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ABSTRACT

A study examined the extent to which microcomputers are being used by industrial technology teachers in Idaho public junior and senior high schools. The express purpose of the study was to develop an information base upon which teacher educators and administrators could design pre- and inservice teacher education curricula. The survey questionnaire was mailed to 209 industrial technology teachers throughout the state. A total of 128 (61 percent) were eventually returned. The teachers reported using a total of 257 computers, with plans to purchase an additional 117 in the near future. Most of the computers now used belong to the Apple family, and most of those surveyed plan to continue using the brand. Most computers were located in a computer or industrial technology lab. Other locations included the main office, library, drawing room, chemistry lab, composition lab, typing room, or math and science rooms. The areas of drafting and graphic arts had the most software available. Robotics, construction/woodworking, and manufacturing were the areas in which the greatest desire for software was expressed. Funding and availability of hardware were identified as the greatest barriers to infusing computer instruction into industrial technology programs. It was concluded that teachers would benefit most from workshops covering basic computer literacy and computer use skills, criteria for selecting computers for an industrial technology program, use of available software and authoring systems to develop customized courseware, and special applications related to industrial technology (including robotics and computer-aided design and manufacturing). (MN)

A Study of the Status of Computer Usage in Industrial Technology Programs in Idaho J.H. and Secondary Schools

Paper Present at the
Annual Conference of the Idaho Vocational Association,
August 3-6, 1987

Boise, Idaho

by

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INTRODUCTION

Need for the Study

Computers are among the most innovative technologies to affect society in the 20th century. This can also be said for their effect on education because in the coming decade, computers will provide opportunities for student learning and institutional management in ways that cannot be imagined at the present time (O'Banion, 1987).

The current group of students will soon take their place in our technological society and, as such, computer literacy will become a high expectation for all of them (Cepica, et al, 1985). This is especially true for students of technology because they will be expected to operate or monitor the operation of high tech equipment most of which is controlled by computers.

When personal computers were introduced eight years ago, educators were among the first to realize their potential. Since then in-school uses and features have multiplied (O'Banion, 1987). Industrial technology educators have been on the cutting edge of microcomputer use by integrating them into all areas of study. The computer currently enjoys widespread use in technology education in such areas as computer aided drafting and design, computer aided

manufacturing, computer numerical control, robotics, computer graphics and telecommunications to cite only a few.

With the developing pre-eminence of the computer in new technology as noted above and the fact that technology is our discipline, we should be the leaders in the use of computers both as the means of instruction and as content to teach. The potential for the use of microcomputers in the actual teaching-learning process in technology education seems virtually boundless (LaPorte, 1982).

Industrial technology educators in the State of Idaho are very aware of the necessity to integrate computer technology into their curriculum. Many, in fact, have and more continue to do so each year. However, no concerted effort has been made to determine the extent that these educators have made use of the computer, their in-service training needs or the status of existing hardware and software.

In the last few years several studies (Clayton, 1980; Tucher; 1981 and Kaufman, 1982) have been conducted in the State dealing with computer use in the public schools. However, none of these have included the field of industrial technology and to date the status of microcomputer use by these teachers is not known.

This study was designed to fill that void and to supply teacher educators and administrators with the necessary

information upon which to design preservice and in-service curricula. The information reported will serve as a base from which meaningful decisions can be made and upon which futures studies can build upon.

Purpose and Objectives of the Study

The purpose of this study was to determine the status of microcomputer use by industrial technology teachers in Idaho public schools. All junior and senior high school teachers were mailed a research questionnaire.

The following questions served as a bases for the conduct of the study.

1. How many and what kind of micros are currently available for use in the industrial technology program?

2. How many and what kind of micros are planned for this specific use in the future?

3. What kind of software is in use and what kind is desired for the future?

4. What kind of microcomputer in-service training is needed?

5. What is the general use of computers in industrial technology programs?

METHODS AND PROCEDURES

Overview of the Study

This project was conducted in two phases. The first phase involved a brief review of literature, development of and pilot testing of the questionnaire. The second phase included the mailing of the questionnaire, collection, analysis and reporting of the data.

