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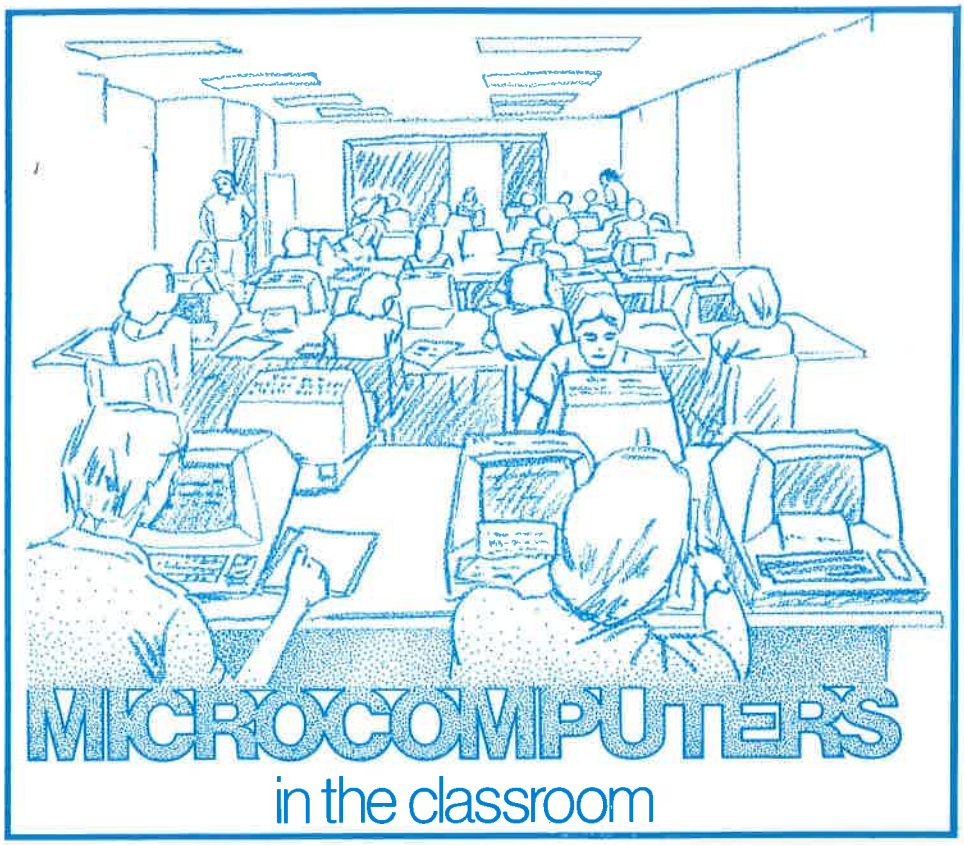


## Articles on Microcomputers:

**Coveny**

**Lockard**

**Starkey and Starkey**

**Thompson**

## An Article on Merit Pay and Excellence:

**Annis and Annis**

THRESHOLDS IN EDUCATION

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# Microcomputers in the Classroom







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# Which Computer Should We Use in the Classroom?

**By John D. and Roberta J. Starkey**

One of the major questions for the classroom teacher is, "Which computer to buy?" Professional educators are very cautious about proposing that one computer would be better than another for classroom use. We sought an answer to this question in the available literature.

We found articles covering the definition of computer literacy (see References) in abundance but good explanations of the differences in computers suitability for classroom use seemed to be scarce.

After a fruitless scanning of many journal articles and texts we found little help for the selection of school microcomputers. Then we turned to the commercial market to find someone who might be willing to start a debate by making some predictions.

Bruce Tonkin is a programmer. He has his own software company and writes software for any microcomputer company which will purchase his programs.

He wrote the Creator which is an excellent aid in writing software programs. He has his own "My Word" word processing system which is one of the top systems and will work on several different computers.

To our limited knowledge, he appears to have a very good grasp as to what various microcomputers will do and what they will not do.

He agreed to allow us to quote a part of his Creator User's Newsletter if we would give credit and quote him correctly. He advised us that he did not wish to write articles because they did not make him any money.

The following is an excerpt from:

LOOKING AHEAD
BY BRUCE TONKIN

From "Creator User's Newsletter," Issue 4, Written and published (March-May, 1984) by Bruce W. Tonkin.

