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## **The effects of positive reinforcement within a computer-assisted instruction program on student achievement and attitude**

Lynne A. Gebhardt

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California State College  
San Bernardino


2 THE EFFECTS OF POSITIVE REINFORCEMENT  
WITHIN A COMPUTER-ASSISTED INSTRUCTION PROGRAM  
ON STUDENT ACHIEVEMENT AND ATTITUDE 2

A Project Submitted to  
The Faculty of the School of Education  
in Partial Fulfillment of the Requirements of the Degree of  
Master of Arts  
in  
Education: Elementary Option

By  
Lynne Gebhardt

San Bernardino, California  
1986

APPROVED BY:

  
Advisor


  
Committee Member

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## PROJECT SUMMARY

### THE EFFECTS OF POSITIVE REINFORCEMENT WITHIN A COMPUTER-ASSISTED INSTRUCTION PROGRAM ON STUDENT ACHIEVEMENT AND ATTITUDE

Lynne A. Gebhardt

California State University, San Bernardino, 1986

#### Statement of the Problem:

The purpose of this project was to determine the effects of a positive reinforcement statement within a computer-assisted instruction (CAI) program on student achievement and attitude toward the CAI program.

#### Procedure:

Thirty-five high ability sixth grade students were randomly placed in control and experimental groups. The eighteen students in the experimental group used a CAI spelling program with a positive reinforcement statement ("Great, [student's name]") given for correct responses. The seventeen students in the control group used the same CAI program without the reinforcement statement. Both groups received the same amount of computer time and had the same instructor. A pre and post test of thirty randomly selected words was given. Weekly tests on the words

presented were also given. At the end of the study, a questionnaire was given to measure student attitude toward the program used.

#### Results:

The spelling pretest showed no significant differences between the control and experimental groups. Weekly spelling tests also indicated no significant differences. The spelling posttest, however, showed that the experimental group scored significantly higher [ $t=2.6, p<.02$ ].

The attitude questionnaire showed no significant differences between groups. Both the control and experimental groups enjoyed using the CAI program.

#### Conclusions and Implications:

The CAI program containing the positive reinforcement statement did not increase weekly test scores, however the posttest indicates that it may affect retention of learned material. Further study is necessary in this area.

As attitudes did not differ between groups, it could be that the type of reinforcement offered in commercial programs need not be a major evaluation factor.

- program containing a positive reinforcement statement
3. To compare students' attitudes toward the use of a CAI using a CAI program not containing such a statement.
2. To compare the achievement of students using a CAI program containing a positive reinforcement statement following a correct answer with the achievement of students using a CAI program not containing such a statement.
1. To determine whether positive reinforcement positively affects student achievement.

The main objectives of this study were:

Objectives:

- and/or attitude?
- practice computer program increase student achievement
- Do positive reinforcement statements within a drill and

Statement of Problem:

practice computer program.

effectiveness of positive reinforcement within a drill and

considerations. This study was undertaken to determine the

(reinforcement, graphics, color) are important

simulation, etc.) and the motivational qualities

the type of program (drill-and-practice, tutorial,

available for students. The curriculum area(s) presented,

education. Much time is spent selecting the best programs

Computer-assisted instruction (CAI) is part of today's

following a correct answer with the attitudes of students using a CAI program without a positive reinforcement statement.

Hypotheses:

There will be no statistically significant differences at the .05 level in the scores of a criterion referenced posttest between students using a CAI program with a positive reinforcement statement given following a correct response and those students using a CAI program without a positive reinforcement statement given.

There will be no statistically significant differences at the .05 level in students' attitude toward using the CAI program with a positive reinforcement statement given following a correct response and those students using a CAI program without a positive reinforcement statement given as measured by a questionnaire.

Methodology:

A class of thirty-five 6th grade students (reading level 7.0 - 8.9) was randomly divided into two groups. Both groups went to the computer lab at the same time. One group of students used a CAI drill-and-practice spelling program containing a positive reinforcement statement ("Great, [student's name]") for correct responses and the other group used the identical program with the reinforcement statement eliminated. Students used the program 10-15 minutes per day, three days a week, for six weeks. Pre and post tests

were administered consisting of a random sample of thirty spelling words taken from the 144 words presented during the study.

At the conclusion of the six week study, a simple questionnaire (see Appendix C) was distributed to the students to determine whether or not they enjoyed using the CAI program.

#### Significance of the Study:

Most educational software contains some kind of positive reinforcement for correct student responses. Some programs have very simple statements such as "Right, Johnny!", while others have elaborate graphics, music, etc. which dramatically increase the price. This study will determine just how important reinforcement is for increasing achievement and attitude.

#### Limitations:

This study provides useful information for educational software design and selection. However, several factors limit the inferences which can be made.

The spelling programs used in this study are of a teacher-made, criterion-referenced, drill and practice design. The type of reinforcement is a simple, positive statement following a correct response. Other types of reinforcement may produce different results.