Population and Survey Instrument

The population for the study included all junior and senior high school industrial technology teachers in Idaho. Teachers were mailed a copy of the questionnaire and a cover letter explaining the nature of the study. All were asked to return the completed instrument two weeks after it was mailed. Those teachers not returning the instrument were mailed a second one approximately two week after the first mailing.

Data Collection and Analysis

All data was collected by questionnaire (See appendix) utilizing a variety of reporting formats. Fill-in information was requested in Parts I and III with Part II

requiring the selection of a number on a Likert-type scale. All data was compiled and reported in tabular format.

The analysis of data included the computation of a percentage score reported for each entry. A listing of all fill-in information was tabulated and reported as received.

A discussion of all data based on tabulated information is reported in the next section. Based on this, recommendations are presented and complete the research study.

PART I - PRESENTATION AND DISCUSSION OF THE DATA

Demographic Information

A total of 209 industrial technology teachers were mailed the first round of questionnaires. Of those mailed 90 (44%) were returned. Approximately two weeks later a second round was mailed with 38 (18%) returned. Total quetionnaires returned numbered 128 or (61%) representing approximately two-thirds of the teachers.

A frequency distribution of teachers responding to the questionnaire is illustrated in Table 1.

TABLE 1

Frequency Distribution of Teachers Responding to the Survey Instrument

	N	Round #1	Round #2	Total
Teachers	209	90 (44%)	38 (18%)	128 (61%)

The total number of districts included in the survey was 107. Of that number 61 (57%) returned the questionnaire.

TABLE 1A

Responding Districts

Total # of Districts in State	# of Districts Responding
107	61 (57%)

Present Status of Micorcomputers in IT Program

1. Inventory

This section of the study determined what kinds of microcomputers, by brand name, were in use, how many of each and the number planned for purchase in the following year. Brand names were grouped into families, i.e. IBM family, Apple family etc. for easy of data reporting.

The total number of computers reported in use by industrial technology teachers was 257 with 117 planned for the near future. It appears that there will be over a 50% increase in the use of micros in the next year if teachers are allowed to purchase the equipment desired.

Table 2 shows the results of the data compilation with the bulk of computers in use belonging to the Apple family. The data suggested a strong trend for teachers to remain with this brand name of computer perhaps because of cost, support and a large amount of educational software available for this brand.

Table 2

Status of Microcomputers Currently in Use in IT Programs

Type of Micro Computer	Number of Existing Micros	Number Planned for Next Year
Apple II family or other compatible	151 (59%)	44 (38%)
Apple LISA or Macintosh family	23 (9%)	37 (32%)
Commodore family	37 (14%)	9 (8%)
IBM family incl, PC, XT, PC Jr., or compatibles	26 (10%)	24 (20%)
Radio Shack type	7 (3%)	3 (2%)
Other brands	13 (5%)	0 (0%)

The data further suggested that teachers are looking at the IBM family of micros with an eye towards the future. The percentage of micros planned is not large but there is a trend for growth in this area.

The data reported suggests that teachers are indeed interested in integrating computers into the study of industrial technology. This should prove a healthy sign as the field moves from traditional industrial arts to the study of high technology and its reliance on computers.

2. Computer Location

In quering the teachers about a specific location for housing computers, most indicated either a designated room as a computer lab or the industrial technology lab. Presumably, some teachers understood the questions to be the same, i.e. those checking a designated lab intended this to also mean the lab was in the industrial technology facility.

Table 3 shows a partial listing of computer locations.

TABLE 3

Location of Computers

Location	Number
A Designated Room as a Computer Lab	34 (29%)
Transported from Room to Room as a Mobile Unit	11 (9%)
Faculty Office	11 (9%)
Industrial Tech. Lab	33 (27%)
Other Area	32 (26%)

Among the other areas reported were such places as; the main office, library, drawing room, chemistry lab, composition lab, typing room, math and science rooms.