> A lot of users have asked my opinions about the future of Tandy/Radio Shack, 8-bit machines, DOSes, languages, and the entry of AT&T into the computer market.
>
> Lately, it seems as if every third call wants my opinions on one or more of these subjects. So, I'll attempt to start a debate; feel free to disagree with me if you like. Write me a letter, and I'll either answer it personally or run it in this newsletter.
>
> First, Tandy is not going to be a major factor in the computer market in the future. Neither is it going to go out of business. In fact, Tandy is probably in better shape than Apple is, and in a far better position than Commodore (or Atari).

Tandy has managed to consistently make money selling computers. For a change, Tandy has even decided to go with standard operating systems and languages. The Tandy 2000 is a very nice machine, and probably is a better deal than the IBM PC. What hurts Tandy is its past reputation for indifferent software support and poor-quality hardware.

Tandy's reputation for poor-quality hardware is no longer deserved, and its adoption of MSDOS for the Tandy 2000 makes that machine an almost immediate winner in the software department. Still, Tandy's past continues to haunt them. The Model I was an utter failure, in my opinion. I know; I had one.

Still, Tandy does have decent machines now. Tandy can sell them, never fear. They'll never seriously threaten IBM or AT&T, though.

Apple is going to sell a load of Macs. They won't sell as many as they hoped, though--the machine is seriously flawed. For my money, it isn't half the machine that the IBM PC is, not to mention the Tandy 2000. I don't like the mouse and icon interface. I don't think much of their word processor, and to be able to use the system resources, you'll have to run a Lisa development system and Pascal (spell that $9,000+, and Pascal is for idiots). Apple claims the system is 'open'; I haven't seen any information that would make me believe that claim.

The Mac needs a lot more memory and a lot more system software; an assembler, a BASIC compiler, and inexpensive system documentation (a draft copy of the system documentation now costs $150, and isn't easy to get). Until then, (and maybe even with it), thumbs down on the Mac. I've got one, and I've used it for several months. My wife and kids like it but I surely don't, from a software development standpoint. I do like the BASIC, and Macpaint is just about the neatest program I've ever seen. I won't be selling my Mac any time soon! Still, if you buy a computer for the things it can do for you, the Mac is rather expensive. About the only way to justify it right now is in generating advertising graphics: a small ad agency could make the Mac pay for itself in six months.

Now, if the Mac had 512K of memory, imagine loading BASIC and seeing the message '468744 Butes free.' Together with the graphics support, the advanced features, and a typical Basic compiler, the Mac could be a really fantastic machine. For now, it isn't. Getting Mac is gambling on the future.

On the other hand, if there's any justice in the world, Apple should never sell a single IIc. Why buy a 1976 computer in 1984?

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*John D. and Roberta J. Starkey are professors of Educational Psychology, Northern Illinois University, DeKalb, Illinois.*

Commodore is all but dead. I say 'good riddance.' Their cheap little toy computers should never have been sold in the first place. Their marketing has been fundamentally stupid. "Buy a Commodore, or you'll wind up stupid. Buy a Commodore, or you'll spend a lot more money on software than needful."

8-bit machines will be around, for quite a while. There are several things the older machines can do just fine, word processing, small business management, etc.

However, I wouldn't buy a new 8-bit machine. I'll keep what I've got; I can even see buying a used machine under some circumstances. But, buying a new 8-bit machine is like buying a horse for daily transportation. Sure, it'll get there (and it might even be fun), but you can do an awful lot better for the same amount of money.

See, it doesn't cost that much more to build a 16 or 32 bit machine than an 8-bitter. The peripherals cost the same (same drives, same keyboard, same case, same monitor, same printer); memory costs the same (and it's cheap, anyway, if you get more). The only current difference is in software, and there's something everyone ought to consider.

On the new machines, software is EASY. It took me three WEEKS to write a word processor for the IBM PC that I like better than WordStar; I've had several customers tell me that secretaries and other daily users prefer mine to WordStar when given free choice of either. WordStar took MAN-YEARS to write! I think that software is going to become available for any decent new machine within a matter of weeks after the machine is introduced. I've seen some material on the 32-bit chips, and (for several of them) writing in assembler is easier than writing on BASIC on the TRS-80. I feel sure I can write decent compilers, word processors, and other software for those machines in a real hurry. Take it from me, software won't be a problem.

