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While the initial adoption of microcomputers may be a highly ambiguous process, future implementations could be facilitated by an over-all strategy of linking teachers to specific applications.

# Microcomputer Adoptions and Educational Change

by Elden A. Bond

The increasing utilization of microcomputers in schools has created much debate, controversy, and confusion. Becker (1984) reported that microcomputer use in public education in the United States is frequent and widespread. Is this phenomenon an example of unplanned change or an example of purposeful instructional innovation? A study was undertaken to provide insights into this question and to provide an interpretation of the microcomputer adoption process. Specific objectives of the study included contributions to (1) an understanding of the decision to utilize microcomputers, including identification of the participants in the decision, (2) an understanding of the process of assimilating microcomputers into the instructional program, and (3) an understanding of the process of educational change itself.

Methods used in this qualitative study include the development of a conceptual framework which distinguishes change from innovation. Interviews with school district personnel and documents relative to microcomputer implementations were collected from two non-similar school districts. These data were analyzed using a **time-ordered matrix** to establish an event chronology as suggested by Miles and Huberman (1984). Results of the analysis are presented in the form of a narrative. Also included is a discussion of the similarities in the adoption patterns in the selected school districts, from which conclusions are derived. Implications for further microcomputer implementations are discussed in the context of planning and organizational theory.

The intent of the study was to identify processes that are present, and to contribute to knowledge of the variables involved so that further studies could explore these factors. It is important to note that the study was not designed to evaluate the educational uses of microcomputers, nor was it designed to evaluate the quality of the implementations in the selected school districts.

## Innovation and Change

The introduction of microcomputers into the school

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environment is an example of educational change. While change in itself implies neither planning nor direction, innovation implies both. In order to conceptualize innovation, it is important to distinguish between the subprocesses of diffusion, adoption, and implementation. Diffusion is the process of communication of change through social systems, as suggested by Rogers (1983). Change in institutions and organizations is reflective of the dynamic nature of society; innovation involves change selected by an organization.

Adoption is the decisional process that associates the school district with the innovation: it is the announcement of intentions. The involvement of decisions and intentions in the adoption process emphasizes the importance of understanding innovation from an organizational perspective. Adoption of educational innovations is ambiguous because intentions tend to be loosely coupled to actions (Weick, 1976). In the context of planning for innovation, the goals of a particular adoption may bear little relation to implementations. Clark (1981) has suggested that goals may be entirely inappropriate as necessary conditions for planning in educational organizations.

Implementation is the actual placement of the innovation in the instructional system, an important distinction because many innovations are adopted but never implemented (Aslin and DeArman, 1976). The implementation subprocess involves not only adjustment of the user to the innovation, but also adjustment of the innovation to the local situation, a concept which Fullan (1982) describes as **mutual adaptation**. Thus the form of the adopted innovation may be quite different from the form of the implemented innovation.

## Westview School District

Westview is the name that will be used for a small city in Western Washington, with a school district enrollment of approximately 10,000 students. Westview first became involved with microcomputers through some isolated early adoptions at the high school level. A background of pressure for implementing microcomputer use from teachers, parents, and the community resulted in the formation of a microcomputer review committee in December of 1982. This committee reported directly to the assistant superintendent of the school district.

The actual decision to adopt microcomputers stemmed from the attendance of Westview administrators at national conventions which featured reports of "successful" microcomputer implementations in major school districts. On the basis of this demonstrated feasibility of implementation, the superintendent decided it was time to "go ahead" with microcomputers.

Additional committees composed of teachers, principals, administrators, and consultants were formed to develop recommendations concerning (1) instructional uses, (2) management uses, and (3) community, staff, and miscellaneous uses. The committee approach was intended to secure broader involvement within the school district, and to methodically and deliberately develop their recommendations. These committees reported to the original microcomputer review committee, which reported to the assistant superintendent, thus creating a hierarchical structure.

The elementary schools in the district were required to justify the allocation of resources for microcomputers. Before funds were made available, each school would complete a "Microcomputer Implementation Plan." This policy was the result of administrative sensitivity to the relatively high national test scores in the elementary schools. Spe-

cific problems other than academic achievement would have to be identified as targets for microcomputer use. In addition, administrators felt that these plans would lead to the identification of those individuals best able to facilitate the implementation. The plans would stimulate the commitment in each school to their microcomputer plan.

Considerable effort was expended at the school, committee, and administrative level in the discussion and documentation of student learning objectives, which were stated in the form of specific microcomputer applications. The committee also developed an elaborate plan for continuing inservice training and course development. Topical areas include word processing for classroom and management uses, the development of problem solving skills, computer awareness for parents, and computer-assisted instructional applications. Teacher skills, support material, and hardware selection were seen as important but subsidiary factors in the planning process.

The clearest statement of the intended uses of microcomputers was found in a document produced for a "computer tour" by members of the Westview board in February of 1985. This tour was organized by the administration in response to board interest in the utilization of the allocated resources. With over 300 computers in the schools, Westview devoted considerable monetary and organizational resources to the implementation, in addition to the time spent by numerous school system personnel.

#### Grass Valley School District

The second case will be called Grass Valley. Located in rural Eastern Washington, the Grass Valley School District has an enrollment of about 100. Original school district consideration of adoption occurred due to pressure from the school board chairperson whose child showed an interest in microcomputers. In response to pressure from the chairperson, the superintendent formed a committee of parents, teachers, board members, and interested members of the community to "scout" computer usage in other school districts. While no formal, written policies were produced, the committee recommended the purchase of three computers to "get computers in use."