The data suggested that approximately 75% of the computers were housed in a facility directly accessable to the industrial technology teachers. In some cases, such as where the computers were located in math and science rooms, the opportunity for interaction among technology students

and their counterparts in other areas would be facilitated.

3. Computer Software

In this portion of the survey, teachers were asked which area(s) of software were available to them or that they would have liked to have access too. The respondents were given a listing of areas and asked to check software which was available and that which they desired.

Table 4 graphically illustrates computer software which was available for teacher use. Also shown is software which teachers indicated they would like to have for use in the classroom or lab.

TABLE 4

Computer Software

Subject Area	Available	Like to Have
Drafting/CAD	48 (38%)	42 (33%)
Manufacturing/CAM	2 (2%)	48 (38%)
Graphic Arts	21 (16%)	35 (27%)
Construction	8 (6%)	51 (40%)
Woodworking	9 (7%)	53 (41%)
Metals	4 (3%)	37 (29%)
Robotics	4 (3%)	54 (42%)
Others	____	17 (13%)

The areas of drafting and graphic arts emerged as having the most software available. This suggests that since CAD software has been available for some time it was also one of the first areas where computers were utilized by teachers to enhance instruction

In terms of desired software, almost all areas were indicated with robotics, construction/woodworking and manufacturing being in high demand. Also in demand, was the

area of drafting/CAD but not as high as the others possibly because this was one of the first areas to utilize computer software and a great deal of it is available and in use by teachers as noted above.

4. Software Programs Currently in Use

Teachers were asked to list the computer programs they used in order of most frequently used. Again, as indicated in the previous section, CAD and graphic arts progroms were mentioned the most frequently. Table 5 shows a listing of programs reported.

TABLE 5

Software Programs Currently in Use

Program Name	# of Times Listed by Teachers
Print Shop	15
CADD Draw	10
MATCCAD	8
AutoCad	5
Word Star	1
AutoSketch	1
Grade Manager	1
Ace Writer	1
Word Perfect	1
Super Writer	1
Super Calc 3	1
Wood Shop Safety	1
RoboCaD	1
CNC-Radio Shack	1

The trend seen from this data is that teachers are interested in a mix of software applications. Clearly, the

preference is for technical applications but wordprocessing seems to also be of strong interest.

This item was not answered by many of the teachers so an exhaustive listing of software is not available. Many of the respondents did not seem to know the difference between a program name and the publisher so a duplication of data occured in some cases.

PART II - NEEDS IN TRAINING AND EQUIPMENT

This section of the survey dealt with those items that teachers felt were important in terms of inservice and computer hardware needs. Specifically, teachers were asked to identify the factors they felt significantly limited the extent to which they were able to introduce computer instruction.

A Likert-type scale was used to collect the data and is reported graphically in Table 6.

TABLE 6

Training Needs and Equipment

Inservice/Equip.	Least Significant 1	2	3	4	Most Significant 5
Availability of Equipment	9(8%)	7(5%)	13(12%)	14(13%)	62(59%)
Availability of Proper Software	11(10%)	9(8%)	21(20%)	17(16%)	38(36%)
Lack of Inservice Training	13(12%)	13(12%)	25(24%)	18(17%)	30(29%)
Lack of Printed Instructions	15(14%)	21(20%)	25(24%)	11(10%)	21(20%)
Computer Background	21(20%)	12(11%)	22(21%)	17(16%)	24(23%)
Funding	4(4%)	2(2%)	6(6%)	10(9%)	79(75%)

The above data shows that the factors most significantly

limiting the extent to which instructors are able to introduce computer instruction were funding and availability of equipment. The lack of available or applicable software was also a limiting factor.

