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AUTHOR Lambrecht, Judith J.
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ABSTRACT

Data were collected from Minnesota secondary and postsecondary business teachers regarding their instructional microcomputer applications and their attitudes about several instructional computing issues. Usable surveys were returned by 342 teachers in 236 schools. The predominant brand of computer at the secondary level was the Apple II; most postsecondary schools used both Apple II and IBM personal computers. High schools had an average of 19 computers for instructional use in the business department; postsecondary schools had an average of 35. The business microcomputer applications currently taught most frequently were word processing, accounting, BASIC programming, spreadsheet use, and database applications. Computers were infrequently used to teach content. The content areas most frequently taught using computers were accounting and keyboarding. Teachers infrequently used computers as a teaching management tool (word processing and spreadsheets). Less than half of responding teachers marked any area of instructional computing as one about which they needed more information; they were often those already using computers most. Teachers teaching with computers liked the experience. Areas of greater indecision were equity in access to computers by teachers and students, copying software for classroom use, and preparation of business teachers for using computers in instruction. (A copy of the survey instrument is appended.) (YLB)

INSTRUCTIONAL MICROCOMPUTER APPLICATIONS BY BUSINESS TEACHERS IN MINNESOTA

by

Judith J. Lambrecht
Professor, Business Education

January 1986

Division of Business and Marketing Education
Department of Vocational & Technical Education
University of Minnesota
St. Paul, Minnesota 55108

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INSTRUCTIONAL MICROCOMPUTER APPLICATIONS BY BUSINESS TEACHERS IN MINNESOTA

by
Judith J. Lambrecht
University of Minnesota

INTRODUCTION

This study collected data from Minnesota secondary and postsecondary business teachers regarding their instructional microcomputer applications and their attitudes about several instructional computing issues. Before examining the specific purposes and procedures of this Minnesota survey, the context of the questions asked in other similar national and regional studies is reviewed.

Several national, regional, and state-wide surveys have been conducted to determine how many computers have been acquired by the nation's schools, how these computers are being used, and how teachers feel about instructional computing opportunities. The number of computers in public schools has been estimated to range from 630 thousand (Education Turnkey Systems, Inc., 1985) to 828 thousand ("Status Report", 1985). Minnesota has been ranked number one in the nation according to the percentage of public schools using computers with a 1984 percentage of 98.3 compared to a U.S. average of 85 percent. The national percentage is a marked increase from 68.4 percent in 1983 ("Computer Use," 1985).

Becker's (1983, 1984) comprehensive survey of computer installations and uses showed that students at both the elementary and secondary levels have brief periods of access to computers which are not themselves very intensively used (11 or 13 hours out of 30-hour week). A national computer-student ratio of 63.5 to one in 1984 may account for infrequent student access (Smetanka, 1985).

Minnesota again is more favored with a computer-student ratio of 35.8 to one. Nationally, the average number of computers per building in public shools as of the fall of 1984 was 8.3 (InfoGraphics, 1985, p. 3F). The highest averages were reported to be 13.7 in Minnesota and 13.0 in Florida.

Programming instruction is the most prevalent computer activity in the secondary schools, and drill-and-practice has been the most often employed application of microcomputers at the elementary level. The Condition of Education, 1984 edition, confirms the prominence of programming and computer literacy at the secondary level and further shows that the second most common application is "tool applications/instruction," namely word processing, data base instruction and other laboratory opportunities. These latter applications have also been identified as a major component of business education, the subject area most likely to incorporate computer use after the subject areas of computer science and math (Education Turnkey Systems, Inc., 1985, p. 40).

The specific implementation of computers into business programs has been investigated by at least two researchers. Rauch (1985) surveyed business teachers in the nine-state Mountain-Plains Region of the National Business Education Association and identified the types of equipment used and the courses in which computing concepts were taught. Ninety-one percent of the 67 responding schools were using microcomputers. Primarily Apple II and TRS-80 computers were being used, and they being used most often in advanced accounting and office procedures courses. Most schools taught word processing, and one-quarter of the sample had a separate word processing class. Over one-third of the schools used microcomputers in typewriting courses, but keyboarding was not a frequent prerequisite for using a microcomputer.

An examination of teachers' attitudes regarding microcomputer use was included in Holder's (1984) survey of Nebraska business teachers. Her finding that teachers felt a need for more information about computer use paralleled Stevens' (1980, 1982) findings from a broader survey of K-12 Nebraska teachers. A need for continued in-service, computer-based education for business teachers has further been supported by Robinson's (1985) follow-up of participants in microcomputer workshops.

The instructional applications of computers differs so much by grade-level and content-field (Anderson & Smith, 1984) that data from teachers or schools in general is not as useful for program planning as data from specific teacher/student populations. It is necessary for business teacher-educators to know not only how microcomputers are used in business (i.e., Bartholome & Dockter, 1984; Lake, 1985), but also to know how far teachers have progressed in replicating major business applications in their classrooms. The specific needs of business teachers for further preparation may best be articulated by those who have already made efforts to use computers in their own classes. The present survey of Minnesota business teachers was intended to provide current descriptive information of this type.

PURPOSE

The purpose of this 1984-85 school-year survey was to obtain information about teaching activities and needs related to microcomputer use in business education programs in the State of Minnesota. This information is needed, first, to assist teacher-educators in preparing preservice teachers at both the secondary and postsecondary levels for teaching or taking advantage of the microcomputer applications currently underway in public schools. Second,

information about teachers' needs for further in-service instruction in using microcomputers will assist in developing (or continuing) special topics offerings in these areas. Thirdly, information about the type of computing equipment in use will affect any plans to upgrade and/or expand the computing facilities in the Department of Vocational & Technical Education at the University of Minnesota.

PROBLEM STATEMENTS

The following specific questions were to be answered in this study:

1. What computing equipment is being used in business programs in Minnesota public secondary and postsecondary institutions and where is this equipment located?
2. What business applications of microcomputers are being taught or are being planned for instruction? Are these business applications taught within existing courses, or are they taught in separate computer applications courses? Do teachers need additional information about any of these business applications?
3. What business content is being taught with the use of the computer as an instructional tool? Does this instruction use a drill and practice, tutorial, or simulation type of application? Do teachers need additional information about using the computer to teach a particular business or marketing topic?
4. What teacher-management applications have business teachers made use of with microcomputers? How frequently do they use computers in this way, and would they like to make greater use of any teacher-management tool? Do teachers need additional information

about ways of using the computer as a teacher-management tool?

5. What are the attitudes of business teachers about several issues related to instructional use of microcomputers? These issues relate to equity in access to computing equipment, teachers' responsibilities for becoming prepared to teach various business computing applications, software acquisition, instructional materials and time requirements for teaching computer use, and the need for teachers and/or students to know how to program.

PROCEDURES AND SAMPLE

A questionnaire was mailed to a sample of 550 business teachers in the State of Minnesota, approximately one-third of those who held a vocational license for the 1984-85 school year. This mailing list was available from the Minnesota State Department of Education and included teachers at both the secondary and postsecondary levels. The questionnaire was mailed to a random sample of teachers rather than to schools because it was considered important to include both potentially computer-using and noncomputer-using teachers in assessing in-service needs and attitudes about computer use.

The initial mailing of the questionnaire and cover letter went to 550 teachers at the end of January, 1985. In the middle of March, 1985, a follow-up postcard was mailed to approximately 450 nonrespondents. At the beginning of May, a second questionnaire and cover letter were mailed to 380 nonrespondents. Table 1 shows the response rate for the entire sample and the returns at both secondary and postsecondary levels.

Table 1

Microcomputer Survey Returns

SCHOOL LEVEL	TOTAL	SAMPLE	RETURN	USABLE	PERCENT
SECONDARY					
Schools	532	300	211	207	69%
Teachers	1205	402	262	255	63%
POSTSECONDARY					
Schools	34	34	29	29	85%
Teachers	415	148	91	87	59%
TOTALS					
Schools	566	342	240	236	69%
Teachers	1620	550	353	342	62%

The 236 schools used in the analysis can be categories into the levels shown in Table 2 according to the range of grades in the secondary schools plus the postsecondary technical institutes as a separate level. The "Other" level included schools with grades 8 - 12 and secondary cooperative vocational centers.

Table 2

Minnesota Respondents
Level of Educational Institutes by Grade

Level	Frequency	Percent
Grades K - 12	59	25%
Grades 7 - 12	53	22%
Grades 9 - 12	45	19%
Grades 10 - 12	41	17%
Other	9	4%
Area Vocational Technical Institute	29	12%
TOTAL SCHOOLS	236	100%

Table 3 shows the enrollment ranges in the secondary schools, and Table 4 shows enrollment in the technical institutes.

Table 3

Minnesota Respondents
Secondary School Enrollment Ranges

Enrollment Range	Frequency	Percent
Less than 250 Students	35	17%
251 - 500 Students	48	23%
510 - 1000 Students	66	32%
1001 - 1500 Students	28	14%
1501 - 2000 Students	13	6%
Over 2000 Students	17	8%
TOTAL SCHOOLS	207	100%

Table 4

Minnesota Respondents
Technical Institute Enrollment Ranges

Enrollment Range	Frequency	Percent
Less than 250 Students	0	0%
251 - 500 Students	8	28%
501 - 1000 Students	9	31%
1001 - 1500 Students	5	17%
1501 - 2000 Students	5	17%
Over 2000 Students	2	7%
TOTAL SCHOOLS	29	100%

FINDINGS

The findings from the survey are described below in the following sections:

1) equipment available in the schools;
2) comparisons of equipment availability by school level and school size;
3) the kinds of instructional computing applications used in the three main areas of teaching business microcomputer applications, using computers to teach business content, and using the computer as an aid to managing instruction;
4) comparisons of the total number of instructional applications used in three areas between secondary and postsecondary school levels;
5) teachers' needs for more information about computing applications; and
6) teachers' attitudes about instructional computing issues.

Equipment Availability

Teachers were asked to provide the number of computers, by brand, that were available in either a computer/business lab, a multipurpose classroom, or in teachers' offices. Table 5 shows the average number of computers, by brand, in these three locations for the secondary schools. Of the 207 high school responding, 192 gave a number available for each equipment type; teachers in 15 schools made a check mark by the equipment type/brand which they used, and these were tallied separately. Of the 192 schools which reported equipment numbers, eight (4 percent) reported having no computers.

Table 6 provides the same equipment information for postsecondary technical institutes. No postsecondary school reported having no computing equipment.

Table 5

Computing Equipment Availability
by Brand and Location
Secondary Schools
Mean and Range
N = 192

Equipment Type or Brand	Location: Computer/ Business Labs	Location: Multi-Purpose Classroom N = 192	Location: Teachers' Offices	Total N = 192	Total Excluding Schools With "0"
COMPUTERS					
Apple II+/IIe					
N					179
Mean	10.6	5.8	0.4	16.8	18.0
Range	0 - 54	0 - 55	0 - 11	0 - 63	1 - 63
IBM PC					
N					24
Mean	0.5	0.3	0.0	0.9	7.2
Range	0 - 15	0 - 15	0 - 1	0 - 30	1 - 30
TRS-80					
N					3
Mean	0.1	0.0	0.0	0.1	5.7
Range	0 - 11	0 - 2	0	0 - 11	2 - 11
Other					
N					25
Mean	0.8	0.3	0.1	1.2	9.1
Range	0 - 25	0 - 16	0 - 6	0 - 26	1 - 26
ALL BRANDS					
N					184
Mean	12.0	6.5	0.5	18.9	19.8
Range	0 - 60	0 - 55	0 - 11	0 - 86	1 - 86

(Continued)

Table 5 (Continued)

Computing Equipment Availability
by Brand and Location
Secondary Schools
Mean and Range
N = 192

Equipment Type or Brand	Location: Computer/ Business Labs	Location: Multi-Purpose Classroom N = 192	Location: Teachers' Offices	Total N = 192	Total Excluding Schools With "0"
PRINTERS					
Dot Matrix					
N					157
Mean	3.2	1.5	0.2	4.9	6.0
Range	0 - 25	0 - 20	0 - 8	0 - 34	1 - 34
Letter Quality					
N					64
Mean	0.4	0.3	0.1	0.8	2.3
Range	0 - 10	0 - 10	0 - 4	0 - 14	1 - 14
Both DMP and LQP					
N					170
Mean	3.6	1.8	0.3	5.7	7.0
Range	0 - 25	0 - 20	0 - 9	0 - 35	1 - 35
Graphic Plotter					
N					5
Mean	0.0	0.0	0.0	0.0	1.0
Range	0 - 1	0 - 1	0	0 - 1	1
OTHER					
Network					
N					12
Mean	0.1	0.0	0.0	0.1	1.0
Range	0 - 1	0	0	0 - 1	1

Table 6

Computing Equipment Availability
by Brand and Location
Postsecondary Technical Institutes
Mean and Range
N = 27

Equipment Type or Brand	Location: Computer/ Business Labs	Location: Multi-Purpose Classroom N = 27	Location: Teachers' Offices	Total N = 27	Total Excluding Schools With "0"
COMPUTERS					
Apple II+/IIe					
N					23
Mean	9.9	3.2	0.6	13.7	16.1
Range	0 - 43	0 - 24	0 - 5	0 - 45	1 - 45
IBM PC					
N					26
Mean	14.9	2.0	0.4	17.3	17.9
Range	0 - 38	0 - 15	0 - 6	0 - 44	2 - 44
TRS-80					
N					17
Mean	0.9	0.1	0.0	1.1	6.0
Range	0 - 13	0 - 4	0 - 1	0 - 17	1 - 17
Other					
N					14
Mean	2.7	0.1	0.0	2.8	5.4
Range	0 - 18	0 - 1	0	0 - 18	1 - 18
ALL BRANDS					
N					27
Mean	28.4	5.5	1.0	34.9	34.9
Range	10 - 72	0 - 24	0 - 11	10 - 83	10 - 83

(Continued)

Table 6 (Continued)

Computing Equipment Availability
by Brand and Location
Postsecondary Technical Institutes
Mean and Range
N = 27

Equipment Type or Brand	Location: Computer/ Business Labs	Location: Multi-Purpose Classroom N = 27	Location: Teachers' Offices	Total N = 27	Total Excluding Schools With "0"
PRINTERS					
Dot Matrix					
N					27
Mean	11.2	2.0	0.7	13.9	13.9
Range	2 - 60	0 - 12	0 - 10	2 - 70	2 - 70
Letter Quality					
N					21
Mean	2.5	0.2	0.3	2.9	3.8
Range	0 - 15	0 - 2	0 - 3	0 - 18	1 - 18
Both DMP and LQP					
N					27
Mean	13.6	2.2	1.0	16.8	16.8
Range	2 - 75	0 - 12	0 - 13	4 - 88	4 - 88
Graphic Plotter					
N					8
Mean	0.5	0.0	0.0	0.5	1.8
Range	0 - 3	0 - 1	0	0 - 3	1 - 3
OTHER					
Network					
N					9
Mean	0.3	0.0	0.0	0.3	1.0
Range	0 - 1	0 - 1	0	0 - 1	1

Table 7 summarizes the proportion of schools at both the secondary and postsecondary levels which had each brand of computers, Apple II's, IBM PC's, TRS-80's, or Other. The secondary schools include those which checked a computer brand but did not include the number used; these were, therefore, not included in Table 5.

