DOCUMENT RESUME

ED 235 295 UD 023 181

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TITLE	Computer-Assisted Instruction in Mathematics. Disadvantaged Pupil Program Fund. Final Evaluation Report, 1982-83.
INSTITUTION	Cleveland Public Schools, OH. Dept. of Research and Analysis.
PUB DATE	Jul 83
NOTE	13p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Compensatory Education; *Computer Assisted Instruction; Computer Programs; Disadvantaged Youth; *Educationally Disadvantaged; Inservice Teacher Education; Microcomputers; *Program Effectiveness; Program Evaluation; *Remedial Mathematics; Secondary Education; *Secondary School Mathematics; Teacher Developed Materials
IDENTIFIERS	Cleveland Public Schools OH

ABSTRACT

The Computer-Assisted Instruction in Mathematics project, of the Cleveland Public Schools, uses microcomputers to provide supplemental remedial instruction in mathematics to students in grades 7-12. The project also provides inservice training for classroom teachers on the use of microcomputers for math remediation and on the development of remedial math software. Twenty schools are each equipped with two microcomputers for use as classroom demonstration devices and/or individual drill and practice vehicles. In the school year 1982-83, operational problems impeded the progress of the project's four stated objectives: implementation and management of the project, assessing student achievement, providing inservice training for teachers, and developing remedial software, all of which met with varied success. Delayed starts (in some schools) and inherent design shortcomings operated to limit the delivery of service to targeted students. It is recommended that thought be given to restructuring the project. (CMG)

COMPUTER-ASSISTED INSTRUCTION IN MATHEMATICS

1982-1983 DPPF EVALUATION

1982-1983
FINAL EVALUATION REPORT

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RESEARCH AND ANALYSIS DEPARTMENT

July, 1983

COMPUTER-ASSISTED INSTRUCTION IN MATHEMATICS

1982-1983 DPPF EVALUATION

PURPOSE AND OVERVIEW

The Computer-Assisted Instruction in Mathematics Project is designed to provide supplemental remedial instruction in mathematics through the use of microcomputer for students in Grades 7 through 12 who have experienced difficulty in learning mathematics. The project also provides inservice training for classroom teachers on the use of microcomputers for remediation in mathematics and for the development of remedial mathematics software. Twenty project schools are each equipped with two microcomputers for use by the project teachers as classroom demonstration devices and/or individual drill and practice vehicles.

SERVICE SUMMARY

Pupils Served: 1200 Grades: 7 -12 Years in Operation: 7

Schools: 20 public Staffing: 1 Consultant Teacher, FT

(See Appendix A)

Total DPPF Expenditures: Per Pupil Cost:

SUMMARY OF FINDINGS

The CAI Mathematics Project has evidenced operational problems during the year which have served to impede the progress towards the successful achievement of the four stated project objectives. Delayed starts (in some schools) coupled with inherent design shortcomings operated to limit the delivery of service to the target student population. (Recommendations for the redirection of the project in the future are suggested).

The student achievement objective was not attained. The project's four objectives, designed to foster the implementation and management of the project, provide inservice for project teachers, provide for remedial software development, and assess student achievement met with varied success. Two objectives (for inservice) were attained. The management objective was not achieved.

OUTCOMES AND OBJECTIVES

- Objective 1: Among the students who receive supplemental instructions via the microcomputer, 75% or more will demonstrate a significant increase in basic mathematical computational skills (Pre-post of at least ten percentage points).

  - Outcome: This objective was not attained.

    In December, 1982 identified project teachers administered the locally constructed pre-test of Basic Mathematics Skills to 979 identified project participants. In May, 1983, the project teachers administered the post-test to 736 students.[1] A pre-to-post test matching of the test results yielded 432 valid pairs.[2] These results comprised the sample used to analyze this objective. Table 1 illustrates the pre-post test results for the entire sample tested and by grade level.