After this initial purchase was made, two teachers began using computers for word processing and computer-assisted instruction. A grant was written for three additional computers. Eventually, eight teachers would make substantial classroom use of microcomputers in several curricular areas, including vocational education, programming, computer-assisted instruction, and word processing for writing term projects in history. Although not intended by the committee, Grass Valley now has nine computers of three different, incompatible types. This is viewed, by the administration, as an advantage because students gain exposure to a wider variety of hardware and software.

Concepts that are considered by the school district superintendent as important to the implementation include (1) the close involvement of at least a few teachers, and (2) inservice. Several on-site inservice programs were conducted; these were critical to the expanded implementation, as perceived by the superintendent.

#### Comparison of the Two School Districts

There are some obvious differences in the scale of the implementation due to the sizes of the two school districts. Westview purchased over 300 microcomputers, and developed an elaborate series of inservice programs; Grass Valley purchased nine and conducted several inservice programs. Despite these differences, there are some

remarkable similarities in the patterns of microcomputer adoption and implementation:

1. Both school districts experienced internal pressure from teachers and students, and external pressures from community members to adopt microcomputers. The decision to adopt microcomputers was a direct result of these pressures.

2. In both cases, committees were used to control the rate of implementation. In the case of Grass Valley, the purpose of the committee, from an administrative point of view, was to "slow down" the implementation. In the case of Westview, the purpose of the committee was to ensure a formal, deliberate process, which had the same effect.

3. In both cases, the clearest statement of the intention of the microcomputer implementation came after the implementation occurred. In the case of Westview, this was in the form of the "computer tour" document. While no documents exist in the Grass Valley case, it is apparent that the intentions grew along with the implementation.

4. While no attempt was made to evaluate effectiveness, the perceptions of personnel in each school district is that the two microcomputer implementations were successful. The Westview implementation, despite some minor timing differences between individual schools, was accomplished in a single step. The Grass Valley implementation occurred in a more flexible, fragmented manner. Political pressure in Grass Valley forced an early, limited adoption.

Microcomputer adoptions differ from most other curricular and instructional innovations because of the extent and rapidity of diffusion of microcomputers within society. Large scale advertising and mass media coverage are important examples of this phenomenon. At the time of adoption, the two communities had a much greater awareness of microcomputers than awareness of, for instance, a new textbook series. The magnitude of this awareness resulted in (1) the existence of change agents within the school districts, and (2) the existence of considerable external pressures to adopt microcomputer use. These pressures created a potential for adoption, but the timing of the decision depended on a change in the value structure of the leadership.

The adoption process in the two school districts studied involved the change in values of the administrative leaders. The form of this change was acceptance of the association of the school district with the microcomputer innovation concept. In the case of Westview, the superintendent accepted the concept when presented with evidence of peer acceptance. In the case of Grass Valley, political pressure caused the superintendent to accept the concept, at least in a limited way. The purposeful nature of innovation implies assessment in relation to educational objectives, and concern with improvement of instruction. However, educational objectives of the innovation were not clear in the two cases presented above. Analysis of innovations, then, must reference the contextual intentions of the participants; an example is the important role of the board chairperson's child in the Grass Valley adoption. Clear explanations of the educational goals of microcomputers came only after the innovation had been implemented.

#### Implications for Planning

Rational models of educational change are inadequate to describe innovations because they assume that planning begins with a clear statement of goals. The ambiguous nature of educational goals, along with the lack of previous or-

ganizational experience of an innovation makes this assumption highly doubtful. Ambiguity of the educational objectives of microcomputer use, as experienced by the two school districts studied, illustrates the difficulty of applying rational models. Further, as suggested by Weick (1976), it may be a mistake to assume that planning is directly coupled to outcomes in educational organizations. If innovation involves the systematic allocation of resources based to some extent on values, a political perspective is implied. Such a perspective allows a more accurate explanation of planned change because it includes the portion of the decision process based on social value systems.

If the ramifications of an innovation were wholly understood, it wouldn't be new. Purposeful change is accompanied by unintended consequences in addition to intended consequences: freeways were not predictable when the automobile was first introduced. Where there is no specific organizational experience of an innovation, the consequences cannot be wholly anticipated, and planning becomes ambiguous, especially in loosely coupled organizations. This paradox suggests a possible explanation for the pattern of microcomputer implementation: The ill-defined nature of the educational goals of microcomputer use tends to make the planning of implementations a difficult process. Ambiguity in the implementation process is thus a reflection of ambiguity in the adoption, and planning becomes the rationalization of the adoption decision.

A large number of very specific educational applications of the microcomputer are available in the form of computer-assisted instructional courseware, languages, word processors and other programs. As suggested by Sheingold, Kane, and Endrewit (1983), the specificity of these applications may be well-suited to local interpretation of the microcomputer innovation. Microcomputers are no longer new; most educational organizations have a better understanding of the potential of microcomputers as

well as their limitations. School district administrators can take advantage of this experience for planning further implementations.

While the initial adoption of microcomputers may be a highly ambiguous process, further implementations could be facilitated by an overall strategy of linking teachers to specific applications. planners need to devote more resources to the identification, implementation, and maintenance of applications for single teachers or small groups, and less time to large scale standardized hardware, software, and inservice activities within the school district.

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