At the secondary level, over 90 percent of schools had Apple II computers; 12 percent used IBM PC's. At the postsecondary level, almost all schools, 96 percent, were using IBM PC's; 85 percent also used Apple II's.

Table 7

Availability of Computers by Brand
Proportion of Secondary and Postsecondary Schools

School Level	N	Brand of Computers							
		Apple II		IBM PC		TRS-80		Other	
		N	%	N	%	N	%	N	%
Secondary	207	193	93.2%	25	12.1%	3	1.4%	25	12.1%
Postsecondary	27	23	85.2%	26	96.3%	5	18.5%	14	51.9%

Equipment Availability by School Level and School Size

The number of computer and printers available was compared by the type or level of school and by the size or enrollment in each school. Table 8 shows the mean number of computers (all brands combined) and the mean number of printers (both types combined) by type of secondary school. In both instances, analysis of variance showed that the mean number of equipment pieces used was greater for schools having Grades 9 - 10, Grades 10 - 12, Grades 8 - 12 or Cooperative Centers than for the other types.

Table 8

Relationship Between Secondary School Type and Equipment Availability

Equipment Type and School Type	No. of Schools	Equipment in School Mean	Std. Dev.	F-Value	F Probability
Total Computers					
Grades K - 12	53	16.0	9.5		
Grades 7 - 12	50	15.9	10.0		
Grades 9 - 12	42	19.1	10.1		
Grades 10 - 12	38	26.4	21.8		
Other (8 - 12 and Coop Ctr.)	9	21.6	26.2		
TOTAL	192	18.9	14.5	3.962	0.0045**
Total Printers					
Grades K - 12	53	3.9	3.0		
Grades 7 - 12	50	4.4	4.4		
Grades 9 - 12	42	7.0	6.9		
Grades 10 - 12	38	8.4	8.0		
Other (8 - 12 and Coop Ctr.9	9	5.4	3.8		
TOTAL	192	5.7	5.8	4.844	0.0013**

** Significant beyond p < .01

Table 9 shows the mean number of computers (all brands combined) and printers (both types combined) by secondary school enrollment. For both computers and printers, analysis of variance showed the means to differ. The mean number used increased as enrollment increased.

Table 9

Relationship Between School Enrollment and Equipment Availability

Secondary Schools
N = 192

Equipment Type and Enrollment Range	No. of Schools	Equipment in School Mean	Std. Dev.	F-Value	F Probability
Total Computers					
Less than 250	31	11.1	6.38		
251 - 500	46	14.8	8.32		
501 - 1000	60	20.5	14.3		
1001 - 1500	27	21.8	17.7		
1501 - 2000	12	19.1	11.1		
More Than 2000	16	35.1	21.5		
TOTAL	192	18.9	14.5	8.203	< 0.0001**
Total Printers					
Less than 250	31	2.8	2.0		
251 - 500	46	4.8	5.1		
501 - 1000	60	5.6	4.1		
1001 - 1500	27	6.5	7.4		
1501 - 2000	12	8.0	6.9		
More Than 2000	16	11.2	9.4		
TOTAL	192	5.7	5.8	5.82	< 0.0001**

** Significant beyond p < .01

Table 10 shows the mean number of computers (all brands combined) and printers (both types combined) by enrollment in postsecondary technical institutes. For both computers and printers, analysis of variance showed no significant differences among the means.

Table 10
Relationship Between School Enrollment
and Equipment Availability

Postsecondary Technical Institutes
N = 27

Equipment Type and Enrollment Range	No. of Schools	Equipment in School Mean	Std. Dev.	F-Value	F Probability
Total Computers					
Less than 250	7	19.6	6.8		
251 - 500	8	39.3	10.5		
501 - 1000	5	38.6	14.5		
1001 - 1500	5	41.4	27.4		
1501 - 2000	2	45.5	34.7		
More Than 2000	0				
TOTAL	27	34.9	18.0	2.077	0.1178
Total Printers					
Less than 250	7	10.5	5.1		
251 - 500	8	16.6	10.0		
501 - 1000	5	13.0	6.0		
1001 - 1500	5	30.0	32.5		
1501 - 2000	2	16.0	14.1		
More Than 2000	0				
TOTAL	27	16.8	16.0	1.249	0.3193

Table 11 permits comparisons of the mean number of computers (all brands combined) and printers (both types combined) between secondary and postsecondary schools. Analysis of variance showed that postsecondary technical institutes possessed significantly more computers and printers than did secondary schools.

Table 11

Comparison of Equipment Availability at Secondary and Postsecondary Levels

Equipment Type and School Type	No. of Schools	Equipment in School Mean	Std. Dev.	F-Value	F Probability
Total Computers					
Secondary	192	18.9	18.0		
Postsecondary	27	34.9	14.5		
Total	219	20.9	15.8	26.917	< 0.0001**
Total Printers					
Secondary	192	5.7	5.8		
Postsecondary	27	16.8	16.0		
Total	219	7.0	8.6	48.456	< 0.0001**

** Significant beyond p < .01

Table 12 shows the ratio of computers to printers for secondary and postsecondary schools. The computers were the total available in a business department, and the printers were the total of dot matrix and letter quality printers available. The ratio of computers to printers was calculated for each school, and the mean ratio of 4.0 for all schools at the secondary level (N = 192) was found not to be statistically different from the mean ratio of 2.7 for all schools (N = 27) at the postsecondary level.

Table 12

Comparison of Computer to Printer Ratios at Secondary and Postsecondary Levels

School Type	N of Schools	Computer to Printer Ratio			t-Value	Prob.
		Mean	Range	Std. Dev.		
Secondary	192	4.0	0 - 50.0	5.2		
Postsecondary	27	2.7	.94 - 8.33	1.7		
Total	219	3.9		4.9	-1.292	0.1947

Finally, Table 13 permits comparison of the mean number of computers (all brands combined) and printers (both types combined) used and whether the business department had access to other computers in the school. At both the secondary and postsecondary levels and for both computers and printers, analysis of variance showed no significant differences between mean number of equipment used and whether the department had access to other equipment.

Table 13

Comparison of Equipment Availability and Access to Other School Computing Equipment at the Secondary and Postsecondary Levels

School Level	Total	Access to Other Computers: Yes	Access to Other Computers: No	F-Value	F Probability
SECONDARY					
Total Computers					
N	192	138	54		
Mean	18.9	18.3	20.6	0.924	0.6608
Std. Dev.	14.5	13.9	16.0		
Total Printers					
N	192	138	54		
Mean	5.7	5.7	5.7	0	0.9899
Std. Dev.	5.8	6.0	5.2		
POSTSECONDARY					
Total Computers					
N	27	14	13		
Mean	34.9	39.4	30.1	1.858	0.1822
Std. Dev.	18.0	21.7	12.0		
Total Printers					
N	27	14	13		
Mean	16.8	20.2	13.1	1.363	0.2529
Std. Dev.	16.0	21.3	5.8		

Microcomputer Instructional Applications

The microcomputer instructional applications used in Minnesota secondary and postsecondary schools are presented in three categories: business microcomputer applications taught; business content using microcomputers; and teacher-management microcomputer uses. Each of these three areas will be considered separately in the following sections. Following these discussions, comparisons between the secondary and postsecondary schools regarding the number of different applications taught will be presented.

Business microcomputer applications. Teachers were asked whether they taught a specific business microcomputer application as a separate course or within another course and whether they were planning to teach a particular application. They could check any or all of these three responses. In addition, they were asked if they needed more information about a particular application.

Table 14 shows a rank order of the business microcomputer applications taught in 207 Minnesota secondary schools. Column 1 shows the percentage of schools teaching the application; columns 2 and 3 show whether the application was "Taught as a Separate Course" or "Within Another Course". Since an application could be taught both as a separate course and within another course in a school, the sum of the percentages in Columns 2 and 3 does not equal the percent in Column 1. Column 4 shows the proportion of schools "Planning to Teach" a specific business application.

These responses have been reported by school rather than the individual responding teachers in order to avoid duplicate counting of applications if teachers from the same school responded for their entire department rather than for themselves individually. Every different application taught was thereby

accounted for, but an application was counted only once per school.

Teachers individually (N = 251) reported using an average of 6.7 business applications of the 22 listed, including the option of "Other." The high was 21 checked; 27 teachers (10.8 percent) reported using none. When applications were tallied by school (N = 207), the average was 7.5 applications; the high was 21; and 16 schools (7.7 percent) reported using no microcomputer business applications.

Almost 80 percent of the schools were teaching Word Processing. The next highest business application taught was Accounting--General Ledger with over 50 percent of the secondary schools teaching this. The other accounting areas of Accounts Receivable, Payroll, and Accounts Payable were taught by a similar proportion, just short of 50 percent. Intermediate Word Processing was taught by 40 percent of the school, closely followed by 39 percent teaching BASIC programming and 38 percent teaching Spreadsheets.

Table 14

Business Microcomputer Applications Taught
Minnesota Secondary Schools
Percent of N = 207

Microcomputer Business Application	Total Percent Teaching	Teaching as a Separate Course	Teaching Within Another Course	Planning to Teach
	Column 1	Column 2	Column 3	Column 4
Word Processing - Intro	79.6%	23.1%	63.7%	11.0%
Acctg - General Ledger	52.7	4.9	48.8	16.9
Acctg - Accts Receivable	48.3	5.3	44.4	20.3
Acctg - Payroll	48.2	2.8	46.8	18.9
Acctg - Accts Payable	47.3	5.3	43.4	19.8
Word Processing - Inter	40.1	13.0	29.0	12.1
Programming - BASIC	39.1	25.1	15.9	1.4
Spreadsheets	38.2	4.4	34.8	15.4
File Mgrs/Data Bases	34.8	2.9	33.8	15.9
Acctg - Inventory	32.3	2.8	30.9	16.4
Graphics	18.9	0.5	18.4	5.8
Word Processing - Adv	17.0	5.4	12.6	8.2
Acctg - Income Tax	11.6	0	11.6	10.1
Programming - Pascal	9.2	6.3	2.9	1.0
Other	8.7	2.4	6.3	2.9
Electronic Mail	8.2	0	8.2	11.1
Mrktg - Merchandising	6.8	1.0	5.8	1.4
Mrktg - Sales Recording	6.3	0.5	5.8	1.9
Telecommunications	6.3	1.0	6.3	3.4
Mrktg - Sales Analysis	5.8	0.5	5.3	1.9
Programming - Other	5.3	2.9	2.4	1.0
Scheduling/Calendaring	2.9	0	2.9	3.4
NONE TAUGHT	7.7			

Table 15 shows a rank order of the business microcomputer applications taught in 28 Minnesota postsecondary schools. As was presented in Table 14 above for the secondary schools, Column 1 shows the percentage of schools teaching the application; columns 2 and 3 show whether the application was "Taught as a Separate Course" or "Within Another Course". Since an application could be taught both as a separate course and also within another course in a school, the sum of the percentages in Columns 2 and 3 does not equal the percentage in Column 1. Column 4 shows the proportion of schools "Planning to Teach" a specific business application.

Again, these responses have been reported by school rather than the individual responding teachers in order to avoid duplicate counting of applications if teachers from the same school responded for their entire department rather than for themselves individually. Every different application taught was thereby accounted for, but an application was counted only once per sc

Teachers individually (N = 71) reported using an average of 9.2 business applications of the 22 listed, including the option of "Other." The high was 20 checked; 12 teachers (16.9 percent) reported using none. When applications were tallied by school (N = 28), the average was 13.6 applications; the high was 20; and no postsecondary school reported using no microcomputer business applications.

Over 95 percent of the postsecondary schools taught Introductory Word Processing, and 82 percent taught Intermediate Word Processing. As was true for the high school level, the next most frequent business application taught was Accounting--General Ledger with 82 percent teaching this. At least three-quarters of the schools were teaching Payroll, Accounts Receivable, and

Accounts Payable applications using the microcomputer. The next highest ranking application, BASIC programming with 71 percent, also paralleled the high schools. Thereafter, File Managers/Data Bases and Spreadsheets were the next highest ranking with 68 percent each.

Table 15

Business Microcomputer Applications Taught
Minnesota Postsecondary Schools
Percent of N = 28

Microcomputer Business Application	Total Percent Teaching Column 1	Teaching as a Separate Course Column 2	Teaching Within Another Course Column 3	Planning to Teach Column 4
Word Processing - Intro	96.4%	71.4%	50.0%	14.3%
Word Processing - Inter	82.2	60.8	42.9	10.8
Acctg - General Ledger	82.1	35.7	67.8	28.5
Acctg - Payroll	78.6	35.7	67.9	17.9
Acctg - Accts Receivable	75.0	28.6	64.3	25.0
Acctg - Accts Payable	75.0	25.0	64.3	32.2
Programming - BASIC	71.4	64.3	32.1	10.7
File Mgrs/Data Bases	67.9	28.6	50.0	32.2
Spreadsheets	67.9	39.3	46.4	35.7
Acctg - Inventory	64.2	25.0	57.1	32.1
Word Processing - Adv	53.7	46.5	14.4	25.1
Acctg - Income Tax	53.5	17.8	42.8	10.7
Graphics	39.?	14.3	35.7	32.2
Mrktg - Sales Recording	28.7	7.2	21.5	17.9
Mrktg - Sales Analysis	25.1	7.2	17.9	10.7
Electronic Mail	25.0	3.6	25.0	35.7
Telecommunications	24.9	7.1	17.8	39.2
Mrktg - Merchandising	21.5	3.6	17.9	14.3
Other	21.4	10.7	10.7	0
Programming - Other	17.9	17.9	0	3.6
Scheduling/Calendaring	17.9	3.6	14.3	35.7
Programming - Pascal	14.2	7.1	7.1	3.6
NONE TAUGHT	0			

Business content areas taught using microcomputers. Table 16 shows the business content areas which were taught using microcomputers by secondary business teachers. The content areas are in rank order in Column 1 according to the proportion of teachers who used microcomputers to teach each one. Twenty-seven percent of high school teachers did not use microcomputers to teach any business content. The average number of different content areas taught using the computer by individual teachers was 2.7, out of a total of 19 possibilities listed in the questionnaire.