TABLE 1

Basic Mathematics Skills Test Results
(by grade)

GRADE	N	PRE-TEST(%)	POST-TEST (%)	GAIN (%)	PERCENT GAINING 10%
TOTAL	432	50.25	59.60	935	46.5
7	143	41.10	51.80	10.70	53.1
8	40	49.43	59.78	10.35	55.2
9	148	53.43	60.24	6.81	39.9
10	43	56.19	66.51	10.32	39.5
11	46	59.33	71.02	11.69	50.0
12	12	66.75	75.66	8.91	33.3

These results illustrate that the tested sample population did not attain the objective as stated.

Significant gains were made, however, by fewer than 75% of each individual grade level except the ninth and twelfth. Grades seven eight, ten, and eleven evidenced an increase in performance greater than 10% by the close to one half of their respective samples. Grades nine and twelve failed to attain a 10% increase in pre-to-post mean scores.

[1] A limited number of students were post-tested due to a year end bus driver's strike.

[2] A valid pair of pre-post test data includes completed pre and post test data from the same project student who scored less than or equal to 90.0% on the pre-test.

- Objective 2: An effective management system of scheduling computer usage will be developed which will permit monitoring the frequency and length of involvement with the computer by participating schools.

  - Outcome: This objective was not attained.

    Year end survey responses of teachers indicated that no standardized record keeping and/or management system was in force for the current project year. When asked to "Indicate the extent to which you have scheduled, monitored, and RECORDED the frequency and length of individual student involvement in project activities," the respondents (N=17) indicated the following: 5 said Always, 9 said Sometimes, and 3 Never. (See Appendix D for a copy of the Survey.)

    Project site visitations conducted during the year also evidenced no standardized management system of computer usage among the project schools. Despite the prescription for the retention of certain data for project students by the project's consultant, teacher's continued to utilize individually devised management and record keeping procedures for the project. The degree of specificity of the various individual record keeping systems appears to have varied with the instructional system utilized (ie. class demonstration or individual drill practice). Consequently, the only method available for the monitoring the frequency and length of involvement with the computers among the project schools was via a survey question on the post-test (see the Additional Findings for this summary.)

- Objective 3: Teachers will receive inservice training and orientation in the operation of the computer and its use as an instructional (remedial) tool.

  - Outcome: This objective has been attained.

    TABLE 2 contains a list of the inservice meetings/visits with project teachers during the year which were completed by the project consultant. (See Appendix B for TABLE 2)

    Thirty-four teacher conferences and two project staff meetings were conducted during the course of the year to complete the planned activities for this objective.

- Objective 4: A class in developing remedial educational software will be organized and offered to interested teachers.

  - Outcome: This objective has been attained.

    Interested teachers were assembled into a "Program Writing Team" during the Spring semester by the project's consultant. The team convened on six consecutive Tuesdays from April 19 to May 24, 1983 to develop mathematics exercise modules for implementation on the microcomputers. Each module consists of a set of activities

designed for completion during one session on the microcomputer; each addresses one Mathematics Concept. A total of 50 activity sheets were developed during the six sessions. A sample of the worksheets which were developed is included in Appendix C.,

ADDITIONAL FINDINGS

Individual project site visitations and interviews with project teachers and management provided the following observations.

- Twenty project site were identified in October, 1982. The project site selection was accomplished as a result of the project management"s assessment of the previous year's operations records, and the stated level of commitment by the perspective teacher. Six sites required equipment transfers while other schools "traded" equipment in order to utilize new and existing equipment most effectively.

- By the end of the first semester (January 28, 1983) all twenty project sites were equipped with the required microcomputing equipment.

- Eleven of the project sites begun operations in September, 1982. Nine of the project sites began functioning in January, 1983 thereby eliminating the possibility of meeting the target of 25 consecutive weeks of instruction via the microcomputer.

- Regular classroom teachers (who implement the project in selected classes) are faced with the dilemma of servicing specific eligible students who reside in heterogeneous classes.