PART III - GENERAL USE OF COMPUTERS

This section was concerned with information regarding the use of computers. Teachers were asked to respond to questions regarding subject area utilization of the computer, how students were introduced to computers and whether there were sufficient numbers of computers.

1. Computer Instruction as Part of a Subject Area

The first question asked teachers if computer instruction was offered as part of a subject area in the industrial technology program. Of those reporting, 68 (59%) said it was not and 47 (41%) said it was.

The question also asked teachers to identify the subject area in which computers were utilized. Almost all areas were cited with most being used in either drafting or construction technology. A comprehensive listing is illustrated in Table 7.

TABLE 7

Subject Areas Which Utilize Computers

Drafting - CAD	Math
Construction Technology	Ag Records
Communications	Woods
Graphic Arts	Metal Fabrication
General Industrial Arts	Robotics
Electronics	CNC

2. Introduction of the Computer to Students

This questionnaire item asked teachers to indicate the manner in which their students were introduced to the computer. Table 8 shows a description of responses.

TABLE 8

Introduction of Computer to Students

Method of Introduction	# of Teacher Responses
Part of the Course Work	37 (30%)
Individualized Work	30 (25%)
Brief Demonstration by the Instructor	22 (18%)
Academic Program	16 (13%)
Other	17 (14%)

Most teachers elected to introduce students to computers by either integrating them into existing course work or individualized work assignments. As can also be seen, computers were used in brief demonstrations by teachers

3. Availability of Computers for Instruction

A final survey item was a question asking teachers if

their were sufficient numbers of computers available to meet the needs of students. Teacher response showed that only 19 (18%) believed there were enough computers and 86 (82%) said there was an insufficient number.

IMPLICATIONS OF THE STUDY

It is difficult to divide "implications" into separate sets of conclusions and recommendations related directly to the five purposes and objectives cited on page 3, as some are closely related. The authors, therefore, chose to group several together.

Question 1. How many and what kind of micros are currently available for use in the industrial technology programs (of Idaho)?

Question 2. How many and what kind of micros are planned for this specific use in the future?

There is little doubt that industrial technology teachers are aware, or are becoming aware, of the importance of computers for use in their classrooms and laboratories. This is indicated by the numbers of computers already in use, and the numbers indicating desire to obtain computers.

Many factors affect choice of computers purchased: recommendations of "experts", cost, available software, reputation, and service record, to name a few.

Some related facts are important in seeking to interpret the

findings of this study. First, the majority of computers reported (68 percent) are from the Apple family. Apple has long supported school use of computers. Cost has been low, and quality is high. Add-ons are reasonably priced. An immense catalog of software (much of which is inexpensive or in the public domain) is available. The newest version of the Apple II series of computers (the GS) continues to allow use of virtually all previously developed software while offering expanded or new features. There is little doubt that the ratio of value for money spent on Apple is high, and the company continues to focus on service to education.

The second greatest group of computers (IBM types) accounts for only 10 percent of those in use. Many of these, from our information, are purchased because of IBM's reputation in the business world. There has been little record of service to schools or of available software for educational use, although this is changing.

Availability of lesser-priced "clones" has helped schools acquire computers of the IBM type. There are also high-quality Apple clones now on the market. One should always consider the availability and cost of service when choosing a computer. Although reputable firms do supply service for most of the clones typically advertised, local service may not be readily available. Down time on educational computers can be critical.

High among considerations which should receive priority from individuals considering purchase of computers for technology edu-

cation is adaptability for multiple use. Industrial technology teachers use computers for the following:

* Computer-assisted instruction, tutoring, and remediation.
* Development of CAI programs using direct programming or authoring systems.
* Problem-solving and complex calculations.
* Word processing.
* Administrative use and record keeping.
* Dedicated application, such as CAD/CAM.
* Interfacing with technical/scientific equipment.
* Simulation.
* Testing and scoring.
* Filing of instructional materials.

