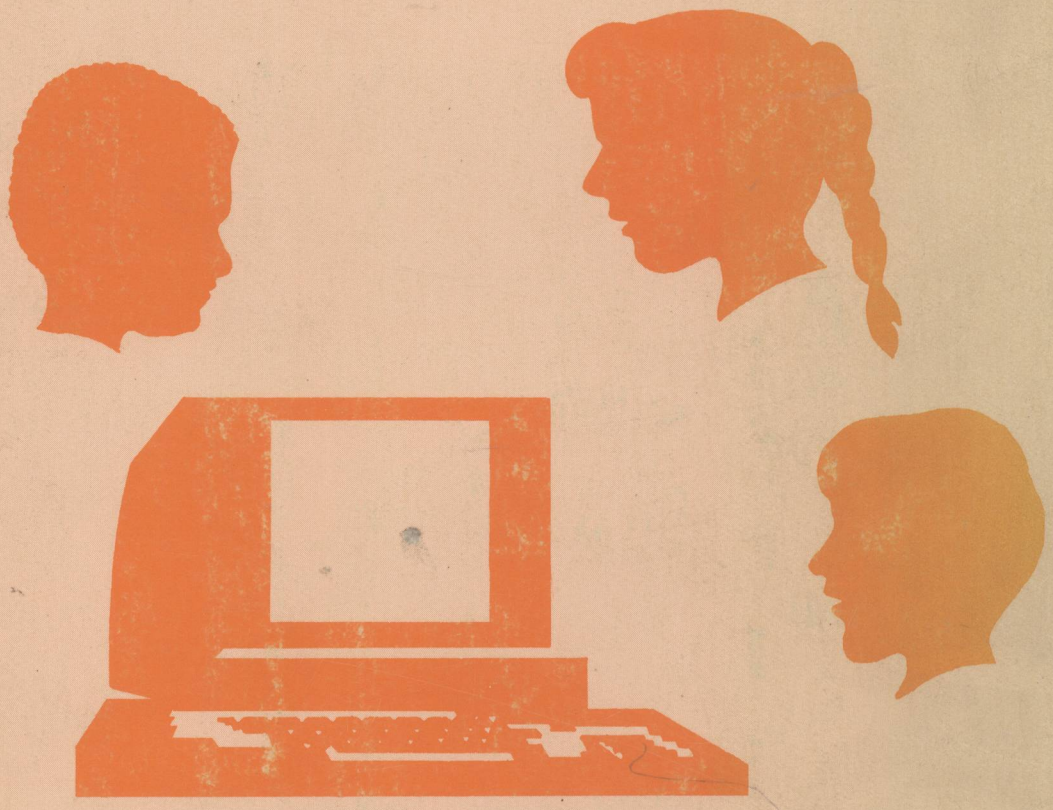
First Annual

Conference Proceedings

Microcomputers in K-12 Education

Pierre Barrette, Editor



Computer Science Press

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Southern Illinois University

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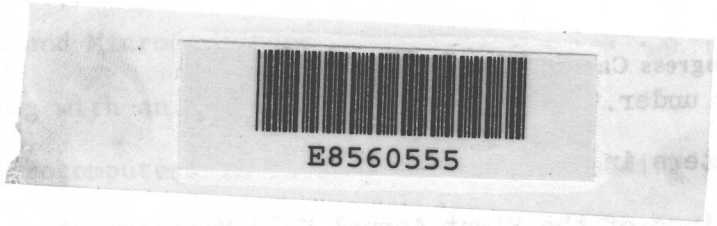

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Microcomputers in K-12 Education

OTHER BOOKS OF INTEREST

S.I. Ahmad and K.T. Fung
Introduction to Computer Design and Implementation

Wayne Amsbury
Structured Basic and Beyond

Pierre Barrette, Editor
Microcomputers in K-12 Education

M. Carberry, H. Khalil, J. Leathrum, and L. Levy
Foundations of Computer Science

Erik L. Dagless and David Aspinall
Introduction to Microcomputers

William Findlay and David Watt
Pascal: An Introduction to Methodical Programming, Second Edition

