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ABSTRACT

In order to discover the extent to which the rhetoric surrounding computers in schools is matched by reality, a study of computer use and teacher acceptance was undertaken in a large upper elementary school (grades 4-6) in an affluent, semi-rural community near a major metropolitan area. The school was near the end of its five year instructional computer plan, which included an extensive inservice component consisting of summer computer literacy workshops, training of newly hired teachers, and training in specialized computer applications. Thirty-four teachers and two administrators completed a questionnaire on their computer use and attitudes toward computers. Logs were kept of student use of computers, documents relating to computer use and policy were analyzed, teachers and administrators were interviewed, and teachers and students were observed using computers. Data analysis indicated that the microcomputer-based innovation has a long way to go before it could be claimed that computers are fully integrated into the school and curriculum. Three major problems are perceived by teachers: (1) limited amount of time in the school day; (2) teacher accountability for student performance on standardized achievement tests which do not include computer skills; and (3) limited availability of hardware. It is recommended that administrators act as mediators of the innovation to create a bridge that would allow teachers to move from very utilitarian, familiar computer applications to those that would truly effect fundamental change in how teachers teach and students learn. (MES)

Microcomputer Education in an Elementary School: The Rhetoric vs. the Reality of an Innovation

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Introduction

During the last few years it seemed hard to avoid stories in magazines and newspapers that described the wonders of microcomputers and how they would soon change the way teachers taught and students learned. The vision of the school implied in these articles was one very different from the present. Schooling, instead of being a mass enterprise, would now focus on the individual student. Using microcomputers each student would follow a program of study specific to his or her individual needs and abilities. The unique capabilities of the computer and its software would provide immediate feedback, tutorials, and activities. And sophisticated software management systems would ensure that no child "fell between the cracks." It appeared that the ideal of individualizing instruction was just around the corner.

The claim that microcomputers would revolutionize schooling seemed at variance with what history and our own experiences as researchers and educators told us about the capacity of schools to accept change. Indeed, someone observing a classroom in the 1930s and one in the 1980s would find very little had changed in terms of a teacher's role and the basic "tools of the trade."

Given the nature of schools and their seeming inability to change and our own experience, we wondered why microcomputers would stand any better chance of becoming part-and-parcel of the definition of schooling. With a healthy scepticism about how successfully and quickly microcomputers had or could take hold in schools, we decided to study one particular school to find out how computers were used and what teachers and administrators thought about their use now and in the future.

The Study

The Alpha School. In order to discover the extent to which the rhetoric surrounding computers in schools was matched by reality the authors undertook a study of computer use and teacher acceptance in a large upper elementary school (grades 4-6) located in an affluent, semi-rural community near a major metropolitan area. We named this school the Alpha School. The school was nearing the end of its five year instructional computer plan. This plan included an extensive in-service component consisting of summer computer literacy workshops, training of newly hired teachers, and specialized training in the use of logo, word processing, and management applications. In addition, a building computer coordinator and computer laboratory staff person were available to assist teachers.

Compared to other schools the Alpha School was well endowed with hardware (some donated by the community) and software (approximately 200 programs). The school board, Superintendent, and the school principal all enthusiastically supported the introduction and use of microcomputers in the elementary school. Based on informal discussions most teachers seemed enthusiastic about using computers in their classrooms. It appeared that this "best case" situation would show us what computer education could really mean.

Method. A variety of qualitative and quantitative measures were used to assess the degree of teacher acceptance and use of computers. Thirty four teachers and two administrators completed an extensive questionnaire on computer use and attitudes toward computers (this questionnaire had been piloted at another school), logs were kept of student use of computers, documents relating to computer use and policy were analyzed, teachers and administrators interviewed, and teachers and students observed using computers. Eleven teachers (three each from grades four and five, four from grade six, and one resource teacher) were interviewed and their classes observed. Three administrators (the Principal, district computer coordinator, and school computer coordinator) were also interviewed.

Findings. The analysis of the data indicated that the microcomputer-based innovation, although five years old in the Alpha school, had a long way to go before computers could be claimed to be fully integrated into the school and the curriculum. While administrators claimed a high degree of teacher acceptance and integration, a claim supported by "official" teacher opinion as represented by survey results, the situation was quite different when we examined student logs and interviewed and observed teachers.

