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ABSTRACT

This study examines whether male and female teachers differ in: (1) their background or training for instructional uses of microcomputers, and (2) their uses of microcomputers to teach mathematics and science. Research carried out in 60 classrooms in 49 schools in 25 California school districts provided data on district and school microcomputer policies; classroom contexts; and teachers' characteristics, instructional decisions, and practices. Analyses of these data indicated that district and school characteristics and classroom organization and composition did not differ, by and large, among male and female teachers. Furthermore, gender was unrelated to teachers' subject matter and computer knowledge, patterns of microcomputer-based instruction, and instructional decisions and practices. Both female and male teachers provide leadership in the microcomputer movement, have the relevant training and experience that contributes to microcomputer use, use microcomputers for instruction in a variety of ways, and present equally viable role models. (Author/DJR)

TEACHERS AS ROLE MODELS: ARE THERE GENDER DIFFERENCES IN MICROCOMPUTER-BASED MATHEMATICS AND SCIENCE INSTRUCTION?

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Teachers as Role Models: Are There Gender Differences in Microcomputer-Based Mathematics and Science Instruction?[1]

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This study examines whether male and female teachers differ in (a) their background or training for instructional uses of microcomputers and (b) their uses of microcomputers to teach mathematics and science. Research carried out in 60 classrooms, 49 schools, and 25 districts in California provided data on district and school microcomputer policies; classroom contexts; and teachers' characteristics, instructional decisions, and practices. A secondary analysis of these data indicated that district and school characteristics and classroom organization and composition did not differ, by and large, among male and female teachers. Furthermore, gender was unrelated to teachers' subject matter and computer knowledge, patterns of microcomputer-based instruction, and instructional decisions and practices. Both female and male teachers provide leadership in the microcomputer movement, have the relevant training and experience which contributes to microcomputer use, use microcomputers for instruction in a variety of ways, and present equally viable role models.

[1]Funded by the National Institute of Education (NIE), this study was restricted to California for budgetary reasons. Nevertheless, California appears to be representative of microcomputer use in other leading states (Chambers & Bork, 1980).

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The growing use of microcomputers for public school instruction has raised both pedagogical and social policy concerns. On the pedagogical side are questions about the instructional capabilities of computer hardware/software, and how teachers can use this instructional potential successfully (Shavelson, Winkler, Stasz, Feibel, Robyn, & Shaha, 1984).

On the social policy side, a major concern is equity of access to microcomputers, particularly for minorities and females (e.g., Dasho & Beckum, 1983; Lepper, 1982; Miura & Hess, 1983). Equal access is essential in our public schools, since early education influences later educational and occupational opportunities and choices.

With respect to gender, the topic of this special issue, nationwide twice as many boys as girls take computer programming courses in high school. By college the ratio is 3:1 (Kolata, 1984). Will those without early exposure to computers be disadvantaged in a society where this technology is rapidly becoming indispensable at all levels of business and government?

Equity issues run deeper than just the numbers suggested. Commentators on gender inequity in the computer world point to the cult of masculinity that pervades the techology's subculture (Kieslar, Sproull, & Eccles, 1983; Kolata, 1984). Youngsters are often first attracted to the machines by games, many of which are titled and designed for boys (Miura & Hess, 1983; Revelle, 1984). War scenarios and physical adventure gaming predominate. Many computer stores and users' groups are almost boys' clubs in atmosphere and language. In the absence of classroom control measures, boys monopolize school equipment, in part because girls refuse to join the "mad rush" for limited hardware (Revelle, 1984). And boys excitedly explore and solve software puzzles while girls seek understandable instructions before plunging in (a reasonable if not easily satisfied demand; see Revelle, 1984).

Analyses that examine only forces that push girls away from terminals oversimplify the gender inequity issues. In a study of teachers' use of microcomputers, we uncovered data that help inform these issues. The study was not designed to explore gender inequity; our report here is a secondary analysis of data collected for other purposes. Consequently, it is not as complete in providing answers as an original study would be. Nonetheless, our results offer some surprises and suggest areas for further research.