Rachelle Heller and C. Dianne Martin
Bits 'n Bytes About Computing: A Computer Literacy Primer

Harold Lawson
Understanding Computer Systems

David Levy
Chess and Computers

David Levy and Monroe Newborn
More Chess and Computers: The Microcomputer Revolution and the Challenge Match

Tom Logsdon
Computers and Social Controversy

Ira Pohl and Alan Shaw
The Nature of Computation: An Introduction to Computer Science

James J. McGregor and Alan H. Watt
Simple Pascal

Gerald N. Pitts and Barry L. Bateman
Essentials of COBOL Programming: A Structured Approach

Donald D. Spencer
Computers in Number Theory

Ivan Tomek
Introduction to Computer Organization

Preface

Many people do not take the time to read the preface of a publication before examining the table of contents or reading an area of interest. I hope this preface may be an exception. The reason for this desire is simple. The preface describes the brief history of individual and collective efforts to share current and emerging effects of new technologies upon K-12 education. It suggests a model that can be replicated in other places. The history of this model follows together with the names of the persons involved in the process and the philosophy underlying the Conference.

HISTORY

The first annual K-12 Microcomputers in Education Conference was conceived in the fall of 1978 at the College of Education, Southern Illinois University at Carbondale. I had newly arrived as a faculty member in the Department of Curriculum, Instruction and Media. A written proposal was submitted through the department to the college to support the purchase of several microcomputer systems, computer terminals, and other hardware. After a period of time the proposal was completely funded by the College of Education. In the summer of 1979 the University also supported a mini-sabbatical for me to design and develop selected materials to be implemented with the hardware.

During the fall of 1979 and spring of 1980 several opportunities presented themselves for me to meet with members of the Illinois State Board of Education and the Southern Illinois Educational Service Center located in Marion, Illinois. Members of the Illinois State Board of Education included Mrs. Willadene Brown and Mr. Mont Davis. Mr. Larry Goldsmith is director of the Southern Illinois Educational Service Center, an organization representing and serving 27 counties.

Among other matters, we tried in these meetings to understand important issues facing Illinois public schools. During these discussions the question was returned to me. "What do you think are important issues that face our schools?" As distilled, the responses offered were associated with the probable impact that microcomputer technologies would have on public education generally and our Illinois schools in particular, regardless of their local or

other organizational patterns, enrollment changes, financial changes or financial support, or the current instructional or management practices they employ.

After several meetings I offered the suggestion that it might be appropriate to consider organizing a conference during the spring of 1981 to bring educators together and provide them with opportunities to focus upon these and other related issues.

The response was positive. However, how could we organize a conference on the basis of what likely would occur, since it hadn't yet occurred? Would people consider it viable? Where would the physical location of such a conference be? Were there enough individuals who would want to attend? Would the interest level be high enough for people to even come? Who would be the presenters and keynote speakers? Would school administrators encourage staff to attend? What were we to do about a budget that did not even exist to sustain advance announcement expenses? These and many other questions surfaced once the decision was made to go ahead with the first conference. There was less than six months from initial decision time to the conference date.

A coordinating committee of Mrs. Brown, Mr. Davis, Mr. Goldsmith and myself was formed. It was deemed important to further involve interested or partially interested persons by forming a larger advisory committee. Several meetings of the advisory committee were held and members were asked for their suggestions for the Conference as well as to search for individuals who could serve as presenters. The committee's efforts proved very successful. Each committee member was able to locate persons who were actually using microcomputer systems for instruction or management. A list of possible presenters was prepared. From that list and from other sources the presenters were invited.

The College of Education at Southern Illinois University made available their entire physical facilities for the two-day conference. In addition, the college agreed to sponsor one of the keynote speakers. The second keynote speaker was sponsored by the Southern Illinois Educational Services Center. Southern Illinois University, through its Graduate School and Continuing Education Division, authorized the offering of a one-credit course through the Department of Curriculum, Instruction and Media. The University's security service made available free parking for all participants. The Vocational Center of the Carbondale high school district arranged for printing the conference brochure.