Columns 2, 3, and 4 show the proportions of teachers who used drill and practice, tutorial, and simulation modes to teach a given content. Since teachers could mark more than one mode, these percentages do not sum to 100 percent.

The content areas taught using microcomputers by at least 18 percent of the respondents were Accounting, Introduction to Keyboarding, Keyboarding Skill Building, Office Procedures, and Indexing and Filing. The percentage of responding teachers who taught these subjects using computers ranged from 45.5 percent for Accounting to 18 percent for Indexing and Filing.

Table 16

Business Content Taught Using Microcomputers
Minnesota Secondary Teachers
Percent of N = 251

Business Content Area	Total Percent Teaching Column 1	Drill & Practice Mode Column 2	Tutorial Mode Column 3	Simulation Mode Column 4
Accounting	45.5%	15.2%	10.4%	33.5%
Keyboarding - Intro.	38.3	31.5	11.6	3.2
Keyboarding - Skill Bldg.	34.7	29.1	10.0	2.0
Office Procedures	29.2	13.2	12.0	12.0
Indexing & Filing	18.0	12.0	6.4	3.6
Spelling	13.6	9.6	2.4	2.4
Business Communication	13.2	6.8	4.4	6.0
General Business	10.0	3.6	2.0	6.8
Management	8.8	1.2	0	7.6
Punctuation	8.8	6.0	2.4	0.8
English Grammar/Style	7.6	5.2	2.4	0.8
Career Education	7.2	1.6	3.6	2.0
Business Mathematics	6.8	4.8	1.2	2.0
Income Tax Accounting	5.6	2.0	2.8	2.8
Economics	4.4	1.6	0	2.8
Consumer Education	4.0	1.6	1.2	2.4
Marketing	4.0	2.0	0.8	1.6
Business Law	3.6	1.6	1.2	0.8
Sales/Selling	3.6	1.6	0.4	1.6
NONE TAUGHT	26.7			

Table 17 presents similar information for postsecondary teachers in Minnesota (N = 70). The content areas are ranked in descending order in Column 1 according to the proportion of teachers who used microcomputers to teach these topics. One-third of the postsecondary teachers did not use microcomputers to teach any business applications. The average number of different content areas taught using the computer by individual teachers was 2.7, out of a maximum of 19 content areas listed on the questionnaire.

Columns 2, 3, and 4 show the proportions of teachers who used drill and practice, tutorial, and simulation modes to teach a given content. Since teachers could mark more than one mode, these percentages do not sum to 100 percent.

The areas taught using microcomputers by at least 18 percent of the respondents were Accounting, Introduction to Keyboarding, Keyboarding Skill Building, Business Communication, and Income Tax Accounting. The proportions ranged from 44.5 percent for Accounting to 18.4 percent for Income Tax Accounting.

Table 17

Business Content Taught Using Microcomputers
Minnesota Postsecondary Teachers
Percent of N = 70

Business Content Area	Total Percent Teaching Column 1	Drill & Practice Mode Column 2	Tutorial Mode Column 3	Simulation Mode Column 4
Accounting	44.3%	10.0%	11.5%	35.7%
Keyboarding - Intro.	38.6	28.6	18.6	1.4
Keyboarding - Skill Bldg.	32.8	28.5	10.0	2.8
Business Communication	18.6	4.3	4.3	11.4
Income Tax Accounting	18.4	11.3	2.8	9.9
Business Mathematics	14.3	10.0	2.8	2.9
Indexing & Filing	14.3	8.5	5.7	5.7
Office Procedures	11.6	4.5	1.7	10.2
English Grammar/Style	11.4	7.1	4.3	1.4
Sales/Selling	11.4	4.3	2.8	7.1
Management	10.0	5.7	1.4	5.7
Marketing	8.6	4.3	1.4	4.3
Economics	8.5	1.4	0	7.1
Spelling	8.5	7.1	2.8	1.4
General Business	7.1	1.4	2.8	4.3
Punctuation	7.1	5.7	4.3	1.4
Consumer Education	2.9	0	0	2.9
Career Education	1.4	0	0	1.4
Business Law	0	0	0	0
NONE TAUGHT	32.9			

Teacher-management uses of microcomputers. Table 18, Column 1, shows the proportion of secondary school teachers (N = 251) who made use of a teacher-management microcomputer application. Columns 2, 3, and 4 show whether a teacher-management tool was used "Often," "Occasionally," or "Seldom." The sum of these percentages equals the total proportion in Column 1. Finally, Column 5 shows the proportion of teachers who said they would like to use a particular teacher-management tool more often.

Over 61 percent of the respondents used Word Processing software, over 41 percent using it often. Over one-quarter of the teachers used the following teacher-management tools: Spreadsheets, Grade Book Maintenance, and File Managers/Data Bases, with the second highest percentage after Word Processing being 28.7 percent for Spreadsheets. Almost one-third of the teachers did not use any teacher-management tool, and the average number of tools used was 2.1, out of the ten uses listed on the questionnaire.

Table 18

Teacher-Management Microcomputer Uses by
Minnesota Secondary Teachers
Percent of N = 251

Teacher-Management Use	Total Percent Using	Frequency of Use			Would Like to Use More
		Often	Occasionally	Seldom	
	Column 1	Column 2	Column 3	Column 4	Column 5
Word Processing	61.4%	41.8%	16.0%	3.6%	8.4%
Spreadsheet	28.7	8.8	12.7	5.2	11.2
Grade Book Maintenance	28.2	12.0	8.7	7.5	14.3
File Manager/Data Base	25.5	6.8	11.5	7.2	13.1
Test/Drill Generator	15.6	4.8	5.6	5.2	11.6
Games Generation	15.6	1.2	4.4	10.0	4.4
Worksheet Generator	13.2	4.0	4.8	4.4	8.8
Test Answer Sheet Scoring	8.8	3.2	2.0	3.6	9.6
Authoring Software for Lesson Creation	8.4	1.6	3.2	3.6	9.2
Graphics Displays or "Slide Shows"	8.4	0.8	1.6	6.0	8.8
NONE USED	32.3				

Table 19, Column 1, shows the proportion of postsecondary school teachers (N = 72) who made use of a teacher-management microcomputer application. Columns 2, 3, and 4 show whether a teacher-management tool was used "Often," "Occasionally," or "Seldom." The sum of these percentages equals the total proportion in Column 1. Finally, Column 5 shows the proportion of teachers who said they would like to use a particular teacher-management software tool more often.

Over 55 percent of the respondents used Word Processing software, over 44 percent using it often. Over one-quarter of the teachers used the following teacher-management tools: Spreadsheets, File Managers/Data Bases, and Grade Book Maintenance, with the second highest percentage after Word Processing being 44.5 percent for Spreadsheets. Forty percent of the teachers did not use any teacher-management tool, and the average number of tools used was 2.6, out of the ten uses listed on the questionnaire.

Table 19

Teacher-Management Microcomputer Uses by
Minnesota Postsecondary Teachers
Percent of N = 72

Teacher-Management Use	Total Percent Using	Frequency of Use			Would Like to Use More
		Often	Occasionally	Seldom	
	Column 1	Column 2	Column 3	Column 4	Column 5
Word Processing	55.6%	44.4	9.7	1.4	2.8
Spreadsheet	44.5	15.3	19.4	9.7	7.0
File Manager/Data Base	32.0	12.5	11.1	8.3	8.3
Grade Book Maintenance	27.8	15.3	8.3	4.2	12.5
Test/Drill Generator	19.5	6.9	8.3	4.2	11.1
Games Generation	16.7	0	2.8	13.9	1.4
Test Answer Sheet Scoring	15.3	2.8	4.2	8.3	13.9
Worksheet Generator	13.9	4.2	2.8	6.9	12.5
Authoring Software for Lesson Creation	13.9	2.8	4.2	7.0	13.9
Graphics Displays or "Slide Shows"	12.5	1.4	4.2	6.9	8.3
NONE USED	40.3				

Comparisons of Instructional Applications Between Secondary and Postsecondary Schools

The total number of applications used was tallied for each of the three areas: business microcomputer applications, using computers to teach business content, and using the computer as a teacher-management aid. In the case of business applications, an application was counted once if a teacher (or school, when the unit of analysis) either taught it as a separate course, within another course, and/or was planning to teach it. There were a maximum of 22 applications listed on the questionnaire, including the option of "Other."

The total number of business content areas taught using the computer was determined by counting a content area once if a teacher checked using either drill and practice, tutorial, and/or simulation as the mode of teaching carried out with computer assistance. There were a total of 19 content areas which could be marked on the questionnaire.

The total number of teacher-management uses of the computer was determined by counting a use if a teacher checked using it either "Often," "Occasionally," or "Seldom." There were a maximum of 10 uses which could be checked on the questionnaire.

Table 20 presents the comparisons between the mean number of total applications taught at the secondary and postsecondary levels in the three areas of teaching business applications, teaching business content using microcomputers, and teacher-management uses. The total number of different business applications are compared both for individual teacher respondents and by school. The totals compared for the teaching of business content and teacher-management uses are both totals for individual teachers, not by school.

Whether analyzed by schools or by teachers, the total number of

microcomputer business applications taught was significantly higher at the postsecondary level than at the secondary. No significant differences existed between the school levels regarding the total number of business content areas taught using the computer nor the total number of teacher-management applications used.

Table 21 shows the Pearson Product-Moment correlations between the total number of applications teachers used in the three categories of business microcomputer applications, business content taught using computers, and teacher-management software tools. Each correlation for both secondary and postsecondary teachers was significantly different from zero beyond the $p < .0001$ level. Teachers who were teaching more business microcomputer applications also taught more business content areas using computers and used more teacher-management tools.

Table 20

Comparison of Total Computer Applications
of Three Types by
Secondary and Postsecondary School Levels

Type of Application	N	Max. No.	Mean	Std. Deviation	T-Value	Prob.
BUSINESS APPLICATIONS						
By School						
Secondary	207	22	7.5	4.5		
Postsecondary	28	22	13.6	5.2	6.588	<0.0001**
Total	235	22	8.3	5.0		
By Teacher						
Secondary	251	22	6.7	4.5		
Postsecondary	71	22	9.2	6.2	3.740	0.0005**
Total	322	22	7.3	5.0		
BUSINESS CONTENT						
Secondary	251	19	2.7	3.0		
Postsecondary	71	19	2.7	3.6	0.035	0.9711
Total	322	19	2.7	10.0		
TEACHER-MANAGEMENT TOOLS						
Secondary	251	10	2.2	2.5		
Postsecondary	72	10	2.6	3.0	1.201	0.2285
Total	323	10	2.3	2.6		

** Significant beyond p < .001

Table 21

Pearson Product-Moment Correlation Coefficients
Between the Total Number of Applications Used
in Three Software Categories
Minnesota Secondary and Postsecondary Teachers

Software Category	Correlation Coefficients Between Total Applications		
	Business Applications Software	Business Content Taught by Computer	Teacher-Management Software Tools
SECONDARY TEACHERS N = 251			
Business Applications Software	1.00	.54	.45
Business Content Taught by Computer	.54	1.00	.41
Teacher-Management Software Tools	.45	.41	1.00
POST-SECONDARY TEACHERS N = 70			
Business Applications Software	1.00	.60	.55
Business Content Taught by Computer	.60	1.00	.56
Teacher-Management Software Tools	.55	.56	1.00

* All correlation coefficients significant beyond $p < .0001$

Teacher Needs for More Information about Microcomputer Instructional Applications

Business teachers were asked whether they needed more information about any of the topics or applications in each of the three software categories: business microcomputer applications, teaching business content with microcomputers, and using teacher-management tools. The following sections describe these findings and relate teachers' expressions of need to the total number of applications which they reported using. Findings for secondary and postsecondary teachers are presented separately.

Business microcomputer applications. Table 22, Column 1, shows the proportion of individual secondary teachers (N = 251) who said they "Need More Information" about a given business application. A t-test was carried out for each business application comparing the average number of applications taught by those teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of applications taught by those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

The largest proportion of secondary teachers indicating a need for more information was 20 percent for the application of Electronic Mail. The next highest application with 13.5 percent expressing a need for more information was Accounting - Income Tax. Similar portions needed more information about Accounting - Inventory, File Managers/Data Bases, and Telecommunications.

In all but one instance, those teachers who checked that they did have a "Need for Information" were also those who were teaching more business applications than teachers not indicating a need for more information. Eleven of the 22 business applications had significant t-values, indicating that in

these instances those teachers indicating a need for more information were also teaching a significantly higher number of business applications than teachers who did not need more information.