By virtue of their pedagogical decisions and behavior, teachers can determine access to microcomputers in their classrooms, question and change the current practice of providing almost only drill and practice to lower achieving (often minority) students (*School Uses of Microcomputers*, 1983), and reduce sex-role stereotyping or other conditions that influence girls' interest in and access to computers. Yet little is currently known about the teachers who use microcomputers and how they use them, even though teachers provide the major impetus behind the implementation of microcomputers for instruction in many schools (Sheingold, 1981) and are ultimately responsible for the ways microcomputers are used in classrooms.

Even apart from specific pedagogical techniques, the gender of the teacher can be influential. It has long been a principle of sex equity in education that girls need to see females enacting roles in fields normally identified as male. It is further held that these female role models will be most effective if they are clearly competent and show enthusiasm for their work; wearing skirts is not enough. Such role models, it is argued, will demonstrate to girls opportunities they may not have considered, as well as show boys that a field is not ipso facto masculine.

The data from our study provided particularly useful for considering the influence of women teachers as role models. Two major questions guided our analyses: (1) Do male and female teachers differ in their background and training in ways that might influence their instructional uses of microcompters? (2) Do male and female teachers differ in their uses of microcomputers?

Previous research and prevailing beliefs suggest that the backgrounds of male and female teachers may differ in at least two ways relevant to this study. First, male and female teachers will probably have dissimilar academic backgrounds. Recent statistics on the distribution of male and female graduates with bachelor's degrees, for example, show that men outnumber women more than 2 to 1 in the attainment of a degree in computer science. In contrast, more women than men obtain a degree in education (Berryman, 1983). Second, men are thought to be more technically and mechanically oriented, while women are believed to suffer from technophobia (Naiman, 1982). Background differences such as these might differentially influence male and female teachers' interests in learning about and using microcomputers for instruction. A recent survey of computer-using and nonusing teachers provides some evidence for sex differences in computer use. Although the majority of both using and nonusing teachers were female, the percentage of males was larger among users than among nonusers (National Education Association, 1983).

Such background differences might also influence teachers' uses of microcomputers in instruction. For example, teachers with mathematics or computer, science training might be more inclined to tailor their instructional software (called courseware) to their students and curriculum, while teachers without such skills may limit their instruction to using courseware in whatever form is available.

Theoretical Framework

We examined these issues within a larger study entitled *"Successful" Teachers' Patterns of Microcomputer-Based Mathematics and Science Instruction* (Shavelson et al., 1984). The purpose of our original study was to determine which factors enhance "successful" uses of microcomputers in teaching mathematics and science. Special attention was given to how teachers used computers instructionally, and how these uses varied as a function of teacher characteristics (e.g., knowledge, attitudes) and contextual factors (e.g., student composition, school and district policies).

In order to define successful uses, we adapted the theoretical perspective of teacher decision making (Shavelson & Stern, 1981) to fit microcomputer-based instruction. The basic premise of the decision-making approach is that instruction is an ongoing process, under the active direction of teachers, in which teachers operationalize plans to provide a flow of instructional activity. This framework suggests that classroom computer use should be viewed in terms of how it is integrated within teachers' ongoing decision processes about instruction. This approach also identifies several important inputs to these decisions: the district, school, and classroom context; teachers' characteristics (attitudes and knowledge of the subject matter and computers); and instructional decision and activities (including how computers are used). We expect these variables to influence successful use.

METHOD

Sample

Teachers were selected within California through a "snowball" sampling procedure that solicited nominations of highly regarded teachers from experts in the field (e.g., officials in state government and education; administrators of educational computing organizations; district, school, and teacher contacts). We followed up these nominations through direct telephone contacts and successive screening of candidate teachers, schools, and districts.