Mr. Richard Haney, Assistant Superintendent for the Illinois State Board of Education office in Mt. Vernon, Illinois, totally supported staff time reallocation for the con-

ference. This commitment was further enhanced and embraced by the close working relationship between Illinois State Board of Education and their local office in the College of Education.

Mr. Larry Goldsmith, director of the Southern Illinois Educational Service Center, led the effort to provide staff and other support.

Mrs. Willadene Brown coordinated the efforts to arrange presenters from various locations. Written materials were requested for each presentation to appear in the Conference Proceedings. Southern Illinois University at Carbondale, through the College of Education, volunteered the use of its mainframe computers and advanced word processing program (University of Waterloo SCRIPT) in the preparation of the Proceedings.

The conference was held. An original estimate of 200 participants was overshadowed by the more than 450 final registration. Outstanding conference evaluations clearly reflected the work of each and every person who volunteered time and effort.

PREPARATION OF PROCEEDINGS

There were no restrictions as to content or length of the materials submitted for the Proceedings. Presenters were encouraged to describe what they were doing with microcomputers and what effects their applications had had in any instructional or management area. The emphasis was on practical application experiences.

The written presentations were keyed most efficiently into separate microcomputer Pascal text files by Mrs. Janice Fisher, an office volunteer from the Educational Service Center. The collection of Pascal text files was then uploaded into the University's mainframe system by Mr. William Morey, a volunteer from the Office of International Education, using his personal computer and an uploading program he had developed. Draft copies of the uploaded text files were then generated. A graduate student volunteer then in the College of Education's program in Business Education, Miss Anne Hill, began the time-consuming process of inputting and redefining the appropriate SCRIPT controls to set up our output format. This writer received and edited numerous draft copies of each of the presentations for consistency and intent. In order to make the Proceedings more useful to participants and others, the writer decided to build and include an index of keywords, key phrases and names. (Most proceedings do not include such an index.) This index was generated by the University's Waterloo SCRIPT

program. Miss Hill greatly assisted, spending numerous hours entering edited draft changes and also offering and making technical writing recommendations so as to further clarify the intent of each of the presentations. Her willingness to volunteer her time and expertise, even though she had not attended the conference, is noted in every page of this document that was electronically generated. Without her personal assistance, the preparation of these Proceedings would not have been possible.

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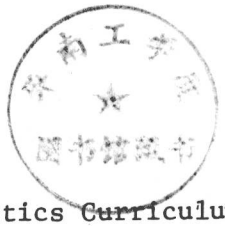

Using a Microcomputer in a High School Mathematics Curriculum

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Fairfield Community High School, located in Fairfield, Illinois, has an enrollment of approximately 625 ninth through twelfth grade students. Since we have exceptional vocational and college preparatory curricula, a decision was made in 1980 to expand each with the purchase of microcomputers for student use. The funds for the purchase were from regular school funds and not dependent on a grant.

After much study and deliberation, the Radio Shack TRS-80 Model I Level II 16K microcomputer was chosen because it seemed to best meet our needs, to accommodate a large number of students and keep the cost low. We were able to purchase eleven microcomputers and place them together in a room to create a laboratory atmosphere. All eleven are equipped equally with the exception of one, which has an additional 16K memory via an expansion interface, two disk drives, a printer, and a modern system desk.

With the aid of many periodicals and books, an instructional unit in programming in BASIC has been devised. Students enrolled in the business data processing class and those in the gifted mathematics program will learn programming.

In the gifted mathematics classes, the instruction of the BASIC programming unit occurs during the ninth grade. In the following years, the computer is used to supplement and enrich the existing curriculum. As each student advances from elementary algebra through differential and integral calculus, the microcomputer is utilized by programming exercises on the current topic.