The students selected for this study were achieving above grade level. The results for these students may not



represent the results which would be obtained for a heterogeneous group.

The questionnaire used to determine students' attitudes required a yes or no answer. The use of a Likert scale may have shown greater differences in attitude.

As mentioned earlier, there are many types of positive reinforcement and many types of educational programs. This study only looks at the effectiveness of a simple positive reinforcement statement in a drill and practice program.

If these limitations are kept in mind when reviewing results, the conclusions can be useful for determining the effectiveness of one type of reinforcement in a drill and practice program, as well as give ideas and direction for further study in this area.

## REVIEW OF THE LITERATURE

Numerous studies have been done on the effectiveness of the computer in the classroom. Research has generally shown CAI to increase student achievement (Alberta Department of Education, 1983; Demshock & Riedesel, 1968; Dunwell, Jeppsen, & Willis 1972; Lysiak, Wallace, & Evans, 1976; Middleton, 1981; Steele, Batista, & Krockover, 1982). This evidence also holds true with high-achieving learners (Gershman & Sakamoto, 1981; Hoffman & Waters, 1982; Menis, Snyder, & Ben-Kohav, 1980) and low-achieving learners (Charp, 1981; Saracho, 1982).

CAI also appears to affect students' attitudes positively (Caffarella, Cavert, Legum, Shtogren & Wagner, 1980; DUBY & Giltrow, 1978; Garraway, 1974). The non-judgemental nature and infinite patience of a computer makes learning much more pleasant than conventional instruction (Lawton & Gerschner, 1982).

Reinforcement may be one reason CAI is so successful. Praise can be an effective reinforcer when used consistently and appropriately (Broughton, 1978; Darch & Gersten, 1985; Heller & White, 1975; Lipe & Jung, 1971; Meyer, Bachmann, Biermann, Hempelmann, Ploger, & Spiller, 1979). CAI programs can control this reinforcement by providing the feedback in a systematic fashion unlike teacher praise (Brophy, 1981; Dalton & Hannafin, 1985).

Two types of feedback have been identified as important: 1) information feedback, which conveys to the learner whether he/she is correct or incorrect and/or provides information that assists in correcting an error; and 2) reinforcing feedback, which facilitates repetition of correct responses through various means including motivational messages (systematic praise) (Carter, 1984). Informational feedback has been shown to facilitate learning more than reinforcing feedback (Bardwell, 1981; Lasoff, 1981; Robin, 1978; Roper, 1977). The timing of feedback is also important (immediate vs delayed), with immediate producing slightly better retention results for students that have not yet reached mastery (Cohen, 1985).

A recent study looked at four types of reinforcement within a CAI mathematics program (Dalton & Hannafin, 1985). The systematic feedback in the CAI program used either affirmation of response only, affirmation plus positive reinforcement for correct responses, affirmation with negative reinforcement for incorrect responses, or affirmation plus positive and negative reinforcement. No significant differences were found in achievement, which was perhaps due to the short term nature of the study. However, attitude scores increased slightly for all groups indicating a positive response to CAI.

This study was developed to observe the effects of one type of positive reinforcement (systematic praise) within a CAI program on students' attitude and achievement. All

students will receive immediate and informational feedback, while only the experimental group will receive reinforcing feedback. The findings of this research may then provide a basis for further studies on types of reinforcement.

## DESIGN

### Population:

The population of Hemet Unified School District is primarily Anglo of a lower-middle to upper-middle socio-economic level.

Of the 520 sixth grade students in regular classrooms at Acacia Middle School in Hemet, 125 were currently receiving computer assisted instruction (CAI) as part of their regular spelling program. These 125 students received their spelling instruction from the same teacher.

### Methodology:

The 125 students who were receiving CAI for spelling had been homogeneously grouped by achievement level using both the Stanford Achievement Test, reading and math sections, and criterion-referenced reading and math tests. The second-highest group (grade level 7.0 - 8.9) was randomly selected to participate in the study.

The pretest-posttest control group design was used in this study. A random number table was used to place students in either the control or the experimental group. Eighteen students were placed in the experimental group and seventeen were placed in the control group.

The pretest/posttest consisted of a random sample of thirty spelling words selected from the 144 presented during

the six week study. (See Appendix A) The spelling words (high school - adult level) were from "504 Absolutely Essential Words" (Bronberg, Leibb, & Traiger, 1975) lessons 7-18.

Students in the experimental group used the computer program containing a positive reinforcement statement ("Great, [student's name]") to be displayed following a correct response. Students in the control group used the identical program with the positive reinforcement statement omitted. (For a complete description of the computer program see Appendix B).

Throughout the study, students were taken to the lab three days per week. Each student had 10-15 minutes of computer time per day. Students in the control group used the computers on one side of the lab and students in the experimental group used the computers on the other side. The students did not notice the difference in the programs.