Table 22

Information Needed About
Business Microcomputer Applications by
Minnesota Secondary School Teachers
N = 251

Microcomputer Business Application	Total Percent Needing Information	Mean Number of Total Applications: Needing Information	Mean Number of Total Applications: NOT Needing Information	t-Value
	Column 1	Column 2	Column 3	Column 4
Electronic Mail	20.0%	8.9	6.2	3.831*
Acctg - Income Tax	13.5	8.0	6.5	1.808
Acctg - Inventory	13.1	8.2	6.5	1.948*
File Mgrs/Data Bases	13.1	8.3	6.5	2.204*
Telecommunications	12.7	9.4	6.4	3.686*
Spreadsheets	12.0	8.6	6.5	2.442*
Acctg- General Ledger	12.0	7.9	6.6	1.511
Acctg - Accts Receivable	11.6	7.7	6.6	1.344
Acctg - Accts Payable	11.6	8.1	6.6	1.701
Graphics	11.2	10.5	6.3	4.915*
Acctg - Payroll	10.4	8.2	6.6	1.749
Scheduling/Calendaring	9.6	10.1	6.4	3.999*
Word Processing - Adv	8.8	8.4	6.6	1.783
Word Processing - Intro	8.0	8.1	6.6	1.414
Word Processing - Inter	8.0	7.9	6.6	1.205
Mrktg - Merchandising	5.6	10.4	6.5	3.222*
Mrktg - Sales Recording	5.6	10.7	6.5	3.484*
Mrktg - Sales Analysis	5.2	10.8	6.5	3.460*
Programming - BASIC	3.2	6.5	6.7	-0.154
Programming - Pascal	2.8	9.7	6.7	1.785
Programming - Other	2.0	10.6	6.7	1.953*
Other	1.2	8.7	6.7	0.747

*Significant at P < .05

Table 23, Column 1, shows the proportion of individual postsecondary teachers (N = 71) who said they "Need More Information" about a given business application. A t-test was carried out for each business application comparing the average number of applications taught by those teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of applications of those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

As was true for the secondary level, the applications of Electronic Mail has the highest proportion of teachers needing more information, 24 percent. Next highest was Scheduling/Calendaring with 21 percent. Telecommunications and Graphics both had 17 percent of postsecondary teachers expressing a need for more information.

In all instances, those teachers who checked that they did have a "Need for Information" were also those who were teaching more business applications than teachers not indicating a need for more information. However, only two of the 21 business applications had significant t-values, indicating that those teachers expressing a need for more information about Graphics and Spreadsheets were also those teaching a significantly higher number of business applications than teachers who did not need more information.

Table 23

Information Needed About
Business Microcomputer Applications by
Minnesota Postsecondary School Teachers
N = 71

Microcomputer Business Application	Total Percent Needing Information	Mean Number of Total Applications: Needing Information	Mean Number of Total Applications: NOT Needing Information	t-Value
	Column 1	Column 2	Column 3	Column 4
Electronic Mail	23.9%	11.1	8.6	1.436
Scheduling/Calendaring	21.1	11.0	8.7	1.280
Telecommunications	16.9	11.8	8.7	1.585
Graphics	16.9	12.6	8.5	2.129*
File Mgrs/Data Bases	14.1	11.2	8.9	1.108
Programming - BASIC	9.9	11.3	9.0	0.941
Acctg - Income Tax	8.5	11.0	9.0	0.745
Word Processing - Adv	8.5	10.8	9.0	0.677
Word Processing - Inter	8.5	10.5	9.1	0.539
Mrktg - Sales Analysis	8.5	12.8	8.8	1.516
Programming - Pascal	8.5	11.5	9.0	0.953
Programming - Other	8.5	13.2	8.8	1.660
Word Processing - Intro	7.0	11.2	9.0	0.750
Mrktg - Merchandising	7.0	12.2	9.0	1.127
Mrktg - Sales Recording	7.0	12.2	9.0	1.127
Acctg - Inventory	5.6	14.0	8.9	1.612
Acctg- General Ledger	5.6	14.0	8.9	1.612
Acctg - Accts Receivable	5.6	14.0	8.9	1.612
Acctg - Accts Payable	5.6	14.0	8.9	1.612
Acctg - Payroll	4.2	15.7	8.9	1.878
Spreadsheets	4.2	17.0	8.8	2.291*
Other	1.4	15.0	9.1	0.941

*Significant at P < .05

Business content taught using microcomputers. Table 24, Column 1, shows the proportion of individual secondary teachers (N = 251) who said they "Need More Information" about a given business content area which might be taught using microcomputers. A t-test was carried out for each business content area comparing the average number of content areas taught by those teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of content areas taught by those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

At least 15 percent of the respondents indicated a need for more information about teaching the following content areas using microcomputers: Office Procedures, Accounting, Income Tax Accounting, and Business Law. The highest proportion indicating a need for more information was 18.3 percent for Office Procedures.

Four of the 19 business content areas had significant t-values, indicating that in three instances, Income Tax Accounting, Business Law, and Marketing, those teachers indicating a need for more information were also using computers to teach a significantly higher number of business content areas than teachers who did not need more information. In the Introductory Keyboarding area, however, teachers indicating a need for more information were teaching significantly fewer business content topics using microcomputers than were teachers not indicating a need for more information.

Table 24

Information Needed About
Business Content Areas Which Might be
Taught Using Microcomputers by
Minnesota Secondary School Teachers
N = 251

Microcomputer Business Application	Total Percent Needing Information	Mean Number of Total Applications: Needing Information	Mean Number of Total Applications: NOT Needing Information	t-Value
	Column 1	Column 2	Column 3	Column 4
Office Procedures	18.3%	2.3	2.8	0.497
Accounting	17.9	2.2	2.8	-1.241
Income Tax Accounting	15.5	3.7	2.5	2.458*
Business Law	15.1	3.6	2.5	2.045*
Indexing & Filing	14.3	2.1	2.8	-1.182
Punctuation	13.5	2.5	2.7	-0.273
Spelling	13.5	2.4	2.7	-0.456
Business Communication	12.4	2.9	2.6	0.412
Management	12.4	3.5	2.5	1.624
Keyboarding - Skill Bldg.	12.0	2.0	2.7	-1.214
Keyboarding - Intro.	11.6	1.5	2.8	-2.185*
English Grammar/Style	10.4	2.9	2.6	0.397
Career Education	10.0	2.8	2.6	0.311
Business Mathematics	9.6	3.3	2.6	1.146
Consumer Education	9.6	3.8	2.5	1.938
General Business	9.6	2.9	2.6	0.435
Marketing	8.4	4.7	2.5	3.317*
Economics	7.6	2.9	2.6	0.350
Sales/Selling	5.6	3.9	2.6	1.620

*Significant at P < .05

Table 25, Column 1, shows the proportion of individual postsecondary teachers (N = 71) who said they "Need More Information" about a given business content which might be taught using microcomputers. A t-test was carried out for each business content area comparing the average number of content areas taught by those teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of content areas taught by those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

At least 18 percent of the respondents indicated a need for more information about teaching the following content areas using microcomputers: Business Mathematics, Business Law, Business Communication, Spelling, Office Procedures, Management, and Punctuation. The highest proportion indicating a need for more informant was 24 percent for Business Mathematics.

Two of the 19 business content areas had significant t-values, indicating that in these instances, Business Law and Career Education, those teachers indicating a need for more information were also using computers to teach a significantly larger number of business content areas than teachers who did not need more information.

Table 25

Information Needed About
Business Content Areas Which Might be
Taught Using Microcomputers by
Minnesota Postsecondary School Teachers
N = 71

Microcomputer Business Applications	Total Percent Needing Information	Mean Number of Total Applications		t-Value
		Needing Information	NOT Needing Information	
	Column 1	Column 2	Column 3	Column 4
Business Mathematics	24.0%	2.3	2.8	-0.497
Business Law	22.5	4.3	2.2	2.021*
Business Communication	21.1	2.7	2.7	-0.091
Spelling	21.1	3.4	2.5	0.871
Office Procedures	19.7	3.3	2.5	0.701
Management	19.7	2.9	2.6	0.208
Punctuation	19.7	3.5	2.5	0.951
Accounting	18.3	2.5	2.7	-0.235
Indexing & Filing	18.3	2.8	2.6	0.186
English Grammar/Style	18.3	3.2	2.6	0.609
Income Tax Accounting	15.5	2.0	2.8	-0.672
General Business	15.5	2.7	2.7	0.051
Career Education	15.5	4.8	2.3	2.194*
Consumer Education	14.1	4.1	2.4	1.351
Economics	14.1	2.9	2.6	0.210
Keyboarding - Skill Bldg.	11.3	2.8	2.7	0.061
Marketing	11.3	3.4	2.6	0.578
Sales/Selling	9.9	2.9	2.7	0.139
Keyboarding - Intro.	9.9	1.7	2.8	-0.739

*Significant at $P < .05$

Teacher-management uses of microcomputers. Table 26, Column 1, shows the proportion of individual (N = 251) secondary teachers who indicated a "Need for More Information" about teacher-management microcomputer software. A t-test was carried out for each teacher-management tool comparing the average number of tools used by thos teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of teacher-management tools used by those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

At least 15 percent of the secondary teachers indicated a need for more information about the following teacher-management tools: Grade Book Maintenance, Spreadsheets, Worksheet Generators, Authoring Software, and Test Answer Sheet Scoring. For only one of the ten tools, Word Processing, did those teachers who expressed a need for more information differ from those who did not express this need. Teachers indicating a need for more information about Word Processing currently used significantly fewer tools than teachers not indicating a need for more information. However, only 8.4 percent of the teachers indicated a need for information about word processing.

Table 26

Information Needed About
Teacher-Management Microcomputer Uses by
Minnesota Secondary School Teachers
N = 251

Microcomputer Business Application	Total Percent Needing Information	Mean Number of Total Applications Needing Information	Mean Number of Total Applications NOT Needing Information	t-Value
	Column 1	Column 2	Column 3	Column 4
Grade Book Maintenance	15.5%	1.3	2.3	-2.328
Spreadsheets	15.5	1.5	2.3	-1.745
Worksheet Generator	15.5	2.2	2.1	0.111
Authoring Software for Lesson Creation	15.1	2.7	2.0	1.637
Test Answer Sheet Scoring	15.1	2.5	2.1	0.985
Test/Drill Generator	13.9	2.1	2.1	-0.065
Graphics Displays or "Slide Shows"	12.7	2.4	2.1	0.736
File Manager/Data Base	11.6	1.7	2.2	-1.133
Word Processing	8.4	0.9	2.3	-2.533*
Games Generation	7.6	2.2	2.1	0.034

*Significant at $p < .05$

Table 27, Column 1, shows the proportion of individual (N = 72) postsecondary teachers who indicated a "Need for More Information" about teacher-management microcomputer software. A t-test was carried out for each teacher-management tool comparing the average number of tools used by those teachers who said they did "Need More Information" and those who did not check this item. Columns 2 and 3 show the mean number of teacher-management tools used by those who did and did not "Need More Information." Column 4 shows the t-test values resulting from the comparison of the means.

At least 15 percent of the postsecondary teachers indicated a need for more information in the following teacher-management tools: Grade Book Maintenance, Authoring Software, Worksheet Generators, and Test Answer Sheet Scoring. However, there were no significant differences between teachers who expressed a need for more information and those who did not on any of the comparisons of the average number of teacher-management tools currently used.

Table 27

Information Needed About
Teacher-Management Microcomputer Uses by
Minnesota Postsecondary School Teachers
N = 72

Microcomputer Business Application	Total Percent Needing Information	Mean Number of Total Applications: Needing Information	Mean Number of Total Applications: NOT Needing Information	t-Value
	Column 1	Column 2	Column 3	Column 4
Grade Book Maintenance	20.8%	2.1	2.7	-0.755
Authoring Software for Lesson Creation	18.1	3.4	2.4	1.076
Worksheet Generator	16.7	3.6	2.4	1.284
Test Answer Sheet Scoring	15.3	3.3	2.5	0.835
Test/Drill Generator	12.5	2.8	2.6	0.209
File Manager/Data Base	11.1	2.0	2.7	-0.587
Graphics Displays or "Slide Shows"	9.7	4.4	2.4	1.756
Spreadsheets	8.3	4.0	2.5	1.225
Word Processing	8.3	1.8	2.7	-0.644
Games Generation	6.9	3.2	2.5	0.479

Given the small proportions of teachers at both school levels who expressed a need for more information about any of the instructional computing applications, it is necessary to ask how many different teachers expressed a..y need for additional information. Table 28 shows the number of teachers who did or did not express a need for more information about any topic or application and the average numbers of "needs" marked by individual teachers in each of the three instructional computing categories: business microcomputer applications, teaching business content using computers, and teacher-management tools. The total number of "needs" marked by teachers were correlated with the total number of applications or topics they currently taught using computers within the three categories.

Column 1 in Table 28 shows the maximum number of applications or topics listed on the questionnaire and, therefore, the maximum number of "needs" for more information which could be checked. Columns 2 and 3 show the number and proportions of teachers who did (Column 2) or did not (Column 3) check any topic or application. Approximately one-third to two-fifths of teachers at each instructional level indicated they did have a need for more information about an instructional computing application.

Column 4 shows in two columns the average number of applications or topics checked by teachers in a given instructional computing category and the standard deviation. This mean may be compared with the maximum number of choices in Column 1. The average teacher at each instructional level checked a "need for more information" about two business microcomputer applications, two to three business content areas which might be taught with microcomputers, and one teacher-management tool.

Column 5 contains the Pearson Product-Moment correlation coefficient

between the number of "needs" a teachers expressed and the number of instructional computing applications each teacher was currently using within one of the three categories. A low but statistically significant correlation between "needs" and total current uses was obtained only in the category of business microcomputer applications. Teachers who were teaching the most business applications also marked a need for more information in a greater number of business applications.

Table 28

Number of Teachers Expressing a Need
for More Information About
Three Categories of Instructional Computing

Secondary and Postsecondary Teachers

School Level and Instructional Computing Category	Max. N of Appl.	No. of Tchrs Expressing Need for More Infomation				No. Categories Marked		Corr. with Total Appl Used
		YES		NO				
		N	%	N	%	$\bar{X}$	S.D.	
	Col. 1	Col. 2		Col. 3		Col. 4		Col. 5
Secondary N = 251								
Business Appl	22	96	38.2%	155	61.8%	2.0	3.4	0.266*
Tchg Content	19	112	44.5%	139	55.4%	2.3	3.8	0.038
Tchr-Mgmt Tools	10	94	37.4%	157	62.6%	1.3	2.2	-0.037
Postsecondary N = 71								
Business Appl	22	26	36.6%	45	63.4%	2.1	4.0	0.239*
Tchg Content	19	28	39.4%	43	60.6%	3.2	5.2	0.069
Tchr-Mgmt Tools	10	26	36.6%	45	63.4%	1.3	2.2	0.085

*Significantly different from r = 0 at $p < .05$

Teachers' Attitudes About Instructional Computing Issues

The attitudes of secondary and postsecondary business teachers on 27 attitude items are presented in the following tables.