So why get an 8-bit machine? No reason unless you get a real deal, and you don't need a bigger one. For that reason, I think the Model IV, and all 8-bit DOSes (1DOS, TRSDOS, CP/M, MP/M) are doomed. They're history. I'll still write software for them, as long there's enough of a demand for it; but I think the demand is gradually going away. Look at the ads in "80 Micro"--notice the changes?

The key (systems) software will be written in C and assembler; applications software will be written in C and BASIC. The big DOS will be UNIX, Forget PICK and OASIS; I've seen them, and I'm not going to waste my time. They're pitiful. State-of-the-art minicomputer DOSes from about 1975, with stupid operator interfaces and little capabilities worth mentioning, compared to UNIX or even MSDOS, CP/M-86, concurrent CP/M, MPM/M-86, and CP/M 68K are all losers, too. The only question is which version of UNIX will become most popular.

Pascal is being abandoned by a LOT of software developers. It's just too restrictive, VERBOSE, and artificial. C is hot right now (with good reason). Other languages to watch are ADA, APL, MODULE 2, and PL/I. I thing ADA and C are going to become very popular.

AT&T is going to sell more computers two years from now than IBM. IBM is too conservative; wait until you see the new AT&T personal computer. Their office computer will blow the socks off the XT and the Tandy 2000, 18 users, 20 Megabytes of disk, a 32-bit processor, UNIX, and 4 megabytes of main memory for about 15 Grand. Yes, it's a lot faster than the PC, too.

Their personal computer will come with 2 meg of memory, two floppies, UNIX and MSDOS, BASIC, C, assembler, a 32-bit processor, and sell for less than a PC. That'll get IBM's attention in a hurry. You'll see some fantastic machines come out of the competition between those two giants. That's why Tandy won't be serious competition. Where's Tandy going to get that kind of development money and manpower? Answer: There's no way it will. Nor will Apple. The Mac and Lisa have just about broken them.

The latest rumor is that AT&T will buy Apple to get the marketing network. I don't think they will, though. They'd do better to buy Tandy. AT&T isn't stupid. I'm pretty sure they'll buy someone. AT&T could buy either Apple or Tandy out of petty cash, and so could IBM. If IBM thinks AT&T is serious, IBM may try to buy whichever one it thinks AT&T really wants first. Or IBM might buy them both. Or AT&T might.

Either way, Apple and Tandy might just disappear in a hurry. Their names will continue, but as a subsidiary of one of the giants.

Minicomputer manufacturers are going to fail--impressively--when they try to move into micros, even into micros that look like minis, and that's an easy prediction, based on past performance. Burroughs, DEC, Honeywell, Sperry/Univac, NCR, Data General. Name one mini manufacturer that's made an impact in the micro area. All of them have tried, and the Sperry machine seems to be the best attempt so far, but the Sperry machine is an IBM PC clone, and not a better machine than the Tandy 2000 (in my opinion).

In fact, as micros get faster and more capable, the minicomputer manufacturers are going to go out of business as micro manufacturers in the coming crunch. Part of the reason is STANDARDS. How many people are familiar with MSDOS, TRSDOS, and CP/M compared with the number familiar with RSTS-E, PICK, or some other minicomputer DOS+? How many know Data General BASIC or BASIC PLUS compared to Microsoft's?

Software is going to kill the "mini" manufacturers, because of these implied standards, and it' too late to do much about them.

Even though you do not agree with the above predictions, we believe you will at least agree that the article by Tonkin may lead to some serious thought before buying an 8-bit computer, or one which uses the software of a decade ago, for classroom use. As Tonkin so clearly indicates, computers are in the midst of rapid changes, hence it will be difficult to decide which one should be used in the classroom.

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*

# Utilizing Microcomputers for Curriculum Development

**Thomas E. Thompson**

Since the late 1970's when microcomputers began to surface in public schools, educators have prophesied their applications for schooling as almost limitless. Today the prophesy continues, witnessed by the explosion of microcomputers being placed in classrooms throughout the United States. Classrooms containing multiple computers with networking capabilities have become commonplace. Selected classrooms find microcomputers in use by students on an individualized basis. Also, administrators and teachers are gaining access to microcomputers for business and educational applications.

It has been this author's personal experience and also that of other microcomputer owners, to go through an evolutionary process in working with various software programs. That is not to say that all persons have or must go through the same steps, however, it would appear to be a 'logical' progression.