The 144 spelling words were presented to the students in groups of twenty-four words per week. A test on these twenty-four words was given each Friday.

The only other practice the students were given each week was a vocabulary worksheet where the students were to fill in the blank with the correct spelling word.

## RESULTS AND CONCLUSIONS

### Test Results:

The pretest was administered in May, 1986. Table 1 illustrates the mean, standard deviation, and t-value for the control and experimental groups.

TABLE 1

#### SPELLING PRETEST SCORES

Group	Mean	S.D.	t
Control	13.1	4.4	
Experimental	11.4	4.2	1.19*

\*p=n.s.

Table 1 shows no significant differences between groups on the spelling pretest.

Spelling tests on each group of twenty-four words presented were also given weekly to both groups. Table 2 illustrates the mean and t-value for both groups.

TABLE 2

#### WEEKLY SPELLING TESTS

Week	Control	Experimental	t
1	22.1	20.3	1.7*
2	22.3	22.9	.70*
3	23.3	22.4	1.4*
4	23.1	22.6	.80*
5	23.5	23.2	.96*
6	23.5	23.0	1.1*

\*p=n.s.

No significant differences were found between groups on weekly spelling tests.

The posttest was administered six weeks later in June, 1986. Table 3 illustrates the mean, standard deviation, and t-value for both groups.

TABLE 3  
SPELLING POSTTEST SCORES

Group	Mean	S.D.	t
Control	24.2	3.5	
Experimental	20.7	4.2	2.6**

\*\*  $p < .02$

Table 3 shows significance beyond the .02 level between groups.

At the conclusion of the study, the students were given a simple questionnaire to compare the groups enjoyment of using the program. (See Appendix C). Table 4 illustrates the number of yes and no responses for each group as well as the chi-square value.

TABLE 4  
QUESTIONNAIRE RESULTS

Group	Yes	No	Chi-square
Control	18	0	
Experimental	16	1	1.08*

\* $p = n.s.$

Table 4 indicates no significant differences in attitude between groups.



### Conclusions:

On the spelling pretest, the mean score for the experimental group was higher, although not significantly so. The mean scores on the experimental group's weekly tests were also slightly higher for all but week 2. However, on the posttest, the experimental group scored significantly higher, [ $t=2.6$ ,  $p<.02$ ]. The null hypothesis for student achievement is therefore rejected.

The results of the attitude questionnaire showed quite strongly that there were no differences in enjoyment of the program between groups. As all students had regularly used computers at school, their enjoyment was not due to the novelty of using a computer. Also, the students were told exactly what the question was asking--whether or not this particular program was enjoyable to use--so there was no possibility of misinterpretation. Therefore, the null hypothesis for student attitude is not rejected.

### Educational Implications:

While the program containing the positive reinforcement statement did not appear to increase scores immediately, it did seem to increase the retention of words presented during the six week study. Further study should be undertaken to determine whether or not this is the case.

Since students' attitudes did not show a preference for the program containing the positive reinforcement statement,

perhaps the elaborate types found in some commercial programs are an unnecessary expenditure of programming time and educational monies. Further study should be undertaken to compare different types of positive reinforcement.

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APPENDIX A

PRETEST/POSTTEST

denounce

unforeseen

weird

mediocre

amateur

undeniable

miniature

feminine

masculine

victorious

solitary

absurd

abolish

knowledge

adequate

commence

famine

persist

opponent

vicious

expand

casual

penetrate

surpass

accurate

addict

greedy

wretched

nimble

rave

## APPENDIX B

### CAI PROGRAM DESCRIPTIONS

The computer spelling program used in this study is of the drill and practice design. DATA statements at the end of the program enable the teacher to customize the lesson for each unit by changing the words to be practiced.

#### Control Group with Positive Reinforcement:

The student is first asked to type in his/her name. They must then press a key to indicate they are ready for the program to begin. During the program, each spelling word is presented as follows:

A word is flashed on the screen for approximately two seconds. The student must then type in the word that was flashed.

If the student's response is correct, a positive message, "Great [student's name]", is given, the prompt, "Get ready for the next word...", appears, and the program proceeds to the next word. If the student's response is incorrect, the message, "Sorry try again.", is given and then the word is flashed again. If the student still responds incorrectly the second time, the message, "Please type the word." appears along with the spelling word so the

student may copy it. The program does not proceed until the student has correctly copied the spelling word.

At the end of the program, the student is given the number of incorrect responses along with the percentage.

Experimental Group without Positive Reinforcement:

This program is identical to the above program except for the following differences:

1. The student does not initially type in his/her name.
2. Instead of a positive reinforcement statement after a correct response, only the statement "Get ready for the next word..." is shown on the screen.



APPENDIX C

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COMPUTER LAB QUESTIONNAIRE

Lab Station # \_\_\_\_\_

Did you enjoy using this program?      \_\_\_\_\_ YES      \_\_\_\_\_ NO

Comments:

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