Teachers were invited to participate if they fulfilled minimal criteria: they had been considered successful in their instructional uses of microcomputers, were currently using microcomputers as part of their regular classroom instruction in mathematics or science, and were responsible for determining the content and form of their microcomputer-based learning activities. We did not include teachers whose primary use of computers was to teach programming, computer literacy, or other academic subjects, because our study focus was on the use of microcomputers in mathematics and science instruction. In all, 124 teachers were nominated as "successful" or exemplary, and 60 microcomputer-using teachers in 25 districts and 49 schools met the other criteria and so comprised the sample for this study.

Data Collection Procedures

Because our conceptual framework focused on planning and interactive and evaluative processes of instruction, we chose a field-based, naturalistic method for conducting the study. Instructional uses of microcomputers were examined in elementary and secondary schools where lessons on science and mathematics were being taught.

Biographical questionnaires filled out by the teachers, interviews with them, and observations of their classrooms served as primary data sources, which were conducted and collected by four interviewers. Based on field notes from interviews and observations, the interviewers filled out a formal protocol that contained both open-ended and closed-ended yes/no and rating items that elicited data with respect to key variables under study. (For more details on measurements and reliability, see Shavelson et al., 1984).

In addition to the data on teachers, information on the district and school contexts surrounding instructional microcomputer use was obtained in interviews with district and building administrators and subsequently recorded in formal protocols.

CHARACTERISTICS OF THE SAMPLE

Our procedures for locating candidate teachers, schools, and districts produced a varied collection of computer uses and learning environments. Below, we briefly describe the teachers, their students, and some features of the learning environment (further description of schools and districts can be found in Shavelson et al., 1984).

Thirty-one teachers were female; 29 were male. Forty taught at the elementary level and 20 at the secondary level. As would be expected, female teachers were significantly overrepresented at the elementary level, comprising 65% ($N = 26$) of all elementary teachers. By contrast, female teachers comprised only 25% ($N = 5$) of all secondary teachers.

These teachers exhibited considerable diversity in background. Their teaching experience ranged from 2 to 38 years, with an average of 15.8 years. They also varied on undergraduate major and percentage of undergraduate coursework taken in the disciplines and education. Virtually all held positive attitudes toward computers.

Overall, teachers indicated that their students were about average in ability (mean = 2.1 on a 3-point scale) but the ability composition of individual classrooms varied from low to high. On average, classrooms were comprised of 38% minority students, but percent minority varied greatly from one classroom to another (e.g., percent minority ranged from 0 to 98). Less variable was the gender composition of the classrooms, in which male students comprised 54% on average.

Schools varied in the number of microcomputers available for instructional use and in their policies toward computers. Schools averaged 12.23 microcomputers, but the number ranged from 1 to 55. In 40% of the schools, microcomputers were housed in laboratories, while the other schools placed the computers in classrooms or in rooms adjoining classrooms.

RESULTS

Teachers' instructional uses of microcomputers may be influenced by personal characteristics, including their subject-matter knowledge and their knowledge of computer hardware and courseware. Information about these characteristics has a bearing on policies regarding teacher selection and training for districts seeking wide-scale implementation of microcomputer-based instruction. For example, information about teachers' experience with computer might, along with other information, enter into a district's decision about the types of teachers it seeks to hire or train.

In addition to these individual differences in teachers' knowledge, contextual factors encourage, discourage, or set limits on the kinds and range of instructional uses teachers may employ. For example, school district policies regarding the amount and kinds of hardware and courseware may influence computer use. At the school level, the nature of the students served might affect the modes of microcomputer-based instruction. Such contextual factors may also lead to different selection and training decisions.

Subject-Matter and Computer Knowledge

Studies suggest that men and women might differ with regard to computer and subject-matter knowledge, or at least in the number of courses they take in science and mathematics (e.g., Hewitt & Goldman, 1975). Differences in knowledge are important, because they may directly bear on teachers' microcomputer use. For example, one would expect that the greater a teacher's subject-matter knowledge, the greater the coordination between more microcomputer-based instruction and the curriculum. Or the greater the teacher's knowledge of computer courseware and hardware, the more likely the teacher would be to use a variety of instructional modes (e.g., drill and practice, tutorials, simulations).