- The project's procedures are to be implemented during regularly scheduled mathematics class time. Therefore, CAI math must be thoroughly integrated into or added to the already intensive prescribed mathematics curriculum.

- The following information was gathered from a sample (N=19) of project teachers who completed a survey instrument in May, 1983. (See Appendix D.)

  Project staff had varied perceptions of the product objective attainment (see Objective 1 above) as follows:

Yes is was attained	47%
No it was not attained	24%
Did not know	29%

- The identified project students in the tested sample population provided the following information about the project with their test response (N=441).

77% of the students used the computers one day per week.

59% of the students use the computer between 11 and 20 minutes for each scheduled session.

The CAI delivery method is primarily a combination of individual drill and practice sessions and classroom demonstration sessions.

- Additionally, teachers were required to supply the following information via student test responses.

  66% of the responses (N=441) indicated that the project functioned for less than 24 weeks.

  47% of the students were absent five days or less (during the project). 29% were absent between 6 and 20 days.

CONCLUSIONS

This project was beset with operational problems which appeared to hinder the achievement of the stated objectives, as noted below.

- The operations of the CAI Mathematics Project were delayed in nine of twenty installations for the first semester. This factor reduced the targeted project duration of 25 consecutive weeks in almost one-half of the participating schools. Additional (school semester) data indicated that 66% of the project programs functioned for less than 24 weeks. This could be a significant factor in explaining the partial attainment of the project's one product objective concerning pre-to-post achievement.

- The implementation of an effective computer usage management system was not evident. Individual teachers used a variety of methods which were not applied informally over time.

- The inservice of project teachers was completed, as evidenced by the records of consultations and meetings held throughout the year.

- Interested teachers were able to participate in the development of remedial educational software.

The following recommendations are suggested for consideration.

- Critical attention must be given to the current stated objectives. Regular and frequent consultation between project teachers and project management should serve to enhance functions and the operational design of the project.

- Careful and thoughtful consideration must be given to the notion of restructuring this product in the future. In preparing for future project with the proposed objectives. The planning for this reconcilation should be completed well in advance of proposal submission.

APPENDIX A

SCHOOL-CAI MATH PROGRAMS

ALBERT B. HART

AUDUBON

FRANKLIN D. ROOSEVELT

HARRY E. DAVIS

JOSEPH GALLAGHER

NATHAN HALE

NEWTON D. BAKER

PARTICK HENRY

ROBERT JAMISON

WHITNEY YOUNG

WILLSON

COLLINWOOD

EAST HIGH

JANE ADDAMS

LINCOLN-WEST

GLANVILLE

WEAT TECHNICAL

JOHN MARSHALL

MAX S. HAYES

JOHN HAY

APPENDIX B

Table 2
Project Inservice Activities

DATE	SCHOOL	ACTIVITY
09-13-82	West Tech	Teacher Conference
09-15-82	Patrick Henry	Teacher Conference
09-28-82	Patrick Henry	Teacher Conference
10-01-82	West Tech	Teacher Conference
10-06-82	Whitney Young	Teacher Conference (preservice)
10-07-82	Willson	Teacher Conference (preservice)
10-18-82	F. D. Roosevelt	Teacher Conference (preservice)
10-19-82	East High	Teacher conference
10-19-82	Nathan Hale	Teacher Conference (preservice)
10-20-82	Joseph Gallagher	Teacher Conference
10-21-82	West Tech	Teacher Conference
10-21-82	Lincoln-West	Teacher Conference
10-28-82	Collinwood	Teacher Conference
10-28-82	Lincoln-West	Teacher Conference
11-02-82	Willson	Teacher Conference
11-03-82	F. D. Roosevelt	Teacher Conference
11-03-82	Robert Jamison	Teacher Conference
11-04-82	Robert Jamison	Teacher Conference
11-17-82	John Marshall	Teacher Conference (preservice)
11-23-82	John Marshall	Teacher Conference (preservice)
11-29-82	All Project Schools	Project Meeting (all teachers)
01-03-83	Nathan Hale	Teacher Conference
01-24-83	All Project Schools	Project Meeting (all teachers)
01-25-83	Patrick Henry	Teacher Conference
01-27-83	John Marshall	Teacher Conference
01-28-83	John Marshall	Teacher Conference
01-31-83	Patrick Henry	Teacher Conference
02-01-83	Newton Baker	Teacher Conference
02-02-83	Nathan Hale	Teacher Conference
02-07-83	Nathan Hale	Teacher Conference
02-08-83	Willson	Teacher Conference
02-14-83	Nathan Hale	Teacher Conference
02-16-83	West Technical	Teacher Conference
02-22-83	Franklin D. Roosevelt	Teacher Conference
03-10-83	Patrick Henry	Teacher Conference
03-29-83	Robert H. Jamison	Teacher Conference

