N. (1987). Effective use of classroom walls. Academic Therapy, 22, 341-348.
- Debes, J.L. & Williams, C.M. (1974). The power of visuals. Instructor, 84, 31-38.
- Dwyer, F.M. (1972). A guide for improving visualized instruction. State College, Pennsylvania: Learning Services.
- Ghatala, E.S. & Levin, J.R. (1981). Children's incidental memory for pictures: Item processing versus list organization. Journal of Experimental Child Psychology, 31, 231-244.
- Goldstone, B.P. (1989). Visual interpretation of children's books. Reading Teacher, 42, 592-595.
- Hennigar-Shuh, J. (1988). Learn to look. History and Social Science Teacher, 23, 141-146.
- Hurt, J.A. (1989). A guide for using visuals in teaching culturally diverse children. TechTrends, 34, 24-26.
- Kau, A. & Winer, G. (1987). Incidental learning in young children tested with words or words plus pictures as stimuli. Journal of Experimental Child Psychology, 43, 359-366.
- Linker, J.M. (1968). Designing instructional visuals: Theory: Composition: Implementation. The University of Texas at Austin: Instructional Media Center, Division of Extension.
- Mandler, J. & Ritchey, G. (1977). Long-term memory for pictures. Journal of Experimental Psychology: Human Learning and Memory, 3, 386-396.



- Moriarity, S. & Popovich, M. (1989). Newsmagazine visuals and the 1988 presidential election. (ERIC Document Reproduction Service No. ED 309-488)
- Mugge, D.J. (1970). Involvement bulletin boards. Washington, D.C.: Association for Childhood Education International.
- Pezdek, K. (1989). Memory for pictures: A life-span study of the role of visual detail. Child Development, 58, 807-815.
- Randall, R. & Haines, E.C. (1961). Bulletin boards and display. Worcester, Massachusetts: Davis Publications, Inc.
- Raphelson, A. (1987). The use of slides in class: A demonstration of incidental learning. Teaching of Psychology, 14, 103-105.
- Reese, S. (1984). Visual-verbal redundancy effects on television news learning. Journal of Broadcasting, 28, 79-87.
- Thompson, J.J. (1969). Instructional communication. New York: Van Nostrand Reinhold Company.
- Vasu, E. & Howe, A. (1989). The effect of visual and verbal modes of presentation on children's retention of images and words. Journal of Research in Science Teaching, 26, 401-407.