Subject-Matter Knowledge

In lieu of direct and extensive testing of teachers' subject-matter knowledge, we settled for a proxy measure. We asked teachers to indicate the percentage of their total undergraduate coursework spent in science, mathematics, computer science, social science, humanities, and education (see Table I). Since subject-matter requirements differ for elementary and secondary teachers, we analyzed these percentages by both gender and grade. Although the results showed the expected trend, they were not statistically significant. This is because of the wide variety in the percentage of courses taken in a discipline among the men and among the women. Nevertheless, on average, male teachers had more coursework in science, mathematics, and computer science than did female teachers. The women took more courses in social science, the humanities, and education.

Teaching level, rather than gender, was related to differences in teachers' undergraduate coursework. Secondary teachers took significantly

Table I. Comparison of Teachers' Means on Subject-Matter Knowledge[a]

Percent undergraduate coursework in	Effect of gender			Effect of level		
	Female	Male	Statistical significance[b]	Elementary	Secondary	Statistical significance
Science	20.94 (15.30)	26.34 (24.12)	No	17.67 (16.02)	35.30 (22.48)	Yes
Mathematics	11.94 (12.11)	19.65 (12.98)	No	10.17 (7.84)	26.65 (14.49)	Yes
Computer science	.13 (.56)	1.97 (3.87)	No	.30 (1.59)	2.45 (4.10)	Yes
Social science	18.65 (18.23)	14.75 (13.00)	No	20.38 (18.14)	9.80 (6.40)	Yes
Humanities	23.32 (19.86)	19.11 (17.33)	No	24.50 (20.87)	14.63 (10.42)	No
Education	15.77 (16.30)	9.74 (11.32)	No	15.60 (16.32)	7.45 (6.57)	No

[a]Standard deviations are given in parentheses.
[b]Level of significance, based on two-way analysis of variance, was set at $\alpha = .05$. None of the gender by grade level interactions were statistically significant.

more coursework in science, mathematics, and computer science; elementary teachers in social science. This was not unexpected, since secondary teachers tend to specialize in one subject area, such as science or mathematics, while elementary teachers typically teach all subject-matter areas (for additional analysis and discussion of this topic, see Shavelson et al., 1984).

Computer-Knowledge

As with subject-matter knowledge, we sought a measure of teachers' computer knowledge that could be obtained relatively easily and unobtrusively with the teachers' cooperation. Accordingly, we asked teachers questions related to how extensively they had used computer hardware and courseware. For example, we asked them how many different disks or tapes they had used during the academic year, for which purposes they used microcomputers outside their teaching (e.g., text editing, information storage/recordingkeeping, games), and with which pieces of computer hardware they were familiar (e.g., floppy disk drives, cassette player, modem, printer). We also asked whether they had ever instructed other teachers or school staff in microcomputer use, or if they served as a computer resource person for their school. In addition, the interviewers rated each teacher's courseware and hardware knowledge on a 4-point scale (1 = not knowledgeable ...4 = extremely knowledgeable).

Although male teachers were more "experienced" on most of the experential measures (see Table II), the difference was significant only for the number of different types of hardware used. With the exception of the number of different courseware packages used, secondary teachers were more "experienced" than elementary teachers on these measures. There were no differences among interviewers' ratings of male and female teachers or of elementary and secondary teachers. All received relatively high ratings.

The pattern of results is quite clear: Gender and grade level are, for the most part, unrelated to teachers' experience in using microcomputers and in teaching other teachers about them. The teachers had, on average, used about 25 different courseware packages during the school year, applied computers outside their work in a number of different ways (e.g., word processing, data analysis), used several different types of hardware, and wrote in one or more computer languages. Approximately 70% of all teachers had taught staff development and 85% (virtually all of the secondary teachers) had served as a school resource person for microcomputer use. In short, these teachers had considerable experience

Table II. Comparison of Teachers' Means on Computer Knowledge[a]