I. PRIME AND COMPOSITE NUMBERS

II. PROGRAM

```
10  PRINT "(CLS)"
20  PRINT "THIS PROGRAM WILL IDENTIFY PRIME AND COMPOSITE
    NUMBERS"
30  PRINT: INPUT "WHAT IS YOUR NUMBER";N:PRINT
40  IF N   = 1 THEN PRINT N;" IS NEITHER PRIME NOR
    COMPOSITE": GO TO  30
50  IF N = 2 THEN 90
60  FOR X = 2 TO SQR(N)
70  IF N = INT(N/X)*X THEN 100
80  NEXT X
90  PRINT N;" IS PRIME"
95  GO TO 30
100 PRINT N;" IS COMPOSITE": GO TO 30
```

III. Run Your Program

Enter the following numbers: Are they prime or composite?

1. 2 _____
2. 4 _____
3. 6 _____
4. Any multiple of 2 _____
5. 3 _____
6. Any multiple of 3 _____
7. 5 _____
8. Any multiple of 5 _____
9. 0 _____

IV. EXPLORATION

1. What is the greatest two digit prime number_____
2. What is the smallest composite number_____
3. What is the only even prime number_____
4. What two primes are between 80 - 90_____
5. Explain line 40_____

_____

V. JUST FOR FUN

1. Change the following lines in your program (run your program)

```
30 FOR N = 50 TO 100
95 (RETURN)
100 NEXT N
```

2. What are the prime numbers brtween 50 - 100_____
3. Twin primes are prime numbers that diff er by two,(ie. 41 and 43) Find all twin primes between 50 - 100_____

4. Change the above program to find all primes between 100 - 200_____

5. List all the primes between 100 - 200_____

_____

VI. VOCABULARY

1.

2.

3.

4.

5.

Cleveland Public Schools

1983 DPPF Program Review

COMPUTER ASSISTED INSTRUCTION

CAI PROJECT Teacher Survey

Please Check One (or both if applicable)

MATH CHAIRPERSON ☐ CAI PROJECT TEACHER ☐

PLEASE INDICATE YOUR RESPONSE TO ALL ITEMS

1. Among those students who have utilized the micro-computer on a weekly basis (at least 25 occasions per year), have 75% or more demonstrated a significant increase in basic mathematics computational skills?

   Yes ☐ No ☐ Don't know ☐

2. Has the instruction and practice in the use of the computer been incorporated as a part of the regular mathematics program?

   Yes ☐ No ☐ Don't know ☐

3. What has been the primary mode of computer utilization in your class(es) this year?

   ☐ Class demonstration (monitor)
   ☐ Drill and practice
   ☐ Other (Specify) _____

PROJECT TEACHERS ONLY:

4. Indicate the extent to which you have scheduled, monitored, and RECORDED the frequency and length of individual student involvement in project activities.

   Always ☐ Sometimes ☐ Never ☐

5. Please use the space below (and the back) to recommend operational changes which you feel would improve the project.

NOTE: COMPLETE AND RETURN THIS SURVEY TO JIM LANESE, ROOM 600-S, ADMINISTRATION BUILDING