Microcomputers in the School Media Center

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Rationale

There are at least three good reasons why teacher librarians, media specialists, and classroom teachers should be knowledgeable about the use of microcomputer technology in elementary and secondary school systems.

First, within the context of the school environment, the media center has traditionally been seen to be the logical place to assemble both the required print and non-print resources needed to support the school curricula. Microcomputers have hardware components. These components are subject to the same concerns of acquisition, utilization and maintenance as other educational media. Similarly, microcomputers have software components (programs) which are subject to the same concerns of selection, acquisition, organization and utilization as print resources.

Second, when the recent advances in electronic components and the attendant advances in mass storage technology, are combined with communications advances, this new technology will change the way that media centers operate and interact with their clients and teachers interact with their students.

Third, with the advent and ready availability of the microcomputer to the consumer in the marketplace and the pervasiveness of microcomputer utilization in science, business, and industry; the current impact of the microcomputer on education is only beginning to be felt. Educators in general and media specialists in particular will have to come to terms with this new educational innovation. The most important question to be answered here is, "to what use will this innovation be put?"

There are at least three answers to this question. In the first case, there is a need to teach "about" computers, ie. computer architecture, computer programming and computer systems. Courses of this nature would be necessary for teachers who will be responsible for teaching computer science in the schools. In the second case, there is need to teach specific content "through" the use of computers, ie. the use of computers by all teachers at all grade levels as an audiovisual device which is useful to facilitate the teaching/learning process. In the third case, there is a need to teach "with" computers, ie. use of computers as an extension of one's own capabilities or as a personal productivity tool.

For example, word processors can facilitate the creative writing process because they make the process of successive revision relatively painless. Telecomputing can open up new avenues of communication and remove the barrier of distance between the user and the source of information. Database managers can extend memory capabilities and promote the refinement of searching and sorting skills. Finally, spreadsheets can simplify many tasks that require the use of mathematics.

Focus of the paper

The purpose of this paper, therefore, was to review current thinking, on the subjects of microcomputer hardware selection, microcomputer software selection and the utilization of microcomputers in the school media center. The results of a survey of the professional literature related to the automation of school library services, K-12 has previously been reported by Twaddle (1979). Givens (1981) conducted a survey of media centers throughout the U.S. to determine how computers are being utilized by these centers, the levels of satisfaction with present services and whether or not the services being provided by the computer are cost effective. Both these studies however have concentrated their efforts largely on main-frame systems. This paper focuses, therefore, on the microcomputer.

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HARDWARE SELECTION

One of the most objective assessments of the issues related to the selection of microcomputer hardware was the summary of a Minnesota Educational Computing Consortium (MECC) study presented by Haugo (1981). While his report was concerned specifically with the management applications of microcomputers, the same basic considerations are still pertinent to any other applications situation. With regard to the actual specification of hardware and software for media center application, John Blair, Computer Applications Librarian for the Medical Sciences Library at Texas A & M University, has presented one of the most lucid explanations of the world of microcomputers. Blair's descriptions have appeared in a series of articles in the journal, **On-line.**

The components

Briefly stated, a microcomputer consists of a "black box" that is made up of a number of elements. The black box portion contains the central processor (CPU), logic and memory units. Technical arguments abound with regard to how fast the "brains" (CPU) of the microcomputer should be able to operate and how large the memory size should be. After extensive investigation carried out by MECC, Haugo (1981) reported that MECC concluded the processor speed of the current crop of microcomputers, when compared to large mainframe computers was slow, but for most of the potential daily applications in the school setting, speed was not a critical factor, and therefore adequate. As far as memory size was concerned, 32K of random access memory (RAM) was estimated to be adequate for most of the potential practical applications. However, it was noted that the memory size can easily be increased to 64K or 128K at minimal cost. This minor change would result in decreased processing time for some applications that required the performance of extensive sorting routines.

To be useful, in addition to the "black box", a microcomputer must have a way to be communicated with, and a way to display the results of its operations. These devices are known as peripherals or input and output modes. The most common input mode is the typewriter keyboard which is often seen directly attached to most microcomputers. However, several other input modes are possible and desirable. They may take the form of a disk drive, upload/download connection from another computer, light pen, graphics tablet, game paddle and/or microphone. While cassette tape systems have been used in the past as storage devices, they have almost totally fallen by the wayside because of their slowness and their linear approach to the handling of data.