Variable	Elementary Female	Elementary Male	Secondary Female	Secondary Male
Experience				
Number of different courseware packages used	21.42 (25.49)	34.71 (36.33)	8.0 (3.39)	27.57 (31.86)
Number of uses of computers outside teaching	2.88 (2.58)	4.61 (2.14)	4.40 (1.52)	3.80 (2.76)
Number of different types of hardware used[b]	1.69 (.97)	2.79 (1.19)	2.40 (.55)	3.13 (1.06)
Number of computer languages used	.88 (.99)	1.07 (.62)	1.40 (1.14)	1.67 (1.17)
Taught teachers or other staff[c]	.58 (.50)	.86 (.36)	.80 (.45)	.80 (.41)
Served as resource person[c]	.69 (.47)	.93 (.27)	1.00 (.00)	1.00 (.00)
Interviewer's rating of				
Courseware knowledge	2.68 (.85)	2.57 (.85)	3.40 (.89)	2.69 (.75)
Computer knowledge	2.57 (.81)	2.86 (.86)	2.80 (.84)	3.08 (.49)

[a]Standard deviations are given in parentheses.
[b]Level of significance, based on two-way analysis of variance, was set at $\alpha = .05$. Main effect for gender only was significant. None of the gender by grade level interaction effects were statistically significant.
[c]Responses to these items coded 0 = no, 1 = yes.

with microcomputers as a whole. Interviewers' ratings of courseware knowledge (mean = 2.72 for all teachers) and computer knowledge (mean = 2.75) are consistent with the teachers' reports of computer experience.

Instructional Uses of Microcomputers

A major goal of the larger study (Shavelson et al., 1984) was to describe existing instructional applications of microcomputers that may be termed "successful." In order to identify patterns of microcomputer-based mathematics and science instruction employed by teachers, we first identified instructional characteristics that underlie successful microcomputer-based instruction. The following definition of "success" guided our selection of variables (characteristics): Successful computer use is the appropriate integration of microcomputer-based learning activities with teachers' instructional goals and with the ongoing curriculum, which changes and improves on the basis of feedback that indicates whether desired outcomes are achieved.

Using these characteristics, we created a profile for each teacher and formed statistically homogeneous clusters of teachers. Next, we interpreted these clusters on the basis of certain characteristics and validated our interpretations using additional characteristics of successful microcomputer use (see Shavelson et al., 1984, for details of this analysis). Finally, we described the clusters of teachers using variables related to instructional decisions and practices regarding microcomputer use. The following four clusters emerged.

Teachers in the "orchestration" cluster ($N = 18$) tended to coordinate microcomputer activities with other classroom learning activities, stressed both mastery of basic skills and cognitive goals, considered microcomputer use a valuable tool in itself, grouped students in various arrangements at the computer, altered instruction based on feedback, and used a variety of instructional modes.

Teachers in the second cluster, labeled "enrichers" ($N = 23$), also encouraged microcomputer use in its own right. They were likely to use microcomputers in other subject areas or for other instructional purposes, such as word processing. They did not, however, try to coordinate microcomputer use with other classroom activities, nor did they strive for broad coverage of the subject-matter with the computer. Enrichers made little use of the computer for teaching basic skills.

Teachers in the "adjunct instruction" cluster ($N = 14$) were more likely to have students work in groups of two or more than were other teachers. They stressed the acquisition of conceptual knowledge and skills, but limited computer use to a single subject area. They tended to selectively augment certain lessons, stressing conceptual knowledge, with what little courseware might be available.

Teachers in the "drill-and-practice" cluster ($N = 5$) were characterized by extensive coordination between computer and class activities and by emphasis on basic skills. However, they did not value computer use as a goal in itself. They used one (drill and practice) or two modes of instruction, did not change instructional use based on feedback, and only assigned students to the microcomputer one at a time.

A fundamental question bearing on the gender equity issue is whether male and female teachers systematically differ in the cluster to which they belonged. A cluster by grade level by gender analysis of variance revealed that cluster membership was not related to gender; nearly equal numbers of male and female teachers were found in each cluster. Similarly, grade level did not influence cluster membership. This suggests that "successful" microcomputer use, according to our definition, depends largely on the teachers' interests and instructional proclivities, regardless of their gender or the grade level taught. Moreover, our larger study (Shavelson et al., 1984) showed that these patterns of instructional use were not related to district and school policies for and support of microcomputers, nor to the number and location of microcomputers available for teacher use.