Secondary business teachers. The data from 252 secondary teachers are presented in two tables. Table 29 summarizes the proportion of teacher giving one of five responses to each item ranging from a code of 1 for"Strongly Agree," 2 for "Agree," 3 for "Undecided," 4 for "Disagree," and a 5 for "Strongly Disagree." Because the number of teachers responding to each item differed, sample size is reported for each item.

The average response on each item is also provided. The items have been ranked from the lowest mean (highest agreement) to the lowest mean (highest disagreement). The statement numbers correspond to their order on the original questionnaire.

The following four statements had mean responses less than than 2, or typically a response of "strongly agree":

10. In-service computer education should be made available to teachers by the school district.
5. I enjoy the opportunity to integrate computers into my teaching.
24. Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.
21. Lack of time for teachers to learn to use business/marketing applications software prevents its greater integration into business/marketing classes.

The following three statements had mean responses of 3.5 or higher, or tending to be responses of "disagree":

27. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/marketing students.

13. Most business/marketing applications software is too complicated for instructional use at my teaching level.

16. Most instructional software in business/marketing subjects is generally uninteresting or instructional unsound.

Table 29

Attitude Responses to
Instructional Computing Issues

Minnesota Secondary Teachers

	Attitude Statement	N	Percent Responding 1 SA	2 A	3 Und	4 D	5 SD	Mean
10.	In-service computer education should be made available to teachers by the school district.	253	49.8	41.5	6.3	2.4	0	1.6
5.	I enjoy the opportunity to integrate computers into my teaching.	252	47.2	35.7	14.7	2.0	0.4	1.7
24.	Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.	247	31.2	59.1	8.1	1.6	0	1.8
21.	Lack of time for teachers to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	248	38.7	45.2	6.0	10.1	0	1.9
6.	All teachers should become knowledgeable about microcomputer use in all facets related to bus/mktg education (accounting, file managers, graphics, sales, spreadsheets, word processing).	253	35.6	33.6	17.0	11.9	2.0	2.1

(Continued)

Table 29 (Continued)

Attitude Responses t·
Instructional Computing Issues

Minnesota Secondary Teachers

Attitude Statement	N	Percent Responding 1 SA	2 A	3 Und	4 D	5 SD	Mean
7. All of the faculty should specialize in different computer applications; all staff do not need to be expert in all applications.	253	22.3	47.8	16.3	10.3	0.4	2.1
9. All teachers should be able to use computers for teaching content (drill & practice, tutorial, simulation).	252	22.6	49.2	15.9	11.5	0.8	2.2
1. Computers are available to me whenever I need to use them for my teaching.	252	35.3	36.9	5.6	17.5	4.8	2.2
4. Computers are available to me whenever I need to prepare for teaching.	252	34.1	40.9	4.8	15.9	4.4	2.2
15. Most instructional software in bus/mktg subjects appears likely to enhance teaching.	248	11.7	53.2	30.2	4.8	0	2.3
18. The cost of instructional software justifies making extra copies for classroom use.	248	7.7	47.6	33.5	9.3	2.0	2.5

(Continued)

Table 29 (Continued)

Attitude Responses to
Instructional Computing Issues

Minnesota Secondary Teachers

	Attitude Statement	N	Percent Responding 1 SA	2 A	3 Und	4 D	5 SD	Mean
14.	The cost of business applications software justifies making extra copies for classroom use.	248	11.7	43.1	34.3	8.5	2.4	2.5
19.	Lack of information about the quality/effectiveness of instructional software prevents acquisition.	247	9.7	47.4	22.3	19.8	0.8	2.5
20.	Cost of computing equipment prevents acquisition of a sufficient quantity of hardware for desired integration into the bus/mktg program.	247	8.9	47.8	16.2	26.3	0.8	2.6
8.	A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses.	252	14.2	39.9	22.5	18.2	5.1	2.6
17.	Software costs prevent acquisition of sufficient instructional materials for classroom use.	248	8.5	39.9	24.6	26.2	0.8	2.7
3.	Computers are sufficiently available to students outside of class.	252	15.1	44.0	9.9	21.8	9.1	2.7

(Continued)

Table 29 (Continued)

Attitude Responses to
Instructional Computing Issues

Minnesota Secondary Teacher.

	Attitude Statement	N	Percent Responding 1 SA	2 A	3 Und	4 D	5 SD	Mean
2.	All students have equal opportunity/access to use computers in business/ marketing courses.	252	19.4	32.1	9.1	32.1	7.1	2.8
22.	Lack of time for students to learn bus/mktg applications software prevents its greater integration into bus/mktg classes.	247	6.9	36.8	15.4	39.3	1.6	2.9
23.	Lack of correlated instructional materials appropriate for student use prevents greater use of bus/mktg applications software.	247	6.9	36.8	15.4	39.3	1.6	2.9
12.	Most bus/mktg applications software is too costly for instructional use at my teaching level.	251	4.8	21.1	34.3	35.1	4.8	3.2
25.	Being able to write (author) my own instructional software would result in more useful material.	247	6.5	22.3	30.4	30.8	10.1	3.2

(Continued)

Table 29 (Continued)

Attitude Responses to
Instructional Computing Issues

Minnesota Secondary Teachers

Attitude Statement	N	Percent Responding 1 SA	2 A	3 Und	4 D	5 SD	Mean
11. In-service computer education should be primarily the responsibility of the individual teacher.	252	4.4	25.0	18.7	41.3	10.7	3.3
26. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/ marketing teachers.	247	4.9	17.8	22.7	40.1	14.6	3.4
27. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for bus/ marketing students.	247	2.8	18.2	17.8	45.7	15.4	3.5
13. Most bus/mktg applications software is too complicated for instructional use at my teaching level.	248	0.4	6.5	31.9	51.2	10.1	3.6
16. Most instructional software in bus/mktg subjects is generally uninteresting or instructionally unsound.	248	0.4	4.0	33.9	55.6	6.0	3.6

In Table 30, the total number of microcomputer applications reported by each secondary teacher was compared by attitude response. Analysis of variance was carried out to determine if th average number of microcomputer applications reported differed for teachers possessing different attitudes. The teachers included in this analysis were those who responded to both the questions about computer applications used and to the attitude statements. The smallest number used for analysis of any item was N = 244. The number making each attitude response is reported for each item.

The number of computer applications is the sum of the three categories of business applications, business content taught using computers, and teacher-management tools used. When summed, the number of applications used by individual teachers (N - 251) ranged from 0 applications (23 or 9.1 percent of the teachers) to 45 applications. The maximum possible was 51 applications. The average number of applications used by secondary teachers was 11.6 with a standard deviation of 8.1.

The statements in Table 30 have been arranged in the same order as in Table 29, according to mean response from highest agreement to the strongest disagreement. The items have been renumbered to permit discussion of those having a significant F-value at the $p < .05$ level, or a relationship between the total number of microcomputer applications used and teachers' attitudes.

Statement No. 1, "In-service computer education should be made available to teachers by the school district," was agreed with more highly by teachers who used the most applications. Likewise, those teachers agreeing that they "Enjoy the opportunity to integrate computers into my teaching" (Statement No. 2) were also those who used the most applications.

Teachers who used the most applications were also more likely to "Strongly

Agree" that "Computers are available to me whenever I need to use them for my teaching," (Statement No. 7). However, teachers who "Disagreed" or "Strongly Disagreed" with this statement were also using significantly more computer applications than those who "Agreed" or were "Undecided." A similar pattern was found for Statements Nos. 10, 17, and 18.

Teachers who "Strongly Agreed" with Statement No. 10, "Most instructional software in business/marketing subjects appears likely to enhance teacher," were those who used the most computer applications. However, those teachers who "Disagreed" with this statement also used more applications than those "Agreeing" or who were "Undecided."

Teachers who "Strongly Agreed" with Statement No. 17, "Computers are sufficiently available to students outside of class," used the most computer applications. But those teachers who "Disagreed" or "Strongly Disagreed" used more applications than those who "Agreed" or were "Undecided." The similar Statement No. 18, "All students have equal opportunity/access to use computers in business/marketing courses," had the same pattern: Teachers who "Strongly Agreed" used the most applications, but teachers who "Disagreed" also used more applications than the "Agree", "Undecided," or "Strongly Disagree" group.

Teachers who used the most applications were most likely to "Disagree" or "Strongly Disagree" with Statement No. 21, "Most business/marketing applications software is too costly for instructional use at my teaching level."

The two statements dealing with programming languages, Statements Nos. 24 and 25, had mixed responses in relation to the number of computer applications used. Teachers who used the most applications were also those who "Strongly Agreed" that a "Knowledge of a programming language (BASIC or Pascal) is an

essential component of computer literacy for business/marketing teachers." However, there was general disagreement with this statement; the mean response was 3.4 (Table 29). There was also general disagreement with Statement No. 25, "Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/marketing students," mean of 3.5 (Table 29). But teachers using the most applications were likely to either "Strongly Agree" or "Strongly Disagree."

A similar split of agreement between "Strongly Agree" and "Strongly Disagree" was seen in Statement No. 26, "Most business/marketing applications software is too complicated for instructional at my teaching level." The one teacher strongly agreeing used the most applications. But those who used the most applications generally "Strongly Disagreed" with this statement. Similarly, those teachers who used the most computer applications "Strongly Disagreed" with statement No. 27, "Most instructional software in business/marketing subjects is generally uninteresting or instructionally unsound."

Table 30

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Secondary Teachers

Attitude Statement		N / $\bar{X}$	Sample Size and Mean by Attitude Response 1 SA	2 A	3 Und	4 D	5 SD	F-Value
1.	In-service computer education should be made available to teachers by the school district.	N	125	102	16	6	0	
		$\bar{X}$	13.3	9.8	10.3	10.5	0	2.89*
2.	I enjoy the opportunity to integrate computers into my teaching.	N	118	89	35	5	1	
		$\bar{X}$	14.4	10.5	6.9	3.6	0	9.98**
3.	Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.	N	77	143	20	4	0	
		$\bar{X}$	13.0	11.3	10.6	7.0	0	1.01
4.	Lack of time for teachers to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	N	96	109	14	25	0	
		$\bar{X}$	12.2	10.9	14.9	11.8	0	0.94
5.	All teachers should become knowledgeable about microcomputer use in all facets related to bus/mktg education (accounting, file managers, graphics, sales, spreadsheets, word processing).	N	89	82	43	30	5	
		$\bar{X}$	11.6	12.5	10.0	11.8	10.6	0.73

(Continued)

Table 30 (Continued)

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Secondary Teachers

Attitude Statement	N / $\bar{X}$	Sample Size and Mean by Attitude Response: 1 SA	2 A	3 Und	4 D	5 SD	F-Value
6. All of the faculty should specialize in different computer applications; all staff do not need to be expert in all applications.	N	63	118	41	26	1	
	$\bar{X}$	12.1	10.9	12.9	12.7	0	1.19
7. Computers are available to me whenever I need to use them for my teaching.	N	89	92	12	43	12	
	$\bar{X}$	13.4	1.3	6.0	10.9	10.3	2.86*
8. All teachers should be able to use computers for teaching content (drill & practice, tutorial, simulation).	N	57	121	40	28	2	
	$\bar{X}$	13.9	11.3	9.8	12.2	3.0	2.31
9. Computers are available to me whenever I need to prepare for teaching.	N	86	100	12	39	11	
	$\bar{X}$	13.6	10.5	9.6	11.2	11.6	1.97
10. Most instructional software in bus/mktg subjects appears likely to enhance teaching.	N	29	131	74	11	0	
	$\bar{X}$	16.2	11.6	9.6	14.5	0	4.10**
11. The cost of instructional software justifies making extra copies for classroom use.	N	18	118	82	22	5	
	$\bar{X}$	13.3	11.6	11.3	11.3	14.4	0.37

(Continued)

Table 30 (Continued)

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Secondary Teachers

Attitude Statement	N / $\bar{X}$	Sample Size and Mean by Attitude Response 1 SA	2 A	3 Und	4 D	5 SD	F-Value
12. The cost of business applications software justifies making extra copies for classroom use.	N	28	106	84	21	6	
	$\bar{X}$	13.8	11.2	11.5	11.0	14.5	0.80
13. Lack of information about the quality/effectiveness of instructional software prevents acquisition.	N	24	115	55	48	2	
	$\bar{X}$	14.7	11.9	9.7	11.8	12.5	1.74
14. Cost of computing equipment prevents acquisition of a sufficient quantity of hardware for desired integration into the bus/mktg program.	N	22	115	40	65	2	
	$\bar{X}$	12.4	12.5	8.7	12.0	11.0	1.76
15. A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses.	N	35	100	57	44	13	
	$\bar{X}$	11.9	10.7	11.5	13.0	14.2	0.98
16. Software costs prevent acquisition of sufficient instructional materials for classroom use.	N	20	98	61	64	2	
	$\bar{X}$	12.7	11.2	10.2	13.2	20.0	1.84
17. Computers are sufficiently available to students outside of class.	N	38	109	25	54	22	
	$\bar{X}$	14.5	10.7	8.9	12.9	12.2	2.67*

(Continued)

Table 30 (Continued)

Relationship between Average Number of Total Microcomputer Applications and Attitude on Instructional Computing Issues Minnesota Secondary Teachers

	Attitude Statement		Sample Size and Mean by Attitude Response 1 SA	2 A	3 Und	4 D	5 SD	F-Value
18.	All students have equal opportunity/access to use computers in business/ marketing courses.	N	49	79	22	80	18	
		$\bar{X}$	14.8	10.2	9.7	12.3	9.7	3.37*
19.	Lack of time for students to learn bus/mktg applications software prevents its greater integration into bus/mktg classes.	N	17	91	38	94	4	
		$\bar{X}$	11.9	10.9	9.8	13.3	11.5	1.67
20.	Lack of correlated instructional materials appropriate for student use prevents greater use of bus/mktg applications software.	N	39	110	63	24	8	
		$\bar{X}$	13.0	12.2	9.6	13.5	10.5	1.74
21.	Most bus/mktg applications software is too costly for instructional use at my teaching level.	N	12	52	84	87	12	
		$\bar{X}$	10.4	10.2	10.4	13.6	15.2	2.89*
22.	Being able to write (author) my own instructional software would result in more useful material.	N	16	53	75	75	25	
		$\bar{X}$	16.4	11.5	11.3	10.9	13.1	1.85

(Continued)

Table 30 (Continued)

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Secondary Teachers

Attitude Statement		N / $\bar{X}$	Sample Size and Mean by Attitude Response 1 SA	2 A	3 Und	4 D	5 SD	F-Value
23.	In-service computer education should be primarily the responsibility of the individual teacher.	N	11	62	46	102	27	
		$\bar{X}$	14.5	11.5	10.8	11.9	11.4	0.50
24.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/ marketing teachers.	N	12	44	54	99	35	
		$\bar{X}$	16.8	11.2	9.8	11.8	13.4	2.53*
25.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for bus/ marketing students.	N	7	44	43	113	37	
		$\bar{X}$	14.3	12.2	8.9	11.6	14.3	2.60*
26.	Most bus/mktg applications software is too complicated for instructional use at my teaching level.	N	1	16	76	127	25	
		$\bar{X}$	16.0	7.9	10.2	12.2	15.6	3.38*
27.	Most instructional software in bus/mktg subjects is generally uninteresting or instructionally unsound.	N	1	10	82	137	15	
		$\bar{X}$	9.0	13.6	8.7	12.6	18.5	6.72**

* Significant beyond $p < .05$ ** Significant beyond $p < .01$

Postsecondary business teachers. The data from 85 postsecondary teachers are presented in two tables. Table 31 summarizes the proportion of teachers giving one of five responses to each attitude item ranging from a code of 1 for "Strongly Agree," 2 for "Agree," 3 for "Undecided," 4 for "Disagree," and a 5 for "Strongly Disagree." The average response on each item is also provided. Because the number of teachers responding to each item differed, sample size is reported for each item.