Another consideration is the end purpose of computer use in instruction. Is the purpose to aid in teaching concepts of computer control and integration in a "high tech" and information society, to develop general computer literacy and confidence, to provide instructional support, or to provide specific skill training for job entry? These questions are vital in decisions to incorporate computers, in choosing a particular computer, and for justifying the cost.

One further consideration is availability of peer support in instructional applications of computers. Some states have developed industrial technology computer users' groups and clearinghouses for computer software. A national technology education information exchange (TYMNET) is available through a computer

modem. A clearinghouse for computer software is already in place at the University of Idaho, Oregon State University, and through ITEA. Various users' groups could be developed as interest develops. It certainly would be advantageous for CAD instructors to form such a group. Perhaps the same could be said for instructors of construction technology, transportation technology, robotics, and manufacturing technology teachers.

Question 3. What kind of software is in use, and what kind is desired in the future?

Question 4. What kind of computer inservice training is needed?

It is not surprising that applications of software and the titles of software reported reflects "off-the-shelf" use of commonly popular and/or highly advertised materials. Taken as a group, the list reflects a general lack of information as to what is available, and how it might be applied as an instructional tool. There is, clearly, a high level of interest, optimism, and frustration. Teachers, too, must develop confidence in using this new tool and familiarity with available materials. Off-the-shelf software is a good way to accomplish this. Some commonly available software--such as SCHOOLHOUSE GRADER, a public domain electronic grade book which will do the number crunching and issue class lists and report cards; ROBCAT, a robot control simulation; and SCIENCE EXPERIMENTER, a package which teaches interfacing--are good examples which can be directly applied. However, like borrowed lesson plans or learning packages, much

available software does not exactly "fit" an intended use.

Ideally, instructors could adapt what is available, or develop their own. In addition to being time-consuming, this requires some sophistication or programming ability by users. Time can be justified. It is necessary for all good planning, and once invested, usually results in less time and effort later. Programming ability is another matter. Although a course in basic programming can easily be justified, many teachers are intimidated by the prospect. It is possible to let the computer itself do the programming. This requires use of an "authoring" program, such as APPLE SUPERPILOT, which with only 20 simple commands can produce computer-aided instructional programs (CAI) complete with text, graphics, and sound. Many of the public domain programs available through the clearinghouse were written by technology teachers in professional workshops, using both simple programming and authoring systems.

A conclusion easily drawn is that industrial technology of Idaho could benefit by a series of short workshops covering the following:

* Basic computer literacy/familiarity and use skills.
* Selecting the "right" computer for the industrial technology program.
* Available software and its use in the industrial technology program.
* Developing your own CAI software, using an authoring system.

* Special computer applications:
  - CAD.
  - CAM.
  - ROBOTICS.
  - INTERFACING for technical and scientific applications.

It is known that some such workshops have been offered, and that some teachers have searched out these and other resources to gain such training. It is not likely that such programs will be brought directly to the door of every individual at a personally advantageous time. The need is great and increasing, and is worthy of some professional effort. Such workshops can be arranged, especially in response to requests from professional groups. The six state vocational schools would appear to be logical locations, accessible to most of Idaho's industrial technology teachers. Both the University of Idaho and Idaho State University would respond to such requests, as would personnel at the various vocational schools. Professional organizations often have among their own members persons who can contribute much if asked.

Question 5. What is the general use of computers in industrial technology programs?

It is safe to conclude that there is a sound case for support of greater use of computers in education, especially in industrial technology education. This is reflected by review of literature, the level of interest reflected by respondents, and reported uses already being made.

It is also safe to conclude that general use is not what it

should be . A number of arguments can be made in support of greater use. Computers are a key resource in the study of technology and its applications and, as such, belong in instructional programs for students of today and citizens of tomorrow. Computers can enhance and support instruction and, as such, belong in each teacher's classroom as a resource and teaching tool. Computers do have a great appeal for students and provide an excellent motivator, making instruction relevant for the world in which they live. Computer use is a necessary skill for work and learning, which students need now and in the future. Many students are more sophisticated in use of computers than are their instructors. Because of the close relationship of computers to technology, it is self-evident that there must be greater use in industrial technology classes and that instructors must become, at least, competent users.