Instructional Decisions and Practices

These different patterns of microcomputer use, based on general characteristics underlying successful use, should also be related to specific instructional decisions and practices. If such differences were found, they would elaborate and refine our understanding of alternative patterns of instructional microcomputer use. To this end, we gathered information on teachers' (a) uses of the computer in other subject areas, (b) allocation of time for microcomputer use, (c) use of specific instructional modes (e.g., simulations, tutorial, drill and practice), (d) rules for microcomputer use, (e) strategies for grouping students, and (f) participation in courseware selection decisions.

By and large, these instructional decisions and practices did not differ by gender. The lone exception is that female teachers used more tutorial programs than did male teachers.

In contrast, grade level was a significant factor, particularly with regard to student rules for using microcomputers. Secondary teachers had more rules about games (40% of secondary teachers), time allocations (45%), and student access to the microcomputer (40%) than did elementary teachers (20%, 17.5%, and 7.5%, respectively). When asked about rules for computer use, many elementary teachers explained that rules were not needed as the children want to please the teachers and, therefore, generally do as they are told. Elementary teachers were more likely to bring the microcomputer into other facets of instruction or to use it in other subject areas. Sixty-four percent of the secondary teachers wrote their own courseware, compared to 11% of the elementary teachers. Finally, in assigning computer activities, elementary teachers were more likely to match students with content topics and/or difficulty levels which met students' needs.

District, School, and Classroom Context

District and school policies for implementing an educational program, including microcomputer-based instruction, have profound effects on the program's impact and longevity (e.g., Berman &

Table III. Comparison of Teachers' Means on Teaching Context[a]

Variable	Elementary Female	Elementary Male	Secondary Female	Secondary Male
Organization				
Number of microcomputers[b]	7.64	9.00	18.20	22.23
	(5.41)	(8.77)	(4.54)	(12.96)
Proximity to microcomputer[c]	1.41	1.79	1.75	1.64
	(.80)	(.97)	(.50)	(.74)
Composition				
Percent minority	35.31	49.57	32.20	33.73
	(29.78)	(33.72)	(36.97)	(34.49)
Ability level	2.15	1.93	2.60	2.00
	(.61)	(.73)	(.89)	(.93)

[a]Standard deviations are given in parentheses.
[b]Level of significance, based on two-way analysis of variance, was set at $\alpha = .05$. Main effect for grade level only was significant. None of the gender by grade level interactions were significant.
[c]Proximity coded as 1 = in classroom, 2 = in laboratory adjacent to classroom, 3 = in laboratory.

McLaughlin, 1978; Hall, 1981; Romberg & Price, 1981). Recognizing the potential importance of district and school context, we collected data on the extent to which the 25 districts supported the implementation of microcomputer-based instruction, and on the extent to which the 49 schools (principals) supported and provided incentives for microcomputer use.

For each district and school level variable, we examined differences among male and female teachers and among elementary and secondary teachers. We did not find gender differences on any of the following district and school variables: the source of the impetus for computer use, the level of district support, the inclusion of microcomputers in the district budget as a line item, the provision of personal support for microcomputer use, incentives for using computers, and the number of microcomputers available for instruction.

With two exceptions, district and school variables did not differ among elementary and secondary teachers. In elementary schools, the impetus for computers came clearly from the teachers, while in secondary schools, the impetus for computers came from a cooperative effort of teachers and administrators. In addition, resource persons were more likely to be found in elementary rather than secondary schools.