The most common output mode is the television screen which may also be permanently attatched to the "black box" or appear in the form of a standard television set. Disk and cassette output storage modes are also available. In addition to these peripherals, a hard copy printer can be very useful.

In any event, while it is possible to debate the merits of each of these devices at length, there is no way in which to specify which microcomputer system should be purchased for a media center because it "depends on your special needs" (Sharp and Smith, 1980, p. 20). The important point to be made here is that in terms of hardware selection and availability, suitable equipment exists which can be assembled to meet specific needs at an affordable cost.

SOFTWARE CONSIDERATIONS

The school media specialist who is thinking about starting to use a microcomputer (or who has been presented with one), will quickly discover that programming or creating the software for a microcomputer is not a trivial task. Just as in the production of a television program, a motion picture or slide tape set, the creation of each item of software is time consuming and expensive. The wise microcomputer user will follow the first law of instructional development: first, adopt; if you can't adopt directly, then adapt; and only if you can't adopt or adapt, develop.

Compatibility

The selection of commercially prepared and packaged software (programs) for microcomputers presents some special problems for the school media specialist. As Woolls and Loertscher (1982) point out, there is no single, widely accepted set of manufacturing standards in existence. This means that the software is not interchangeable. It cannot be used on any machine in the same way that a cassette audiotape will function in any manufacturers' hardware. "This variety of hardware dictates equal variety among software and predicates the first criterion for the selection of microcomputer software — the programs you purchase must be compatible with your computer" (Woolls and Loertscher, 1982, p. 22). The implication is, that for the present time at least, the software for the microcomputer is not only applications dependent, but it is also machine and/or system dependent.

Preview privileges

The situation is further complicated by the fact that traditionally, media center specialists have been able to order non-print materials with "on approval" privileges. It would only seem natural to expect the same process to occur when searching for microcomputer software. However, as reported by Glotfelty (1982), this was not to be the case. Media specialists and librarians "have found that not all computer producers are willing to submit educational programs for preview. Printed reviews are helpful, but today's tight budgets necessitate checking the appropriateness of materials for the needs of each situation before purchase" (Glotfelty, 1982, p. 91).

Summary

To conclude this discussion of hardware and software selection, it has been suggested that given specific parameters, several appropriate pieces of hardware will arise to fit the needs assessment of any situation. Secondly, it has been further suggested the real essence of the microcomputers for education involves the programs that run on the machines. "The tricky decision to make is what software (program) is best for a particular application", given the machine dependent nature of the available commercial software (Blair, 1981, p. 91).

Many individuals, when first investigating the use of microcomputers are likely to be most impressed by the equipment, and overlook the fact that in the long haul, their main investment will be in software. As computer needs grow, more software is purchased. The cost, along with the cost of training "will probably dwarf the cost of the hardware" (Falk, 1981 p. 29).

The remaining portion of this paper has outlined several ways in which microcomputers may be used in a media center and has identified some commercially available off-the-shelf software that would fulfill the needs of a specified application.

APPLICATIONS PACKAGES

"What libraries do often boils down to hierarchies of file management, namely, where a certain item is located on the shelf and in the ordering, circulation, or processing procedures" (Blair, 1982a, p. 19). "A micro can handle almost any textual transaction involved in library operations" (Blair, 1981, p. 91). But according to Lundeen (1980), "In the area of applications software, there is a vast array of programs being marketed for a wide range of applications, but there is little available that is written specifically for libraries" (Lundeen, 1980, p. 184). However, there are a number of small business accounting programs, for example, The Controller by Apple, that can be readily adapted to process order initiation, order receiving, and the inventory control of instructional resources.

Data-base creation and management packages

Operating at the most elementary level, Sugranes (1980) was able to use a free, public domain, Apple II user program called File Cabinet to create a bibliographic database which contained a listing of the holdings of her media center. Students were able to gain access to the entire collection by author, title and subject.

This program was also used to produce curriculum related bibliographies for the teachers in addition to being used to control the entire AV equipment inventory. From a listing of media center resources, it could easily be determined what projects were checked out to which particular department.

A more sophisticated version of the same type of program is known as the DB Master, which is distributed by Stoneware Microcomputer Products. This program, as described by Blair (1982d), is an excellent tool for the school media specialist. It incorporates powerful report generation facilities and versatile screen formating commands. Multiple primary and secondary search keys for both printing and displaying records are easily designed by the first-time user. The documentation is helpful in that it has many tutorial exercises available. These are important factors that make the design of one's own files and file management systems a fairly easy task.