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SURVEY OF THE PRESENT STATUS OF COMPUTER USAGE IN INDUSTRIAL ARTS EDUCATION PROGRAMS IN IDAHO J.H. & SECONDARY SCHOOLS

Respondent Information:

Name: _____

Telephone: _____

School Information:

School name _____

Location IDAHO District 61 (57%)

Number of students in IA program Low - 14, High - 600

I. PRESENT STATUS OF MICROCOMPUTERS IN IA PROGRAM

1. Inventory:

Type of microcomputer	No. of existing micros	Number planned for next year
APPLE II family or other compatible	151(59%)	44(38%)
APPLE LISA or MACINTOSH family	23(9%)	37(32%)
COMMODORE family	37(14%)	9(8%)
IBM family incl,PC, XT,PC jr, or compatibles	26(10%)	24(20%)
RADIO SHACK type	7(3%)	3(2%)
Other Brands	13(5%)	0(0%)
TOTAL	257	117

2. Computer location:

	Please check
A designated room as a computer lab	34(29%)
Transported from room to room as a mobile unit	11(9%)

Faculty office	11(9%)
Industrial Arts lab	33(27%)
Other area (Please specify)	32(26%)

3. Computer Software:

In which of the following areas is software available to you or that you would like to have access to:

Subject Area	Available	Like to have
Drafting/CAD	48(38%)	42(33%)
Manufacturing/CAM	2(2%)	48(38%)
Graphic Arts	21(16%)	35(27%)
Construction	8(6%)	51(40%)
Woodworking	9(7%)	53(41%)
Metals	4(3%)	37(29%)
Robotics	4(4%)	54(42%)
Others (Indicate)	---	17(13%)

4. Please list the programs currently being used by you in order of most frequently used.

	Program Name	Publisher (if known)
1.	Print Shop (15)	Grade Manager (1)
2.	CADDRAW (10)	Ace Writer (1)
3.	MATCCAD (8)	Word Perfect (1)
4.	AutoCaD (5)	Super Writer (1)
5.		Super Calc 3 (1)
6.	Word Star (1)	Wood Shop Safety
	Auto Sketch (1)	RoboCAD (1)
		CNC-Radio Shack (1)

II. NEEDS IN TRAINING AND EQUIPMENT

1. Which of the following factors do you feel significantly limits the extent to which you are able to introduce computer instruction in the IA program.
(Circle one number on each line)

	Least Significant				Most Significant
Availability of equipment (hardware)	1 (9)	2 (7)	3 (13)	4 (14)	5 (62)
Availability of proper software	1 (11)	2 (9)	3 (21)	4 (17)	5 (38)
Lack of in-service training	1 (13)	2 (13)	3 (25)	4 (18)	5 (30)
Lack of printed instruction	1 (15)	2 (21)	3 (25)	4 (11)	5 (21)
Computer background	1 (21)	2 (12)	3 (22)	4 (17)	5 (24)
Funding	1 (4)	2 (2)	3 (6)	4 (10)	5 (79)

III. GENERAL USE OF COMPUTERS

1. Is computer instruction offered as part of a subject area in your IA program.(i.e. wood technology, CAD, material processing, etc.)

YES 47 (41%)
NO 68 (59%)

If yes, identify the subject area _____

(See Data)

2. Through what manner are students introduced to the computer?

a. Part of the course work 37 (30%)
b. Individualized work 30 (25%)
c. Brief demonstration by the instructor 22 (18%)
d. Academic program 16 (13%)
e. Other (specify) 17 (14%)

3. Are there sufficient numbers of computers available to meet the needs of your students?

YES 19 (18%)
NO 86 (82%)

THANK YOU FOR YOUR COOPERATION