Microcomputer Software Development for Schools: What, Who, How?

Charles L. Blaschke

The major bottleneck limiting the widespread and effective use of microcomputers in elementary and secondary schools is the availability of quality software which meets high-priority user needs. Having stated the "obvious," especially to readers of this magazine, we conducted an informal survey early this year through mailed questionnaires, telephone discussions, and personal meetings with "interested" users at six national education conferences to identify priority user needs and perceptions of the types of applications at the building level which low-cost microprocessors could fulfill. This article summarizes the results of this survey of approximately 1,200 respondents. Ongoing software development approaches are then highlighted with some "crystal ball gazing" about the emerging, unsettled microcomputer field.

Perceptions of priority user needs vary considerably among respondents by "types" (e.g., secondary school principals versus elementary principals) and the degree of prior knowledge about the capabilities as well as limitations of microprocessors. Most knowledgeable respondents who have given some thought to their specific needs view the microcomputer as a "mule" rather than a "quarter horse"—a relatively slow, hard-working machine which will reduce routinized staff time and paperwork for a number of users at the building level. Most respondents felt the microcomputer could be used for both administrative and instructional purposes (at the least it would have to be proposed as "multi-purpose" to obtain local district resources for purchase). While most respondents perceived the need for "stand-alone" microcomputer applications, a surprising number of respondents were considering micro-mini "networks" (see Matthews, *Educational Technology*, November 1978). .

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Microcomputer application interest and existing activity are highest at the secondary school level. At their annual convention in February 1979, over 50 percent of the 550 secondary principals who observed software demonstrations at the MEAN booth stated that they had already purchased (or had on order) one or more microprocessors. Most of these units were relatively small with limited peripheral equipment. Instructional applications perceived to be useful and feasible included teaching BASIC programming, science instruction, enrichment programs, simulations for the gifted and talented, and supplemental basic skills instruction for remedial education. Most secondary principals saw the potential for using the microprocessor in monitoring student progress and in scoring tests.

Several priority administrative applications were also identified. While virtually all secondary principals expressed the need for better scheduling and student accounting, only a few felt the microcomputer was "the answer," unless the micro could be tied into a larger unit, which many indicated they could access. Most secondary principals, whose schools had large enrollments and were legally classified as "local education agencies," were interested in financial reporting, equipment control, and other business applications.

Elementary principals' needs and their perceptions of microcomputer applications meeting them are rather different from those of their counterparts at the secondary level, for a number of reasons. First, enrollments are usually much smaller, which reduces the need for certain administrative applications. Second, a relatively larger proportion of elementary students participate in federal or state special projects, such as ESEA Title I and P.L. 94-142, the new Education for the Handicapped legislation, both of which place additional time-consuming tasks on building-level staff. Indeed, the application in which virtually all elementary principals felt a priority need was a software package which could automate many of the steps involved in developing and updating "individual education programs" (IEPs), which are required by P.L. 94-142 for each handicapped child. State formats for IEPs may be 25 pages long, including several pages of short-term instructional objectives which have to be specified along with learning activities and have to be updated annually. A teacher may spend several hours in writing, rewriting, and updating a single IEP each year. Most principals felt the microcomputer could not only assist in writing and updating the IEPs, but also would be extremely useful in documenting all of the time-consuming "processing activities" through which a special education child proceeds, in anticipation of potential lawsuits by public interest

groups or parents alleging violations of due process. A lesser number, but still significant proportion, of elementary principals felt the "micro" could be extremely useful in test-scoring and evaluations, particularly when building-level staff time and local dollars are allocated to pay for these functions.

Beginning in 1979, each Title I program is required to use one of three federally-mandated evaluation models and reporting systems. In addition to savings in staff time and costs on paper reduction, many principals felt their Title I and regular teachers could make better use of test scores and evaluations if they were provided feedback on-site immediately. These applications were also identified as a high-priority need of directors of federal and state education programs during a convention in Washington, D.C. in March, 1979. Respondents during this conference also expressed interest in the use of the microcomputer (tied into a word processor) to generate state and federal reports.

Another application, particularly of interest to elementary principals and curriculum specialists, was the conversion of curriculum reference guides to floppy discs. In those districts using math and reading individualized instructional learning systems, most felt that the microcomputer would facilitate the effective implementation of instructional programs by referencing test items to prescriptions and updating student mastery profiles. In districts where curriculum specialists and teachers had developed their own taxonomy of test items/skills/instructional objectives/curriculum page references, the need for a "skeletal" program was widely expressed. Other instructional applications of high interest to elementary principals and curriculum specialists were test drills for math and reading, math simulations and games, and computer "awareness" programs of instruction.

"Here—take this course in domestic tranquility and solve your own problems."