The most elaborate circulation system described in the literature was the system devised by Betty Costa (1981), (Costa and Costa, 1983) who is a library media

specialist. Both of the previously described systems, when used to set up an online catalog for a large school media center, could run into storage capacity or convenience problems in this application. To avoid this concern, Costa's system has taken advantage of the larger storage capacity of a hard disk system. However, a customized program was required to handle the operation of the system. While this was not difficult to obtain, it makes this system one step removed from the off-the-shelf packaged program.

Each of these examples demonstrates the file management capabilities of the microcomputer. When used correctly, they can update a circulation file, an acquisitions file, an overdue list or an equipment inventory listing and generate the revised versions of the lists with a minimum of clerical effort. In addition, special utilities packages for programs such as DB Master will generate management statistics and, if it is required for reporting purposes, turn these statistics into computer generated graphs or charts.

Telecomputing

The electronic universe is in fact a community of computer users. The common denominator is the telephone line. Through that medium, mainframe, mini, and micro computers (and the people who own or use them) can "talk" to each other. Thus, anyone who owns or has access to any kind of computer may join the network by plugging into a telephone jack, turning on the equipment, and dialing a telephone number (Hurly, Laucht and Hlynka, 1985).

When viewed from this perspective, it can in fact be seen that today's online information industry has evolved from the remote data processing services that began in the late 1950's as a low-cost alternative to buying or leasing a mainframe computer because, in the pre-microchip era, only big government and big industry could afford to have their own on-site mainframe computers. While smaller organizations may have needed the power of that particular type of computer, cost factors made a time-shared system the only viable alternative. The result was the creation of a delivery mechanism, ie. a well-developed system of computers, specialized software, standards, protocols, electronic packet-switching networks, and other industry components capable of reliably transmitting information from one computer to another. Once the delivery mechanism was in place, it was only a function of time before individuals and companies began to find ways to use this system for something other than transmitting the day's banking transactions to a remote mainframe computer. Thus the only obstacle inhibiting the expansion of this embryonic network was the cost of the equipment needed to make use of the delivery mechanism.

The advent of the microcomputer permitted this obstacle to be overcome and subsequently, the electronic information industry began its period of rapid growth and development.

During this period of rapid growth and development, a bewildering array of systems and services have developed almost overnight. Observing the players jostling and jockeying for positions in the industry is a fascinating activity to watch, but a difficult situation to classify into a unified system for descriptive purposes.

Three databases however, currently fit into the description of the term "information utility". They are The Source, Compuserve and the Dow Jones News/Retrieval Service. Two main features serve to distinguish an information utility from other types of organizations. First, it offers a system of information retrieval that has been designed to be used by the average user rather than by a professional researcher. To serve the needs of this type of client, the database contains information on a wide range of subjects rather than indepth treatment of any one subject. Second, in providing access to a database, each utility also offers services. These services may include such things as electronic mail delivery, banking, shopping, real-time communication, game playing with other system users and the opportunity to write and run programs on the mainframe computers.

On the other side of the coin, encyclopedic database organizations offer the user access to "in depth" types of information. The major companies that fall into this category are DIALOG, BRS, and ORBIT. Each organization can be thought of as a convenient delivery system or gateway service that enables the user to search over 200 databases, covering everything from chemical formulas to dissertation abstracts, on-line. In this context, these companies are essentially information brokers. They strike a contract with an independent company that developed the database, repackage the information according to the needs of their particular system and offer it to the user on a fee for service basis. From the user's point of view, they are helpful, intermediary agents who handle all of the billing of telephone lines and computer time, customer services, and royalty arrangements with the database developers.

Decision-making aids

Strazdon (1981) has described the use of the VisiCalc program. VisiCalc is an electronic spreadsheet which is formatted like a matrix. The regular version can handle up to 63 columns and 254 rows. Extended versions are readily available. With this program, the user can type in labels, numbers and formulas at each intersection of the columns and rows. Once the matrix is set up, the program automatically does the desired calculations and either stores the results or displays them on the printer. With the VisiCalc program the user can add, subtract, multiply and divide values anywhere on the worksheet. It has a built-in library of functions such as sum, average, and repeat. Some of the applications of this program listed are tallying the number of volumes of books and audiovisual materials cataloged, the number of interlibrary loans transacted, and the various types of materials circulated.