The items have been arranged in rank order according to the average response from those items have a mean response in the "Agree" range to those in the "Disagree" range. The item numbers correspond to the numbering on the questionnaire. Four items have mean responses of 1.8 or lower (agreement), and six items have means of 3.2 or higher (toward disagreement).

Those items having means lower than 1.8 (agreement) were the following:

1. I enjoy the opportunity to integrate computers into my teaching.
10. In-service computer education should be made available to teachers by the school district.
21. Lack of time for teachers to learn to use business/marketing applications software prevents its greater integration into business/marketing classes.
24. Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.

Those items having means of 3.2 or greater (disagree) were the following:

11. In-service computer education should be primarily the responsibility of the individual teacher.
12. Most business/marketing applications software is too costly for instructional use at my teaching level.
26. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/marketing teachers.
16. Most instructional software in business/marketing subjects is generally uninteresting or instructionally unsound.
27. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business marketing students.
13. Most business/marketing applications software is too complicated for instructional use at my teaching level.

No item had a mean over 4.0, or definitely in the "Strongly Disagree" range.

Table 31

Attitude Responses to
Instructional Computing Issues
Minnesota Postsecondary Teachers

	Attitude Item	N	Percent Responding SA 1	A 2	UnD 3	D 4	SD 5	Mean
10.	In-service computer education should be made available to teachers by the school district.	85	48.2	43.5	8.2	0	0	1.6
5.	I enjoy the opportunity to integrate computers into my teaching.	85	56.5	24.7	16.5	2.4	0	1.6
24.	Greater exposure by teachers to actual business micro-computer use in business/ sales offices would aid in teaching.	82	34.1	53.7	8.5	3.7	0	1.8
21.	Lack of time for teachers to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	82	46.3	40.2	4.9	7.3	1.2	1.8
7.	All of the faculty should specialize in different computer applications; all staff do not need to be expert in all applications.	85	34.1	37.6	20.0	7.1	1.2	2.0

(Continued)

Table 31 (Continued)

Attitude Responses to
Instructional Computing Issues
Minnesota Postsecondary Teachers

Attitude Item	N	Percent Responding SA 1	A 2	UnD 3	D 4	SD 5	Mean
9. All teachers should be able to use computers for teaching content (drill & practice, tutorial, simulation).	85	25.9	51.8	16.5	3.5	2.4	2.0
6. All teachers should become knowledgeable about microcomputer use in all facets related to bus/mktg education (accounting, file managers, graphics, sales, spreadsheets, word processing).	85	42.4	29.4	9.4	15.3	3.5	2.1
2. All students have equal opportunity/access to use computers in business/ marketing courses.	85	24.7	47.1	8.2	14.1	5.9	2.3
1. Computers are available to me whenever I need to use them for my teaching.	85	30.6	36.5	3.5	22.4	7.1	2.4
4. Computers are available to me whenever I need to prepare for teaching.	85	23.5	42.4	5.9	23.5	4.7	2.4
15. Most instructional software is bus/mktg subjects appears likely to enhance teaching.	82	8.5	51.2	32.9	6.1	1.2	2.4

(Continued)

Table 31 (Continued)

Attitude Responses to
Instructional Computing Issues
Minnesota Postsecondary Teachers

	Attitude Item	N	Percent Responding SA 1	A 2	UnD 3	D 4	SD 5	Mean
23.	Lack of correlated instructional materials appropriate for student use prevents greater use of bus/mktg applications software.	82	11.0	41.5	24.4	22.0	1.2	2.6
14.	The cost of business applications software justifies making extra copies for classroom use.	82	18.3	36.6	22.0	13.4	9.8	2.6
3.	Computers are sufficiently available to student outside of class.	85	12.9	44.7	10.6	25.9	5.9	2.7
18.	The cost of instructional software justifies making extra copies for classroom use.	82	13.4	40.2	23.2	12.2	11.0	2.7
19.	Lack of information about the quality/effectiveness of instructional software prevents acquisition.	82	7.3	36.6	30.5	25.6	0	2.7

(Continued)

Table 31 (Continued)

Attitude Responses to
Instructional Computing Issues
Minnesota Postsecondary Teachers

Attitude Item	N	Percent Responding SA 1	A 2	UnD 3	D 4	SD 5	Mean
20. Cost of computing equipment prevents acquisition of a sufficient quantity of hardware for desired integration into the bus/mktg program.	81	14.8	39.5	13.6	28.4	3.7	2.7
8. A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses.	85	11.8	42.4	11.8	25.9	8.2	2.8
25. Being able to write (author) my own instructional software would result in more useful material.	82	12.2	28.0	30.5	24.4	4.9	2.8
17. Software costs prevent acquisition of sufficient instructional materials for classroom use.	82	8.5	32.9	28.0	29.3	1.2	2.8
22. Lack of time for students to learn bus/mktg applications software prevents its greater integration into bus/mktg classes.	82	4.9	34.1	17.1	41.5	2.4	3.0

(Continued)

Table 31 (Continued)

Attitude Responses to
Instructional Computing Issues
Minnesota Postsecondary Teachers

	Attitude Item	N	Percent Responding SA 1	A 2	UnD 3	D 4	SD 5	Mean
11.	In-service computer education should be primarily the responsibility of the individual teacher.	85	4.7	23.5	23.5	40.0	8.2	3.2
12.	Most bus/mktg applications software is too costly for instructional use at my teaching level.	85	5.9	14.1	20.0	47.1	12.9	3.5
26.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/ marketing teachers.	82	4.9	11.0	20.7	42.7	20.7	3.6
16.	Most instructional software in bus/mktg subjects is generally uninteresting or instructionally unsound.	82	1.2	8.5	30.5	52.4	7.3	3.6
27.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for bus/ marketing students.	82	3.7	8.5	22.0	45.1	20.7	3.7
13.	Most bus/mktg applications software is too complicated for instructional use at my teaching level.	82	7.3	17.1	65.9	8.5	1.2	3.8

In Table 32, the total number of microcomputer applications reported by each postsecondary teacher are compared by attitude response. Analysis of variance was carried out to determine if the average number of microcomputer applications reported differed for teachers possessing different attitudes. The teachers included in this analysis were those who responded to both the questions about computer applications used and to the attitude statements. For the postsecondary group, this resulted in a drop in the total sample from 82 to 68 teachers. The number making each attitude response is reported for each item.

The number of computer applications is the sum of the three categories of business applications, business content taught using computers, and teacher-management tools used. When summed, the number of applications used by individual teachers (N = 70) ranged from 0 applications (9 teachers or 12.9 percent of the teachers) to 45 applications (2 teachers or 2.9 percent). The maximum numbers of applications on the questionnaire was 51. The average number of applications used by postsecondary teachers was 14.4 with a standard deviation of 10.8.

The items are arranged in the same order as in Table 31, from those having the highest agreement to those having the strongest disagreement. The items have been renumbered to permit discussion of Table 32. Four of the items had significant F-values at the $p < .05$ level of significance, indicating a relationship between the number of instructional computing applications used by teachers and their attitudes on these items.

The first item having a significant F-value was Item No. 8 in Table 32, "All students have equal opportunity/access to use computers in business/marketing courses." Persons agreeing with this item were also those

using a significantly larger number of computer applications.

A significant F-value for Item No. 11 shows that those teachers disagreeing with the statement "Most instructional software in business/marketing subjects appears likely to enhance teaching" were also those using the most computer applications. Those disagreeing, five teachers, represented 7 percent of those responding to an item on which there are generally agreement.

Teachers were mostly undecided on Item 18, "A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses." Those who disagreed with this statement, however, were using significantly more applications than those who agreed.

Item 20, "Software costs prevent acquisition of sufficient instructional materials for classroom use," was also one on which there was general disagreement. Those four teachers "Strongly Agreeing" with this item and the 20 teachers "Disagreeing," however, were teachers who used significantly more computer applications than teachers were were "Agreeing" or were "Undecided."

Table 32

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Postsecondary Teachers

Attitude Statement	N / $\bar{X}$	Sample Size and Mean by Attitude Response: 1 SA	2 A	3 Und	4 D	5 SD	F-Value
1. I enjoy the opportunity to integrate computers into my teaching.	N	41	14	11	2	0	
	$\bar{X}$	15.8	12.6	13.1	1.5	0	1.003
2. In-service computer education should be made available to teachers by the school district.	N	31	31	6	0	0	
	$\bar{X}$	15.3	11.7	22.3	0	0	1.416
3. Lack of time for teachers to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	N	31	26	4	5	1	
	$\bar{X}$	14.3	13.2	13.3	23.6	14.0	1.004
4. Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.	N	24	35	5	3	0	
	$\bar{X}$	14.3	14.9	12.0	15.3	0	0.086
5. All of the faculty should specialize in different computer applications; all staff do not need to be expert in all applications.	N	26	26	12	3	1	
	$\bar{X}$	14.0	14.2	12.4	26.3	10.0	1.070

(Continued)

Table 32 (Continued)

Relationship between Average Number of Total Microcomputer Applications and Attitude on Instructional Computing Issues Minnesota Postsecondary Teachers

Attitude Statement	N / $\bar{X}$	Sample Size and Mean by Attitude Response: 1 SA	2 A	3 Und	4 D	5 SD	F-Value
6. All teachers should be able to use computers for teaching content (drill & practice, tutorial, simulation).	N	19	32	14	1	2	
	$\bar{X}$	14.7	15.1	13.3	3.0	9.5	0.442
7. All teachers should become knowledgeable about microcomputer use in all facets related to bus/mktg education (accounting, file managers, graphics, sales, spreadsheets, word processing).	N	28	21	5	11	3	
	$\bar{X}$	15.4	14.3	14.4	14.2	4.7	0.649
8. All students have equal opportunity/access to use computers in business/ marketing courses.	N	15	35	5	8	5	
	$\bar{X}$	16.2	16.7	4.0	9.9	9.0	2.535*
9. Computers are available to me whenever I need to use them for my teaching.	N	20	26	2	15	5	
	$\bar{X}$	16.3	16.6	8.5	9.8	10.2	1.475
10. Computers are available to me whenever I need to prepare for teaching.	N	14	30	5	15	4	
	$\bar{X}$	15.6	14.3	14.8	12.5	15.5	0.161
11. Most instructional software in bus/mktg subjects appears likely to enhance teaching.	N	7	33	22	4	1	
	$\bar{X}$	14.9	15.4	10.3	25.25	32.0	2.869*

(Continued)

Table 32 (Continued)

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Postsecondary Teachers

	Attitude Statement	N / $\bar{X}$	Sample Size and Mean by Attitude Response 1 SA	2 A	3 Und	4 D	5 SD	F-Value
12.	Lack of correlated instructional materials appropriate for student use prevents greater use of bus/mktg applications software.	N	8	25	18	15	1	
		$\bar{X}$	15.9	14.4	14.6	14.2	10.0	0.076
13.	The cost of business applications software justifies making extra copies for classroom use.	N	13	26	15	7	6	
		$\bar{X}$	16.3	15.1	13.1	11.7	14.7	0.279
14.	Computers are sufficiently available to student outside of class.	N	9	30	6	18	5	
		$\bar{X}$	12.1	13.6	15.2	15.8	16.0	0.237
15.	The cost of instructional software justifies making extra copies for classroom use.	N	9	28	16	7	7	
		$\bar{X}$	12.1	17.5	12.8	10.7	13.4	0.975
16.	Lack of information about the quality/effectiveness of instructional software prevents acquisition.	N	5	28	18	16	0	
		$\bar{X}$	13.8	12.6	14.3	18.3	0	0.709
17.	Cost of computing equipment prevents acquisition of a sufficient quantity of hardware for desired integration into the bus/mktg program.	N	9	29	8	19	1	
		$\bar{X}$	14.7	14.3	10.0	18.1	0	1.381

(Continued)

Table 32 (Continued)

Relationship between Average Number of
Total Microcomputer Applications and
Attitude on Instructional Computing Issues
Minnesota Postsecondary Teachers

	Attitude Statement		N	Sample Size and Mean by Attitude Response					F-Value
			$\bar{X}$	1 SA	2 A	3 Und	4 D	5 SD	
18.	A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses.	N		8	27	8	19	6	
		$\bar{X}$		13.9	13.7	3.8	17.9	20.2	3.291*
19.	Being able to write (author) my own instructional software would result in more useful material.	N		10	21	20	14	2	
		$\bar{X}$		15.4	13.2	14.1	16.9	10.5	0.331
20.	Software costs prevent acquisition of sufficient instructional materials for classroom use.	N		4	21	21	20	1	
		$\bar{X}$		19.8	12.7	10.7	20.1	0	3.256*
21.	Lack of time for students to learn bus/mktg applications software prevents its greater integration into bus/mktg classes.	N		4	23	14	25	1	
		$\bar{X}$		19.3	12.5	11.9	17.6	0	1.653
22.	In-service computer education should be primarily the responsibility of the individual teacher.	N		3	16	16	28	5	
		$\bar{X}$		6.0	12.6	15.4	15.9	11.8	0.798

(Continued)

Table 32

Relationship between Average Number of Total Microcomputer Applications and Attitude on Instructional Computing Issues Minnesota Postsecondary Teachers

	Attitude Statement		Sample Size and Mean by Attitude Response					
		N / $\bar{X}$	1 SA	2 A	3 Und	4 D	5 SD	F-Value
23.	Most bus/mktg applications software is too costly for instructional use at my teaching level.	N	2	11	15	30	10	
		$\bar{X}$	21.0	14.2	7.5	16.6	16.2	2.243
24.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/ marketing teachers.	N	4	6	13	30	14	
		$\bar{X}$	8.8	14.3	11.4	15.4	16.9	0.786
25.	Most instructional software in bus/mktg subjects is generally uninteresting or instructionally unsound.	N	1	4	21	35	6	
		$\bar{X}$	32.0	12.3	9.8	17.1	14.5	2.441
26.	Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for bus/ marketing students.	N	3	5	13	31	15	
		$\bar{X}$	6.0	14.8	10.9	15.4	17.5	1.177
27.	Most bus/mktg applications software is too complicated for instructional use at my teaching level.	N	0	4	13	43	6	
		$\bar{X}$	0	10.5	7.1	16.6	18.0	2.461

* Significant beyond $p < .05$

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

This summary of instructional uses of microcomputers by business teachers is based on responses from 342 Minnesota teachers for the 1984-85 school year. These respondents were 62 percent of a random sample of secondary and postsecondary teachers in Minnesota who held vocational licenses. The 87 postsecondary respondents represented 29 vocational-technical institutes (85 percent of those sampled), and the 255 secondary respondents represented 207 high schools (69 percent of those sampled).