Students love to play computer games of logic, including chess, mancala, subchase, and mazes. The regular class period does not allow time for such activities so the computer lab is available during the lunch hour to allow students to involve themselves with problem

solving activities or independent projects.

An adult computer programming class is offered through Frontier Community College, also in Fairfield. Frontier, a fully accredited institution with over 4000 students, is part of the Illinois Eastern Community College system. The students are adults who work full-time during the day and because of their interest in computer programming enroll in this class, which meets from 6:30-10:00 PM one night a week for eleven weeks.

Both high school students and adults have benefited from the introduction of microcomputers to the Fairfield High School curriculum. Expansion of this usefulness into other curriculum areas is expected in the future. When one examines the pros and cons of using the microcomputer in education, it is easily seen that the benefits far outnumber the drawbacks.

COMPUTER LABORATORY INVENTORY

11	TRS-80 microcomputer, Level II 16K 26-1056
11	Dual-section TRS-80 Power Line Filter 26-1451
1	Expansion Interface with 16 K RAM 26-1141
2	Mini-disk Drives
1	TRS-80 System Desk 26-1301
1	Quick Printer 26-1153
1	Mod 1 Printer Cable 26-1401
1	Set of Student Manuals and Teachers Book 26-2151
11	Dust Covers 26-501
1	TRS-80 System Carrying Case Set 26-500
1	BASIC Course in Level II on cassette PtI and PtII 26-2005 and 26-2006
1	Line printer VI 22-1166, cover 26-507, Ribbon 26-1418
1	Yearly Subscription to each of the following magazines: 80 Microcomputing Creative Computing Computers and People Computronics Classroom Computer News
1	Set Posters
misc	Games on cassette
misc	Books
misc	Cassette packages including: College Board Review Gambiet '80 Advanced Graphics Text Processing Ecology Simulations Checking Account
misc	Supplies: blank cassettes, blank diskettes, printer paper, disk storage box

OBJECTIVES

Upon completion of the unit in basic programming, the students will be able to:

1. Follow an algorithm in flowchart form and give the output.
2. Use the four basic flowchart symbols in proper order to produce a desired algorithm.
3. Design a flowchart to solve a given problem.
4. Identify the basic components of the TRS-80 and relate them to the

block diagram of a general purpose computer.

5. Explain the meaning of the following key terms: BASIC, BIT, BYTE, K, RAM, ROM.

6. Enter and run a BASIC program.

7. Explain what is needed to communicate with the microprocessor.

8. Explain the purpose and use of the following BASIC statements: PRINT, LET, REM.

9. Explain the purpose and use of the following BASIC commands: RUN, LIST, NEW.

10. List the names of the three parts of a line of BASIC programming.

11. Explain how to use BASIC to add, subtract, multiply, and divide.

12. Explain the order of operations in BASIC, according to the M.D.A.S. rule.

13. Describe how the computer follows the program.

14. List the steps to follow in developing a computer program.

15. Use the tape recorder as an input/output device for the TRS-80.

16. Explain the functions of and give examples of the basic statements GOTO and IF-THEN.

17. Write programs using unconditional and conditional branching.

18. Explain what looping means.

19. State the purpose of the FOR-NEXT-STEP statement and illustrate its use.

20. Explain the INPUT statement, including its use with two types of variables.

21. Explain the use of and write programs with the four statements used in graphics: SET, RESET, POINT, CLS.

22. Explain the use of and write programs with two additional PRINT statements.

23. Explain the system used for selecting any point on the entire screen.

24. Create graphics on the TRS-80 video display.

25. Explain the use of the READ-DATA statement pair.

26. List and explain four rules concerning the use of the READ-DATA statement pair.

27. Explain how the READ-DATA statement pair can be used with the FOR-NEXT statement.

28. Explain the general purposes of the GOSUB-RETURN and ON-GOSUB-RETURN statements.

29. Trace the execution of programs which use these two statements.

30. Write programs using these statements to make the programs more efficient.

31. Define the following terms: numeric array, dimension, matrix.

32. Explain the main purpose for using numeric arrays.

33. Create one and two dimensional numeric arrays.

34. Develop, enter, and run programs using numeric arrays.

PROGRAMMING IDEAS FOR USE IN THE MATHEMATICS CURRICULUM

Write a computer program in BASIC to:

A) Algebra I

1. Print values of x^n where $1 \leq x \leq 10$ and $1 \leq n=5$ (whole numbers).
2. Find all factors of a given number.
3. Find all prime numbers less than 100.
4. Read the coordinates of a point and tell if it satisfies YLAX+b.
5. Solve equations of the form AX+B=C.
6. Test the distributive property.
7. Compute the distance between two points.
8. Find what percent x is of y.
9. Find arithmetic mean and geometric mean of numbers.

B) Algebra II

1. Solve 3 equations in 3 variables.
2. Solve 3 equations in 3 variables in matrix form.
3. Factor trinomials.
4. Find roots of equations of the form $ax^2+bx+c=0$.
5. Read A for $Y=AX^2$ and print the parabola's focus, directrix, vertex, and line of symmetry.
6. Read A,B,C,D and find the sum and product of the complex numbers (A+Bi) and (C+Di).
7. Do synthetic division of degree 5 or less by X+K.
8. Produce a specified number of terms of a geometric or arithmetic sequence.
9. Evaluate the discriminant.

C) Geometry

1. Compute slope of a line given 2 points on the line.
2. Read the slope and a point of a line and print the equation.
3. Read slope and constant terms of two lines and tell whether the lines are parallel, intersecting, or coinciding. If intersecting, tell where.
4. Solve for a missing side of a right triangle.
5. Find sum of the interior angles of a polygon given the number of sides
6. Input the radius of a sphere and calculate the volume.
7. Find the volume of a pyramid.
8. Use Heron's Theorem to compute the area of a triangle.

D) Trigonometry

1. Find the measure of the 3rd angle of a triangle and the 2 remaining sides if 2 angles and a side are given.
2. Convert degrees to radians.
3. Produce a table of trigonemetric functions.
4. Input radius and rpm and produce linear velocity.

E) Probability and Statistics

1. Print the values of 1! to 20!
2. Evaluate P(n,r) and C(n,r).

3. Find mean and standard deviation.

4. Calculate the probability of 2 people in a room of N people having the same first initial.

5. Compute expected value of a random variable.

F) Analytic Geometry and Calculus

1. Compute and print the norm of a vector.

2. Add and find inner product of two vectors.

3. Convert coordinates to polar form.

4. Compute upper and lower sums to compute area under a curve.

5. Compute the derivative of a given polynomial function.

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Microcomputers: A+ in Business Education

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I am very happy to share my experiences working with microcomputers in business education. The microcomputer can be a terrific motivator for both the teacher and the students. At Centralia High School, the number of data processing classes increased from two to five this year with the introduction of just one TRS-80 microcomputer. Enrollment for the 1981-82 school year indicates doubling the present enrollment.

At the present time, CHS has one Model III 16K and three Model I Level II 16K microcomputers; all use cassette recorder input. Loading programs from cassette tapes has been fairly successful, although the time involved in loading tapes could be better used. We hope to upgrade at least one station to disk and add a network system. Although our equipment has been extremely reliable, we do maintain service contracts with Radio Shack.

The heaviest use of the microcomputers is in our Introduction to Data Processing classes. The Clerical Office Practice class and Advanced Accounting class also complete assignments on the TRS-80's. As a result of a study completed in spring 1980, and in response to student requests, an Advanced Data Processing class will be added to the 1981-82 curriculum. This new class will use the microcomputers extensively.

DATA PROCESSING

The goals of Centralia High School's Introduction to Data Processing are threefold: 1) promote computer literacy, 2) develop skill in operating a microcomputer, and 3) develop skill in writing BASIC programs. (Appendix A contains the course outline.)

The textbook and workbook, Introduction to Computers and Data Processing, from Anaheim Publishing Company, is used