On the basis of teacher interviews and observations, it was clear that teachers did not feel they had ownership of the innovation. Indeed, student logs revealed that many computers were not used during most of the day. For the majority of teachers, using computers to meet instructional goals was an "all or nothing" issue. They felt that certain computer applications would be frowned upon given administration guidelines that emphasized integration of computer based writing, problem solving, and other higher order cognitive skills into all of the curriculum. Not surprisingly, given such a philosophy, drill and practice had a pejorative connotation and so while teachers saw value in drill and practice programs for skill development and reinforcement (a value that corresponded with the existing practice of small group instruction in reading and mathematics) these programs were rarely used.

Additionally, underlying the process oriented computer instruction "curriculum" was the assumption that all students would use the computer for this purpose. Thus, despite limited access to computers teachers were expected to provide equal access to every student. In a sense, they were being asked to adopt a "mass" approach toward a resource whose major strength was an ability to provide individualized instruction.

The terms the teachers used to describe their negative feelings about using computers were "time", "accountability", and "availability". Time referred to the limited amount of time in the school day Teachers claimed that there was so much content to cover that there was simply not enough time for an additional "subject" like computers. This was closely linked to "accountability". Teachers felt that students would continue to be tested on the skills and content traditionally associated with school subjects and that they personally would be judged on the basis of how well students performed on these standardized achievement tests. Because there was no test related to computers, teachers considered them a hindrance to the real job of instruction.

In addition to time and accountability, "availability" of hardware was frequently cited as a reason for low computer use. Although the number of computers in the Alpha school was high they were divided between a computer lab and classrooms. Thus, officially every three teachers had access to one classroom computer. However, because some teachers refused to use computers the ratio of computers to teachers who used computers was much higher. While sharing was seen as a problem, more problematical was access to only one computer in a classroom. Teachers felt that given the "all or nothing" approach they should cycle all their students through computer activities. Consequently, students had only a few minutes access and that activities were not well thought out and certainly not integrated into on-going instruction.

While some teachers did attempt to teach problem solving, word processing, and logo, others did not. We observed one teacher whose approach to problem solving was to send individual students out of the room to work on the computer. Students would return, having copied (by hand) their work on the screen and receive a grade. These problem solving activities had no relationship to class instruction. In another case whereas one teacher claimed extensive use of his computer for word processing, analysis of the student logs revealed that the great majority of time computers were used for games.

Discussion

Innovations that attempt to change the role and degree of control exercised by the teacher over instruction and classroom management rarely become institutionalized. By contrast those innovations that reinforce classroom practices (such as the overhead projector), or can be redefined as supporting existing practice (such as instructional film) are often quite successful. These particular innovations, as can be seen from the widespread use of the film projectors, overhead projector and so on, simply supplement and complement existing instructional practices. None involves any radical change in classroom activity and all tend to reinforce the existing status quo.

Innovations which involve significant change in the status quo and by their nature cannot be easily redefined or "co-opted" are rarely institutionalized. For example, programmed instruction and the new discipline-based curriculum materials of the 1960s and 1970s disappeared without a trace after their initial enthusiasm and funding had dried up. Programmed instruction - a sort of crude, paper version of the computer, attempted to combine individualized instruction with content defined by objective hierarchies. Taken to its logical conclusion programmed learning assumed that the teacher's role was secondary. The programmed instruction system would assess entry level knowledge, cycle students through lessons and activities, and provide remediation and reinforcement when necessary. No longer would teachers make instructional decision. Rather, they would become supervisors and technicians of a self-driven instructional system.

Today few people even know what a programmed instruction system looks like. Similarly, few can remember the elaborate materials produced by the curriculum projects of the 1960s and 1970s, for although the new social studies, science, and mathematics curriculum materials appeared to be "familiar", they in fact represented subject matter, skills and teaching approaches quite foreign to elementary and secondary schools in the United States. These materials had been developed in response to Sputnik and a growing perception that school curricula was out of date and irrelevant to present needs. Foundations, the federal government, and the National Science Foundation allocated millions of dollars to develop new materials to supersede existing textbooks and to hold teacher institutes that would acquaint teachers with recent advances in science and the social sciences. Then, as now a major concern was not to teach students facts that were easily memorized and tested, but to create a curriculum that stimulated higher order thinking and an understanding of the principles and methodologies of a particular discipline.