Teachers were asked about the types and quantities of computing equipment available to them in their business departments, their instructional computing applications in three main categories, their need for more information about instructional computing application in three main categories, and their attitudes about several instructional computing issues. The following conclusions and discussion are organized around these main topics. When appropriate, recommendations are made.

Computing Equipment Used

The main questions asked about computing equipment included the predominant brands used, the average number of computers in business departments, the ratio between the computers and printers available, the location of computers for instructional use, the use of computer networks, the relationship between school size and the amount of computing equipment available, and the relationship between access to other computers in the school and amount of equipment in the business department. The following paragraphs draw some conclusions from the findings of this survey.

Predominant brand. The predominant brand of computer at the secondary level was the Apple II; most postsecondary schools used both Apple II and IBM personal computers. Teachers education programs, therefore, need to prepare teachers for both brands of equipment.

Average number of computers. High schools had an average of 19 computers for instructional use in the business department; postsecondary schools had an average of 35 computers in the business programs. These averages are considerably higher than national data collection efforts have reported of 8.3 computers per public school building and even considerably higher than the reported Minnesota average of 13.7 (InfoGraphics, 1985, p. 3F).

Eight high schools, 4 percent of the 207 responding schools, had no computers. No postsecondary schools reported having no computing equipment. Schools without equipment are surely the exception, and it is unfortunate that any business department would not be able to provide students with instruction using this tool.

Computer-printer ratio. While not statistically different, secondary schools had a higher (less favorable) computer to printer ratio (4.0:1) than did postsecondary schools (2.7:1). Extreme variation at the high school level caused by one instance of a 50:1 ratio may be skewing the mean ratio for all schools to a higher level than is representative of actual use. A computer to printer ratio of at least 3:1 as the norm may be an indication that sharing printers in this proportion is workable, or not a hardship for students who may be using business microcomputer applications.

Location of computers. Compared to the high school where one-third of the computers were in multi-purpose classrooms, only about one-seventh of postsecondary business department computers were in multi-purpose classrooms.

This may suggest that more applications can be taught (as was true at the postsecondary level) when computers are organized so that they are sufficient for whole-class use. On the other hand, having relatively few computers in multi-purpose classrooms (an average of 6.5 at the high school and 5.5 at the postsecondary level) may account for the small proportion of teachers who taught business content with computer assistance.

The low availability of computers to teachers in their offices (an average of 0.5 per school at the secondary level and 1.0 per school at the postsecondary level) may account for the relatively limited use of teacher-management software tools. However, teachers at both levels tended to agree that computers were available to them when needed to prepare for teaching, so most teachers are apparently satisfied with their personal access to computers.

Computer networks. Only 12 high schools, 6 percent of the 207 schools responding, had computer networks; nine, or almost one-third of the 29 responding postsecondary schools, used networks. This study did not investigate the types of applications which were being supported by the networks. However, since postsecondary schools were teaching a larger number of different business applications, it may be correct to assume that a wider variety of applications can be managed when the software is organized through the assistance of a network.

Relation of school size and equipment. At the secondary level, schools having higher enrollments also had more computers and printers in their business departments. It seems reasonable for more computing equipment to be needed when enrollments are higher, but this relationship did not hold true at the postsecondary level. Since this study did not report the number of students served in business classes, no conclusion can be drawn regarding existing

student-computer ratios.

Access to other computers. There was no relationship, at either the secondary or postsecondary levels, between the number of computers or printers a business department had and their access to other computers in the school. Therefore, centralized school computer labs did not seem to be mechanisms for compensating for smaller numbers of computers in the business departments. This study does most provide information about the uses made of other computing resources available to business teachers or students.

Microcomputer Instructional Applications

Conclusions and discussion about microcomputer instructional applications are organized around the three categories of business microcomputer applications, teaching business content using microcomputers, and teacher-management uses. Some summary comments about the relationship of these three areas are also made.

Business microcomputer applications. The business microcomputer applications currently taught most frequently and which teachers said they were planning to teach are discussed below together with comments about the contrast between the secondary and postsecondary levels.

1. Prominence of word processing. Almost 80 percent of high schools and 97 percent of postsecondary schools taught word processing. More intermediate and advanced word processing instruction was being made available at the postsecondary level. This is not surprising given the time and equipment available and student interest in career preparation at the postsecondary level. Word processing could be considered the most fundamental business use of computing equipment for a wide range of jobs and for personal applications.

2. Prominence of accounting. Half of all responding high schools used computers to teach accounting applications; ~~one~~ three quarters to 80 percent of postsecondary schools did the same. Since business departments can generally be assumed to be teaching bookkeeping or accounting, it is surprising that only half of high school programs taught this common microcomputer-supported business use.

3. Other business applications. Approximately one-third of high schools taught BASIC programming, spreadsheet use, and data base applications. All other potential business applications were taught less. While the place of programming languages for high school instruction is an issue mentioned later, many other common business applications of microcomputers appear to be receiving inadequate attention by Minnesota high schools.

The ranking of business applications at the postsecondary level was similar to the high school, though the portions teaching each one differed. At least two-thirds of the responding postsecondary schools were teaching BASIC programming, spreadsheet use, and data base applications; this was twice the proportion of schools at the secondary level. Graphics showed a similar pattern; it was taught by 19 percent of high schools, 39 percent of postsecondary. The attention given to electronic mail, other telecommunications, and scheduling/calendaring was much less at both school levels, but all of these applications are becoming more common in business offices. Of the 21 applications listed, the average high school taught 7.5, and the average postsecondary school taught 9.2

Preservice business teachers need to be well prepared for teaching the most commonly taught business microcomputer applications, but provision of leadership for expanding the business applications taught requires that teachers be capable

of teaching more. Later discussion of teachers' attitudes will show that the question of "how much" all or some teachers should be responsible for teaching has not been resolved.

4. Plans to teach business applications. Approximately 20 percent of the high schools were planning to teach Accounting applications on the microcomputer, and 15 percent were planning to teach Spreadsheets and Data Bases. The next highest percentage was Electronic Mail with 15 percent of the secondary teachers planning to teach this.

In contrast, at the postsecondary level, 36 and 39 percent of the teachers respectively were planning to teach Electronic Mail and Telecommunications. Over 15 percent of postsecondary teachers were planning to teach in 13 business application areas, a much wider diversity of topics than that for which secondary schools were planning. This coincides with the finding that postsecondary schools are already teaching a wider range of business microcomputer applications than are secondary schools.

Teaching business content using microcomputers. The business content areas which were taught with computer assistance are discussed in the following paragraphs.

1. Infrequent use of computers to teach content. Secondary and postsecondary teachers did not differ in the average number of business content areas which they taught using microcomputers; of 19 possible topics, an average of three were taught using the computer. Less than half of the teachers at both levels taught any subject or topic using the computer. One-quarter to one-third of the teachers taught no business content this way.

2. Accounting most frequent content area. At both levels, accounting was the most frequently area taught using the computer, 44 . 5 percent at each level. Since at least one-third of teachers at each level was using the simulation mode for teaching accounting, this use is likely to have overlapped with what teachers also considered teaching the business microcomputer application of accounting. Much lower proportions, 10 to 15 percent, were using drill and practice or tutorial modes to teach accounting.

3. Keyboarding second most frequent content area. Keyboarding, both introductory and skill building, was the second most frequently taught content area using computer assistance by 33 to 39 percent of the teachers. Drill and practice was the most frequent mode used.

4. Low general use may be related to computer availability in multi-purpose classrooms. The rank order of topics taught using the computer after accounting and keyboarding differed for the two teaching levels, and all other topics were taught with computer assistance by fewer than 20 percent of the teachers.

Since the average number of topics taught with computer assistance did not differ between levels, the greater number of computers at the postsecondary level cannot be said to have affected this instructional computing activity. Since neither level had more than an average of 6.5 computers in multi-purpose classrooms, and all of these not necessarily in the same classroom, this could explain the marked lack of use of computers for teaching content directly.

Unless all students in a class have access to a computer, it may not be practical to use the computer to teach content for major portions of a course. The computer may be useful primarily for remedial or supplementary activities, or for accounting, office procedures, or management simulations during which

students work in teams. More computers may be necessary in multi-purpose classrooms if drill and practice or tutorial modes of computer-based instruction are to play a larger role in the delivery of instruction.

Teacher-management uses of computers. The teacher-management tools used are discussed in the following paragraphs.

1. Infrequent use of computers as teacher-management tool. Secondary and postsecondary teachers did not differ in the average number of teacher-management tools which they used; of ten possible tools, an average of two were used. One-third of the secondary teachers used none; 40 percent of postsecondary teachers used none.

2. Word processing most frequent tool. Paralleling its popularity in business, in the home use of computers, and its frequency for teaching as a business application, word processing was the most frequently used teacher-management tool. It was used by 55 to 61 percent of business teachers for their own work. This proportion may seem low until it is noticed that teachers had an average of one or, at the high school, less than one computer available to them in their offices for their own work.

3. Spreadsheets used second most frequently. A greater proportion of postsecondary teachers (46 percent) than secondary teachers (29 percent) were using spreadsheets for their personal use, even though it was the second-ranked tool for both groups. As many secondary teachers (28 percent) used grade-book maintenance programs as used spreadsheets. These two tools may be meeting the same need since a common use of spreadsheets by teachers is for student grade rosters.

4. Less use of other tools One-third or fewer teachers at both secondary and postsecondary levels used the remaining eight teacher-management tools listed in the questionnaire. Except for the ranking of data base software third for postsecondary teachers and fourth for secondary, the rank order of the software was virtually the same. The tool used by the fewest teachers was graphics displays or "slide shows". Several teaching aids made uniquely available by the computer are not being taking advantage of by most teachers.

Interrelationships Among the Three Applications Categories

Since there was a correlation between the number of applications which teachers used in the three categories of business applications, teaching business content, and teacher-management tools, it may be that offering teachers more opportunities to use teacher-management tools would increase the teaching of business applications as well. These opportunities could take the form of more computers in teachers' offices.

Teachers who gain increased confidence through this "private" use of computers may be encouraged to teach the same applications to their students. The payoff of also teaching more business content using computers would seem to require not only confidence and interest (plus software), but also more computers in multi-purpose classrooms.

As important as more computers might be for encouraging increased use, teachers expressed the attitude that lack of time was of a key factor in affecting their instructional use of computers. Computers are likely to save teachers and students time only after a necessary first investment of time to learn essential basic information and after further opportunity to use computers often enough to master the useful software.

Need for More Information About Instructional Computing.

In all three categories of instructional computing, no more than 20 percent of the secondary teachers nor 24 percent of the postsecondary teachers indicated a need for information in any one of the topics or applications. However, one-third to two-fifths of all teachers indicated a need for more information about at least one instructional computing topic in all three of the main categories. On the average, teachers said they needed more information in two business application areas, two to three business content areas which might be taught by computer, and one teacher-management tool.

There was some indication, however, that those teachers who are in most need of additional information may not be aware of or are unwilling to indicate these needs. Several comparisons showed that those teachers who expressed a need for more information already used the computer significantly more than those who did not express such a need. This was particularly evident in the category of teaching business microcomputer applications.

Since there were differences in the needs for information expressed by secondary and postsecondary teachers, each group is discussed separately in the three main categories of business microcomputer applications, teaching business content using computers, and teacher-management uses. The most frequently checked topics should have the highest priority for teacher in-service workshops.

Business microcomputer applications. The following applications (in rank order) were checked by at least 10 percent of the secondary teachers: Electronic Mail, Accounting (all areas), File Managers/Data Bases, Telecommunications, Spreadsheets, Graphics, and Scheduling/Calendaring.

The following applications (in rank order) were checked by at least 9 percent of the postsecondary teachers: Electronic Mail, Scheduling/Calendaring, Telecommunications, Graphics, File Managers/Data Bases, Programming in BASIC, Income Tax Accounting, Intermediate and Advanced Word Processing, Marketing Sales Analysis, and Programming in Pascal and Other Languages, such as C, Fortran, and assembler.

The following topics were among the top ranked needs by both secondary and postsecondary teachers: Electronic Mail, Telecommunications, Scheduling/Calendaring, File Managers/Data Bases, and Graphics.