Budget analysis can also be done. For example, the total expenditures to date and the percentage of the budget spent can easily be determined. Or, if it is desired, the expenditure on books and periodicals by department and subject, and the expenditure on non-print materials by department and subject can be derived. Perhaps an even more important capability is the ability to deal with "what if" questions when developing both short term and long term plans for the media center. For example, what if the media center receives a fifteen percent increase in budget next year, the rate of inflation is only five percent and the retail price increases at an average of only three and a half percent? How much more will be able to be purchased in categories a, b, and c? Idealistic? Perhaps, but it's food for thought.

Word management packages

A word processing system for a microcomputer is a program that permits the typing of normal text into the microcomputer which in turn is displayed on the screen. Most systems will permit the editing and printing of the text as hard copy in any manner desired by the writer. The text can also be stored on disks (or magnetic tape, if one has the patience) for an indefinite length of time. In essence, the program functions as an electronic "cut and paste" system. For the media center specialist, this feature alone becomes priceless for handling documents such as procedures manuals, guides, reading lists, holdings lists and bibliographies, all of which seem to be in need of constant revision. When the word processor is combined with a letter quality printer, letter perfect work can be produced, ready for the duplication process. "Even if the micro is never used in any mode except that of the word processor, efficient use in that mode alone can justify the cost" (Pratt, 1980, p. 19).

An appreciation of the popularity of word processing capability of microcomputers can be gained by even a cursory examination of the trade journals. For example the July-August, 1982 issue of **Peelings II** reviewed ten word processing packages which are available for the Apple II microcomputer alone. Today, there are in excess of 130 word processing packages for the Apple. Similar patterns are observable in virtually all the other popular brands of micro's.

TEACHING APPLICATIONS

If microcomputers are to be located in the media center, it is only reasonable to expect that some form of instruction relating to the use of this resource will occur. In fact, according to Davies (1979), "Today's school library media specialist is a teacher in the broadest sense of the term — in training, in certification, in attitude, in function, and in commitment. The responsibility of this position extends far beyond organizing and maintaining a media collection, important and basic though these services surely are" (Davies, 1979, p. 63).

Teaching about computers may follow two tracks, computer literacy and computing literacy. Computer literacy refers to students learning how a computer works and how to program a computer. **Computer literacy** is treated as an end in itself.

On the other hand, **computing literacy** refers to students learning how to use microcomputers as tools for the enrichment of their personal and professional lives. Computers are seen as aids to solving problems and extensions of human abilities such as memory. There is no reason why student volunteers in the school media center could not be taught to use any of the previously described file management or word processing packages to assist in the operation of the media center.

The teaching role adopted by the school media specialist will be a function of the educational environment, personal expertise, and enthusiasm. The media specialist may adopt the role of "teacher buff" (Grossnickle and Laird, 1981). In addition to providing regular services to staff and students, this assumed leadership role requires the devotion of a substantial amount of time, energy and effort to developing in-service training workshops for colleagues. Alternately, the media specialist may elect to ignore this new educational innovation. After all, Kemp et al. (1980) have observed that the track record for the adoption of media in the classroom has been littered with unfulfilled expectations. Similarly, given time, there is not any foreseeable reason why the microcomputer will not go the same route.

Somewhere, between these two extremes, a reasonable position exists. Tact and understanding however, must prevail. It is not unusual for the math or science teachers to consider the microcomputer their private domain. Business educators and affiliated disciplines may have similar views. Typing teachers have been known to complain that elementary students, who have become familiar with a microcomputer, already knew how to type prior to coming to high school (Vickery, 1981). Everyone knows that high school is the proper place to learn this skill — not elementary school! Following this line of reasoning, English teachers could have a field day berating anyone who promoted the use of "Dictionary" programs by students to correct the spelling of their themes, reports and essays. Heresy! Yes?

RECREATION

The drawing power of microcomputers for both young and old, has been demonstrated by such organizations as the Menlo Park Library in California. "The library reminds me of a poolroom of years ago because that was the local hangout for kids. Now they hang out at the computers" (Harvie, 1981, p. 604). This project began when a couple of local businessmen donated five micros to the library. By late fall, 1980, the National Science Foundation had been convinced to provide a $224,000.00 grant so that everyone in Menlo Park could have hands-on microcomputer experience.