The hundreds of millions of dollars invested in both programmed learning and new curriculum materials produced innovations with only a limited life. Indeed, the enthusiasm and missionary zeal characteristic of the advocates of these innovation, in retrospect, appeared to border on the naive.

The range of capabilities of microcomputers and software are such that they can be used to play games and provide drill and practice of math facts or vocabulary, or they can provide a vehicle for teaching process oriented skills. These process oriented skills - writing, reading comprehension, and higher order thinking skills such as hypothesizing, generalizing etc., have traditionally been very difficult to teach and test, yet have always been the foundation of the ideal curriculum of schools. Indeed, any statement of instructional philosophy by school superintendents, board presidents, and leading educators, will always emphasize the importance of these process oriented skills.

With the microcomputer what was previously a desired but unattainable educational goal now becomes possible. Microcomputers could "teach" writing, logo provided a structure (albeit an increasingly controversial one) for the development of logical

thought, and sophisticated software provided simulations and tutorials that encouraged students to engage in scientific inquiry. It was this aspect of computers that made administrators, school board members and others - Alpha School included, such strong advocates of microcomputer education.

The vision implied by the use of computers for process oriented skills instruction is in sharp contrast to the drill and practice and gaming capability of the computer. In this dichotomy perhaps lies the promise and the peril of microcomputing. One the one hand microcomputer instruction can fulfil a long standing goal of education and in the process change the relationship between knowledge, learning, and teaching built up over the centuries. On the other hand microcomputers in the classroom are easily "co-optable." The exclusive use of computers for drill and practice or gaming merely reinforces existing practice. While computers may add an element of efficiency and excitement to learning math facts what occurs is only one step better than students using a worksheet. The use of microcomputers for gaming and the fact that many of the teachers in Alpha School wanted to use drill and practice programs (the use of these programs was discouraged) indicated the delicate balance between the radically different functions of computers. For while microcomputers are clearly here to stay, the danger is that they become, for many teachers, like the overhead projector- a supplementary, non-threatening addition to tried and true approaches to instruction.

Conclusion

One of the most striking findings of our study of Alpha School was that despite extensive in-service training, a district planning committee that included teachers, the appointment of a building computer coordinator who continued as a classroom teachers, the teachers on the whole felt little ownership of the innovation. For the majority of teachers it was easy either not to use computers at all or to make token gestures regarding their use. The discrepancy between reported, as opposed to actual use of computers was also striking, and indicated how given the existing structures of schools the innovation could be ignored without anyone knowing this.

We came away from the Alpha School with two recommendations. The first, which initially seems counter to our previous discussion, concerns the introduction of microcomputers. From our observations and interviews it was clear that the teachers had no sense of ownership of the innovations. Part of that sense of ownership would come from perceptions of the utility of the innovation - how could it be useful to teacher X or Y? The use of computers for process oriented instruction, as advocated by the administration, seemed far from the teacher's classroom reality. While administrators wanted process oriented approaches implemented, teachers saw great utility in drill and practice and management applications.

In our view, while there was a danger that the use of computers for drill and practice and management would simply reinforce existing instructional practice and roles, these applications could represent a bridge that would encourage teachers to move from using computers that enhanced existing practice to more process oriented uses. In a sense, administrators were far too ambitious, seeing the great potential that computers offered, without realizing the need to start where teachers were.

Our second recommendation concerns those responsible for the innovation. It was clear that it was not enough for administrators to state what should be and then expect changes to occur in classrooms. Their role as mediators of the innovation was crucial in creating the bridge that would allow teachers to move from very utilitarian, familiar uses to ones that would truly effect fundamental change in how teachers' teach and students' learn.

As we discovered, the rhetoric of microcomputer use in the Alpha School was much different from the reality. We do not think that the Alpha School was aberrant. Rather, as something of a microcomputer "pioneer" the Alpha School may well have been better than most schools. However, if what we found in the Alpha School is typical of other schools, then much must be done before we can be sure that the innovation will become institutionalized and its promise realized. At the moment it seems that microcomputers could become just another supplementary resource or the vehicle that transforms education. The danger and the opportunity exist side by side.