Business content taught using microcomputers. While no more than 18 percent (secondary) or 24 percent (postsecondary) of the responding teachers marked any one business content area as one about which they needed more information, at least 16 of the 19 topics were checked by 10 percent of the teachers in both groups. This indicates that there may a general need by both secondary and postsecondary teachers for more information about teaching business content using computers.

The following business content areas (in rank order) were checked by at least 15 percent of secondary teachers: Office Procedures, Accounting, Income Tax Accounting and Business Law.

The following business content areas (in rank order) were checked by at least 20 percent of the postsecondary teachers: Business Mathematics, Business Law, Business Communication, Spelling, Office Procedures, Management, and Punctuation.

Teacher-management uses of computers. In contrast to postsecondary teachers, secondary teachers expressed a need for more information about Spreadsheets as a teacher-management tool. Except for Spreadsheets, which were

also already being used as a teacher-management tool by 45 percent of postsecondary teachers, the needs of secondary and postsecondary teachers for more information were similar. The teacher-management tools checked by at least 15 percent of both groups were the following: Grade Book Maintenance, Worksheet Generation, Authoring Software for Lesson Creation, and Test Answer Sheet Scoring.

Attitudes About Instructional Computing Issues

Teachers attitudes will be discussed in the two major categories of clear agreement, and areas of greater indecision.

Areas of agreement. Both secondary and postsecondary teachers expressed strong agreement with the statement that they enjoyed integrating computers into their teaching, but that time was not adequate for them to learn the business applications software they would like to teach. They saw the school district as primarily responsible for in-service computer education, but also thought that they needed exposure to actual microcomputer use in business offices. Both these vehicles of providing updating for teachers should be explored by teacher-education institutions as well as more formal, credit-based university workshops.

Business teachers do not think business applications software is too complicated for student use at either the secondary or postsecondary level, and, at least at the postsecondary level, they do not think business applications software is too costly. Even though teachers have not made extensive use of software for teaching business content, they do not think instructional software is uninteresting or instructionally unsound.

There is general agreement that knowledge of a programming language is not needed by either students or business teachers as an essential component of computer literacy. Even teachers who have used computers the most feel strongly that programming knowledge is not necessary. The key may not be the desirability of knowing a programming language, but whether it is necessary for computer literacy. These teachers say not.

The finding that teachers using the most computer applications agreed more strongly with the above issues than teachers who were using fewer applications provides some evidence of the reliability or internal consistency of the questionnaire.

Areas of indecision. Lack of unanimity of opinion suggests that the following issues continue to need discussion and resolution: equity in access to computers by teachers and students, the issue of copying software for classroom use, and appropriate preparation of business teachers for using computers in instruction.

1) Equity. Teachers who used the most computing application had the strongest options at both the agree and disagree extremes regarding equal access to computers by teachers and students. While this is an issue that may eventually be resolved by having more computers available, attention needs to be given now to ways of assuring equal opportunity for many groups to use limited equipment.

2) Software copying. The need to have classroom sets of software for teaching seems to have encouraged the development of rationales for practices that are illegal. If this illegality were know and accepted, it is unlikely that so many teachers would have agreed that the practice was justified, even if they did it. Plainly there is a need for purchasing plans that are fair to

software developers in order to encourage the creation of quality educational software and also fair to schools which need larger quantities of software than do individuals in order for the software to be usable.

3) Teacher preparation. It is difficult for all teachers to know and to be able to teach all the appropriate business microcomputer applications that are available, or it is? Postsecondary teachers who used the most computer applications did not think that a few teachers should specialize in computer uses. However, there tended to be agreement both that all teachers should be knowledgeable about microcomputers in all facets related to business education and also that all staff should specialize in different computer applications. The issue seems to be the balance between general knowledge about a wide range of computer applications and sufficient specialization to be able to teach, but teach how many specializations?

Summary

The data available from Minnesota business teachers about their instructional computing activities has permitted generalizations about the type of equipment and software being used and, therefore, the kinds of teaching activities and content pre-service students should be prepared to handle. Efforts to teach business microcomputer applications surpass the use of computers to teach business content or to use computers as a teacher-management tool. While these latter two areas may require greater equipment availability to teachers and students before they are used more, they represent untapped computing potential.

Less than half of the responding business teachers marked any area of instructional computing as one about which they needed more information. Since those who did say they needed information were often those already using

computers the most, there is reason to be concerned about teachers' awareness of their needs or their willingness to pursue new teaching challenges. Those needs which were expressed can form the basis for continued in-service educational offerings, but teachers are likely to prefer school-district supported workshops and opportunities to participate in actual business settings as they learn more about computer use.

Teachers who are teaching with computers liked the experience very much; as they have opportunities to do more and share their enthusiasm for the tool, greater computer use will become dependent largely upon continued access to equipment by more teachers and students. While more computers may be needed in teachers' offices and in multi-purpose classrooms, national data suggest that existing computers have not been used very intensively.

Minnesota has been fortunate to have an abundance of computers in comparison to other states, but ways need to be found to use existing computing laboratories as intensively as possible by as many students as are interested. The current survey did not ask about class scheduling or the amount of time computers were in use, but teachers were not agreeing that they or their students had sufficient, equitable access to computers. Equipment, software, and procedural needs for effectively teaching specific business applications should be the focus of other research.

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SURVEY OF MICROCOMPUTER USE/NEEDS

Business and Marketing Education
Department of Vocational and Technical Education
University of Minnesota
Winter 1984

YOUR NAME (Optional) _____

SCHOOL NAME _____

GRADES ENROLLED OR SCHOOL TYPE:
_____ K - 12 _____ 7 - 12 _____ 9 - 12 _____ 10 - 12
_____ AVTI _____ COMM COLLEGE _____ Other _____ (Please Specify)

ESTIMATED SCHOOL ENROLLMENT:
_____ < 250 _____ 251-500
_____ 501-1000 _____ 1001-1500
_____ 1501-2000 _____ > 2000

Do you want a summary of the survey results? _____ NO _____ YES
(If YES, include name above.)

I. TYPE OF COMPUTING EQUIPMENT USED IN THE BUSINESS AND MARKETING DEPARTMENT:

(To avoid duplication of information from one school, this section should be completed by ONLY the DEPARTMENT CHAIR, or ONE DESIGNATED PERSON in the department.)

For each equipment type, please indicate the number available in one or more of the three general locations.	Computer/ Business Labs	Multi-Purpose Classrooms	Teachers' Office
Apple II+/IIe	_____	_____	_____
IBM PC	_____	_____	_____
IBM PCjr	_____	_____	_____
TRS-80	_____	_____	_____
Other Computer _____ (Please specify)	_____	_____	_____
Dot Matrix Printer	_____	_____	_____
Letter Quality Printer	_____	_____	_____
Graphic Plotter	_____	_____	_____
Computer Network	_____	_____	_____

Department(s) have access to equipment in other _____ Yes _____ No

Judith J. Lambrecht
Professor

Division of Business and Marketing Education
420 Vocational and Technical Education Building
1954 Buford Avenue
University of Minnesota
St. Paul, Minnesota 55108
(612) 373-0112

II. BUSINESS MICROCOMPUTER APPLICATIONS

Please indicate which of the following BUSINESS MICROCOMPUTER APPLICATIONS you teach or plan to teach. If you teach an application, indicate whether you teach it as a separate course or teach it within another course.

If you need more information about any application in order to use it or to teach it, even if you already teach it, please check the last column on the right. This will be used as a basis for planning in-service courses for business and marketing teachers.

POSSIBLE BUSINESS MICROCOMPUTER APPLICATIONS	Taught as a Separate Course	Taught Within Another Course	Planning to Teach	Need More Info.
Accounting - General Ledger	____	____	____	____
Accounting - Accts. Receivable	____	____	____	____
Accounting - Accts. Payable	____	____	____	____
Accounting - Inventory	____	____	____	____
Accounting - Payroll	____	____	____	____
Accounting - Income Tax	____	____	____	____
Electronic Mail	____	____	____	____
File Managers/Data Bases	____	____	____	____
Graphics	____	____	____	____
Marketing - Sales Recording	____	____	____	____
Marketing - Sales Analysis	____	____	____	____
Marketing - Merchandising	____	____	____	____
Programming - BASIC	____	____	____	____
Programming- Pascal	____	____	____	____
Programming - Other _____ (Please Specify)	____	____	____	____
Scheduling/Calendaring	____	____	____	____
Spreadsheets	____	____	____	____
Telecommunications	____	____	____	____
Intro to Word Processing	____	____	____	____
Intermediate Word Processing	____	____	____	____
Advanced Word Processing	____	____	____	____
Other	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____
_____	____	____	____	____

____ I DO NOT teach any business or marketing applications on the microcomputer.

III. TEACHING BUSINESS CONTENT USING COMPUTERS

Please indicate whether you teach any of the following business content topics with the assistance of microcomputers. If you do, mark whether the activity is a drill & practice, tutorial, or simulation type of application.

If you would like more information about teaching with computers in a particular content area, even if you now use the computer to teach this topic, mark the right column. This will be used as a basis for planning in-service courses for business and marketing teachers.

BUSINESS CONTENT WHICH COULD BE TAUGHT WITH THE ASSISTANCE OF MICROCOMPUTERS	Drill & Practice	Tutorial	Simulation	Need More Info.
Accounting Principles	____	____	____	____
Business Communications	____	____	____	____
Business Law	____	____	____	____
Business Management	____	____	____	____
Business Mathematics	____	____	____	____
Career Education	____	____	____	____
Consumer Economics	____	____	____	____
Economics Principles	____	____	____	____
English Grammar/Style	____	____	____	____
General Business	____	____	____	____
Income Tax Accounting	____	____	____	____
Indexing and Filing	____	____	____	____
Keyboarding--Introduction	____	____	____	____
Keyboarding--Skill Building	____	____	____	____
Marketing Principles	____	____	____	____
Office Procedures	____	____	____	____
Punctuation	____	____	____	____
Sales/Selling	____	____	____	____
Spelling	____	____	____	____

____ I DO NOT use the microcomputer to teach any business or marketing content.

IV. TEACHER-MANAGEMENT COMPUTER USES

Please indicate whether you use the computer as an aid in preparing to teach or managing your own teaching records by checking the type of teacher-management software you use. Mark in columns 1, 2, or 3 whether you use the software often, occasionally, or seldom.

If you do not use the particular software package, but would like to, or if you do use the software but would like to use it more, mark column 4.

If you would like to have more information about a teacher management application, even if you use it some, mark column 5. This will be used as a basis for planning in-service courses for business and marketing teachers.

POSSIBLE TEACHER-MANAGEMENT SOFTWARE USES	1 Use Often	2 Use Occas.	3 Use Seldom	4 Would Like to Use More	5 Need More Info.
Authoring Software for Lesson Creation	____	____	____	____	____
File Manager/Data Base	____	____	____	____	____
Games Generation	____	____	____	____	____
Grade Book Maintenance	____	____	____	____	____
Graphics Displays or "Slide Shows"	____	____	____	____	____
Spreadsheet	____	____	____	____	____
Test/Drill Generator	____	____	____	____	____
Test Answer Sheet Scoring	____	____	____	____	____
Word Processing	____	____	____	____	____
Worksheet Generator	____	____	____	____	____

____ I DO NOT use the computer for any teacher-management applications.

V. ATTITUDES ABOUT MICROCOMPUTER USE

Please indicate whether you strongly agree (sa), agree (a), are undecided (un), disagree (d), or strongly disagree (sd) with each of the following statements. Use BUSINESS and MARKETING students and teachers as the basis for your ratings.

	sa	a	un	d	sd
1. Computers are available to me whenever I need to use them for my teaching.	___	___	___	___	___
2. All students have equal opportunity/access to use computers in business/marketing courses.	___	___	___	___	___
3. Computers are sufficiently available to students outside of class.	___	___	___	___	___
4. Computers are available to me whenever I need one to prepare for teaching.	___	___	___	___	___
5. I enjoy the opportunity to integrate computers into my teaching.	___	___	___	___	___
6. All teachers should become knowledgeable about microcomputer use in all facets related to bus/mktg education (accounting, file managers, graphics, sales, spreadsheets, word processing).	___	___	___	___	___
7. All of the faculty should specialize in different computer applications; all staff do not need to be expert in all applications.	___	___	___	___	___
8. A few of the faculty, but not necessarily all, should be encouraged to specialize in computer uses.	___	___	___	___	___
9. All teachers should be able to use computers for teaching content (drill & practice, tutorial, simulation).	___	___	___	___	___
10. In-service computer education should be made available to teachers by the school district.	___	___	___	___	___
11. In-service computer education should be primarily the responsibility of the individual teacher.	___	___	___	___	___
12. Most business/marketing applications software is too costly for instructional use at my teaching level.	___	___	___	___	___

	sa	a	un	d	sd
13. Most business/marketing applications software is too complicated for instructional use at my teaching level.	___	___	___	___	___
14. The cost of business applications software justifies making extra copies for classroom use.	___	___	___	___	___
15. Most instructional software in bus/mktg subjects appears likely to enhance teaching.	___	___	___	___	___
16. Most instructional software in bus/mktg subjects is generally uninteresting or instructionally unsound.	___	___	___	___	___
17. Software costs prevent acquisition of sufficient instructional materials for classroom use.	___	___	___	___	___
18. The cost of instructional software justifies making extra copies for classroom use.	___	___	___	___	___
19. Lack of information about the quality/ effectiveness of instructional software prevents acquisition.	___	___	___	___	___
20. Cost of computing equipment prevents acquisition of a sufficient quantity of hardware for desired integration into the bus/mktg program.	___	___	___	___	___
21. Lack of time for teachers to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	___	___	___	___	___
22. Lack of time for students to learn to use bus/mktg applications software prevents its greater integration into bus/mktg classes.	___	___	___	___	___
23. Lack of correlated instructional materials appropriate for student use prevents greater use of bus/mktg applications software.	___	___	___	___	___
24. Greater exposure by teachers to actual business microcomputer use in business/sales offices would aid in teaching.	___	___	___	___	___
25. Being able to write (author) my own instructional software would result in more useful material.	___	___	___	___	___
26. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/marketing teachers.	___	___	___	___	___
27. Knowledge of a programming language (BASIC or Pascal) is an essential component of computer literacy for business/marketing students.	___	___	___	___	___