Software Development Activities

The development of software for microcomputer applications in education is a costly process, especially in relationship to the decreasing cost of hardware, and it is risky to both the user and the developer. The risk to the user is the quality of the software and the "real" cost of getting the system "up and running." The risk taken by the developer of costly and quality software is at least two-fold: (a) assurance that the hardware for which the software is developed will be widely used; and (b) protection through copyrights and other incentives which increase the probability that the return on investment may be assured. A number of activities are presently under way to facilitate the development and dissemination of educational software applications on microcomputers; each reflects various attempts to minimize risk and uncertainty.

A large number of respondents, especially those who have already purchased one or more microprocessors, plan to develop software applications to meet their specific needs. Particularly at the secondary level, school staff (and in many instances, students) are actively developing programs. For the most part, these software packages are relatively limited in scope, focusing upon local needs. Some, however, are much more comprehensive and, to varying degrees, have been supported financially or otherwise by hardware manufacturers.

At this writing, it would appear that more activity, time, and effort are being devoted by individuals and various "networks" or "consortia" to convert existing computer administrative and CMI-CAI applications, designed for use on larger mainframes, to modules and languages compatible with a variety of microprocessors.

Some educational software applications are being developed under contract with microcomputer hardware manufacturers directly. Developers range from individuals to independent consultants to university staff. In other instances, distributors or manufacturers are developing applications.

A large number of officials in Intermediate Education Units (IEUs), which have traditionally

provided computer services for local education agencies, are assessing the microcomputer very seriously, most with alarm. Only a small percentage of these IEUs is seriously considering the feasibility of "networks" utilizing microcomputers. IEUs in a limited number of states (e.g., Michigan, Colorado, New York) are aggressively converting existing applications, where appropriate, to software compatible with micros. These particular applications represent some of the most significant and comprehensive software applications, both instructional and administrative, which could be available in the near future for use by building-level staff.

Traditional education publishing firms are also investigating, if not getting into, the software development business, for at least two general reasons: (a) the potential growth market for software generated by the increased hardware sales in both the home and school market; and (b) as a hedge against existing eroding markets in which the microcomputer, largely because of its low cost, makes competitive opportunities available. For example, last spring, it was announced that Bell and Howell would be marketing a modified Apple II to the public schools nationally and would have software developed by a subsidiary, Charles E. Merrill Publishing, Inc. Several large test-publishing firms, which also score tests for school districts, are assessing ways to compete with microcomputer test-scoring equipment configurations, purchased and operated directly by districts. These alternatives range from increased unit pricing for tests, to the development and sale of software, to districts which own microprocessors and use their tests.

The Microcomputer Education Applications Network (MEAN) is designed to facilitate the development and dissemination of educational software applications under various options. It will develop specific software applications under contract or, if several districts have identical needs, will develop software on a "subscription basis" whereby each of the districts shares proportionately in the cost, risk, and potential royalties. Under contract to federal agencies, it will also develop software applications for which there is a national need and, through its network members, convert a software package to the specific forms of BASIC or other languages compatible with the most widely-used microcomputers by subcontracting the conversion to districts which already have the specific hardware. A further opportunity is offered to field test and validate the program in an operational setting. The 3,500-plus members of MEAN get discounts on purchases, while developers receive royalties on sales and are used as consultants for installation and upgrading tasks.

Looking into the Future

As one "gazes into a crystal ball" (or, at this stage in time, perhaps "staring in awe" is more appropriate), there appear to be two basic approaches to the development of quality standards and software development. First, one approach relies heavily upon the market place, where over time through competition (to the extent it can exist) quality and possibly low-cost software for education applications will merge. While compatibility with microprocessors will probably be minimal, it is conceivable that quality software applications will surface, especially if local education agencies purchase total systems on the basis of compatible software availability. At this writing, however, due to the lack of software, many decisions are based upon hardware factors alone.

The second approach involves federal activities, directly or indirectly, and perhaps a federal "policy." Advocates within several agencies feel that existing federal procurement regulations over computer purchases procurements limit the development of quality software applications. On the other hand, through research, development, and demonstration projects, some progress is being made. For example, the National Science Foundation recently funded a project to assess the impact of microcomputers on various sectors in the economy, including education, in addition to funding several software developmental projects. The Bureau of Education for the Handicapped/USOE is funding approximately ten projects designed to develop and demonstrate microcomputer applications in special education-related activities. Other developmental projects are being funded by various R & D and training divisions within the military departments, some of which may have civilian counterpart applications. With or without a unified federal "policy," these activities will have an impact upon the nature and quality of software availability in the near future.

Most probably, a combination of private and public initiatives will influence education software development applications for the immediate future. Networks of electronic libraries which now exist for larger systems have not yet emerged among non-computer special-interest groups in education. As such groups (e.g., the special education, vocational education, etc., "communities") become more knowledgeable about and involved in microcomputer applications to their respective activities, it is conceivable that limited "networks" may evolve in these areas similar to "personal computing bulletin boards." The impact of this fractionalization will have implications for the management of public schools. □