The classroom context profoundly affects instructional processes and outcomes (e.g., Borko, Shavelson, & Stern, 1981; Burstein, 1980; Barr & Dreeben, 1977; Walberg, 1976; Webb, 1980). To what extent does the classroom organization and student composition differ for male and female teachers? With regard to composition, we can answer this question in a limited way from the teachers' estimation of the percentage of minority students in their classes and of the ability level of their students (categorized as 1 = low, 2 = middle, and 3 = high). As for organization, teachers indicated and we observed the number of microcomputers available for instruction and their proximity to the teachers' classrooms. Since elementary schools are organized around self-contained classrooms and secondary classrooms are organized by subject matter, we included grade level as a variable in our analysis.

Gender proved to be unrelated to the organizational variables directly or by interacting with grade level (see Table III). On average, about 12 microcomputers were available for teachers to use, but this number varied greatly from one teacher to the next. However, that significantly more microcomputers were available to secondary, as compared to elementary, teachers is consistent with microcomputer-using schools (cf. Becker, 1983). Almost half of the teachers took their students to laboratories to receive microcomputer-based instruction.

CONCLUSIONS

Male and female teachers nominated as successful users of microcomputers in mathematics and science instruction were, for the most part, similar in their background and training for computer use and in their instructional uses of microcomputers. Significant gender differences were found in only two isolated instances: Male teachers had more experience with different types of computer hardware; female teachers used more tutorial programs. These differences were of little consequence compared to the overwhelming evidence of similarities among male and female teachers—in their knowledge about computers, their academic backgrounds, their teaching styles, and in the districts and schools where they taught.

These findings provide answers to several important questions regarding teacher gender and computer use. First, are female teachers less likely to provide leadership in our schools, as suggested by previous research (National Education Association, 1983)? In our study, the answer was clearly "no." Both male and female computer buffs were found in all school districts. These teachers were most dedicated to the goal of microcomputer-based instruction in their schools and showed extra initiative to interest and train other teachers and to gain support from the district, school board, and community. Furthermore, in elementary schools, where there are typically more female than male teachers, the impetus for computer use was clearly grass roots, or from the teachers.

Second, since male teachers are expected to have more relevant training and experience contributing to microcomputer use, it follows that female teachers might need more training than male teachers. Again, our results indicate that this was not the case. Teachers, regardless of gender, do not need formal education in computer science to use computers successfully in the classroom. Indeed, many of the teachers were self-taught or had only the benefit of an introductory staff development course on microcomputer-based instruction. Many more teachers can make the transition to microcomputer-based instruction if schools and districts provide adequate staff development activities (see Shavelson et al., 1984, for staff development recommendations) and if teachers have the interest to learn about computers.

Third, do the instructional uses of microcomputers differ for male and female teachers? The answer from this study is a resounding "no." Regardless of gender, microcomputer use can take a variety of forms. Teachers varied greatly as to (a) the goals of microcomputer-based instruction (e.g., mastery of basic skills, acquisition of conceptual reasoning, or both); (b) the extent to which they used microcomputers instructionally, integrated computer-based instruction with the ongoing curriculum, and coordinated computer activities with other instructional activities; and (c) the extent to which they varied the modes of microcomputer-based instruction, ranging from almost exclusive drill and practice to the orchestration of multiple modes, including drill and practice, tutorials, simulations, microworlds, and games. Furthermore, teachers' decisions about how to integrate computers in the classroom, although often limited by the courseware available or by microcomputer laboratory schedules, were not bound by lack of ideas.

Finally, do male and female teachers present different role models for computer use? Again, our study found equal involvement among male and female computer-using teachers. We interpret this as a positive sign for the implementation of this new technology in schools. Female computer-using teachers may act as role models for girls, who for various reasons avoid computers. Their presence may also help dispel the myth, for both male and female students, that women are generally less technically oriented than men. In a society where computer use is steadily increasing, it is important that students neither fear the computer nor develop stereotypical attitudes regarding its use.

Our data could not address one important facet of the role model approach, namely, whether these noted computer teachers were sensitive to sex equity issues in their classrooms. The sex of a teacher is not a predictor of nonsexist practices. We encourage others to explore in greater detail teachers as role models to determine the relationship between gender and nonsexist instructional practices. We also encourage further study of women computer buffs, like the teachers in our study, to identify the social and psychological factors that drew them to the terminal.

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