"Although playing games was the most popular ComputerTown activity, users did spend eight percent of their time programming. Some children with previous programming experience refined games they had created, using ComputerTown as a test site where they could receive the advice of and support from other youngsters. High school students completed their programming homework and a few enterprising pupils created programs to tackle difficult math assignments" (Harvie, 1981, p. 604). Some children came to associate libraries with computers. Harvey reports their surprise at not finding micros in branch libraries. Similar experiences have been recorded by Vickery, (1981) and others.

As an isolated instance, the previous description is not important in itself. Rather, it is suggested that this is not an isolated case. Similar programs seem to be rapidly gaining in popularity both in North America and throughout the developed world.

Media center specialists should be knowledgeable in this area, not because it is popular, but rather as Rawitsch (1981) suggests because computers are "thinking" machines, and thinking is what education is all about. Second, many teachers believe that students learn best by doing and microcomputers can help us "do" more in the classroom, than ever before by simulating the actual outcomes of real world concerns. Third, computers make it easier to meet the special needs of students through individualized instruction. Finally, computers are bringing learning into homes at an increasing rate. Parents are beginning to demand similar opportunities for their children during the school day.

CONCLUSIONS

Given the nature of computers, their pervasiveness in science, business and, their current accessibility to the consumer market, their impact is only beginning to be felt. Educators in general and media specialists in particular will have to come to terms with this new educational innovation. The most important question to be answered by the media specialist is, "to what use will it be put?"

Several possible answers were suggested. First, microcomputers have great potential for being able to reduce the amount of time a media specialist has to spend performing clerical tasks. Secondly, a whole new area has opened up in which to develop expertise. Both computer literacy and computing literacy are likely to receive considerable attention in the foreseeable future. Finally, media specialists have a powerful motivational tool at their disposal. Perhaps, through interacting with the microcomputer and the "things" necessary to fuel this hardware, students will begin to view the media center as an important information source, rather than a place to be avoided.

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ning'. Computer logic and human logic do not necessarily become one, but they complement each other as the child grows and learns.

The Need for Computer Literacy

There is rarely an article in the field of computers and education that does not stress the need to supply children (and ultimately society) with knowledge about computers. The advent of microcomputers has made this an even more urgent need. "The literature predicts that computer literacy will be the next crisis in education . . . the potential for computer illiteracy poses a challenge to the educational community which must *not* be ignored" (Dickerson & Pritchard, 1981, p. 7).

Molnar (1981) defines computer literacy as "what a person needs to know and do with computers in order to function competently in our society" (p. 27). It is the 'do' that is the all-too-often forgotten element of computer literacy — a function that is strongly stressed in this paper. Watt (undated) sees one category of computer literacy as being that of learning to program — a skill of problem-solving, analyzing, and predicting outcomes.

The main issue here is that it is not sufficient to teach children *about* microcomputers; what the computer can do for them must transfer into what they can do with the computer (keeping in mind that the essential element is cognitive skill building). Computers may be a powerful 'tool' for learning, but they can also be a very effective medium of expression. When the latter goal is reached (through whatever instructional method one chooses to employ), the control is no longer in the hands of the technology, but rather in the hands of the child. Learning and thinking become active, creative processes controlled by the learner!

Designing such environments and taking into account cognitive-developmental and other individual differences is a worthy goal for educators in the field of microcomputers and education. If children are denied the opportunities to create, to program, to 'represent' through such a form of representation as a microcomputer, then they are being denied the chance to develop creatively and education will be losing an opportunity to use one of the most sophisticated media of expressions available. "Educators must take the lead in showing how this can be done by exploring the many possible ways in which computer use can enhance subject matter learning and student creativity" (Critchfield, 1979, p. 18).

Conclusion

There is strong theoretical support for investigating further the interaction between computers and children. As emphasized in the introduction, researchers must seize the opportunity now. Microcomputers are everywhere, and it is our responsibility to set the stage for their sound use in the school system. We can only do so through research studies. There is now a real dearth of work in the microcomputer and children area. There are many questions to be answered: What can these sophisticated tools offer children and in turn what can young learners bring to this new mode of representation? At what age can microcomputers be introduced to children? At what age can children successfully learn simple programming techniques? Solving such research questions while keeping in mind the notions of learning, development, and instructional design as previously outlined, will in turn serve both education and society in general. In his report to the National Institute of Education, Hall (1981) called for more research into what children can do with computers. Such research is necessary in order to establish policy strategy. This need for research has been expressed internationally as countries recognize the impact of microcomputers on society and the need to establish guidelines for their introduction and use in schools.

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