The challenge of video games is first experienced by children and adults alike. Horizons are expanded to include countless simulation programs such as classics like Odell Lake and Lemonade Stand. Word processing, data base programs, and spreadsheets usually become the next focus of interest. Taking control of the microcomputer by learning a programming language like Basic frequently occurs. Finally, seeking teacher utility programs to facilitate professional efficiency happens. The sequence of the evolutionary process may differ, but generally the result is the same, i.e., the microcomputer maximizes our efficiency at work and at home.

*Thomas E. Thompson is an Assistant Professor, Department of Curriculum and Instruction, Northern Illinois University, DeKalb, Illinois.*

**If classroom teachers are expected to use microcomputers with children, they should have some minimal exposure and understanding of available software programs for the students they instruct.**

Considerable time and money have been spent on in-service activities for educators with the hope that they will become knowledgeable with software programs for children. It is assumed that after exposure to a variety of software programs for students, they will be able to identify and implement the best programs for their curricular area. On the surface this assumption seems reasonable. If classroom teachers are expected to use microcomputers with children, they should have some minimal exposure and understanding of available software programs for the students they instruct. Unfortunately, what often happens is that the few quality software programs which are available appear over and over again in different parts of the school curriculum.

Two possibilities exist if we should remain on this rung of the evolutionary ladder of microcomputer usage. The repetition of selected software programs will continue, or, the few quality software programs will be designated for a specific part of the school curriculum. Either choice results in the inefficient use of microcomputers in the schools.

Until an adequate supply of educational software is developed, it is this author's opinion that microcomputers placed in the hands of educators rather than children, will have far greater impact on the quality of education of our students. If the classroom teacher has ready access to the use of a microcomputer for

curricular purposes, the benefits derived by students will be significantly improved. The potential of the microcomputer rests in its ability to increase one's efficiency.

For classroom teachers this means putting the microcomputer to work performing such tasks as word processing, record keeping, and data managing.

Some obvious choices for classroom teachers to become more efficient with their time include:

1. Most writing tasks, i.e., preparation of lecture notes, professional correspondence, parental communications and class handouts.
2. Common filing tasks, i.e., class handouts, bulletin board ideas, resource materials, and test banks.
3. Keeping anecdotal records and student grades.

Putting the microcomputer to work in the above ways will enable a typical classroom teacher to become a more efficient member of the teaching team.

There is a more global application, however, whereby educators can maximize their efficiency by using microcomputers for writing, managing, and revising curriculum. The following scenario typically occurs when the decision is made to develop curricula in a particular subject area. A writing team composed of subject matter specialists, administrators, and an outside consultant is selected. Agreement is reached by the writing team on the usual curriculum components such as philosophy, goals, and objectives. A decision is made at this point to select a textbook series or to write an original curriculum to meet the school district needs.

Assuming the latter choice is made, the major writing task begins. Countless hours are spent identifying, writing, and rewriting the various parts of the curriculum guide. It is not unusual to have a typist available to translate a variety of handwritten pages into reams of printed materials. After the first draft is completed and field tested, revisions must be made. Additions and deletions are performed and the guide is ready to be typed again. It is then printed and distributed to classroom teachers with the expectation that it will remain relevant for several years.

There are two major problems associated with the aforementioned curriculum development writing process.

a. The first involves the inefficiency of the time spent by the members of the writing team and the person responsible for the preparation of the guide.
b. The second is a concern for the lack of dynamic changes which should periodically occur.

Both problems can be resolved if microcomputers are placed in the hands of educators in the school district.

Picture a more streamlined situation where the writing team is composing curriculum with the aid of a number of microcomputers. The steps of writing long hand and being typed by a person who is unfamiliar with the nature of the curriculum is consolidated into one efficient step. Revisions are handled in a similar manner. The first and final drafts are placed on diskettes, thus avoiding both the time of delay for reproduction as well as associated costs.

**Instead of having a hardbound copy of the curriculum on the desk, the teacher has the curriculum on a floppy diskette.**

If every teacher has ready access to the use of microcomputers, the progress continues. Instead of having a hardbound copy of the curriculum on the desk, the teacher has the curriculum on a floppy diskette. Individual lessons can be taught and feedback in the form of improvements can be entered on the diskette. These improvements can be easily incorporated into the master copy of the guide and the curriculum now becomes a dynamic one instead of the dusty, outdated document which classroom teachers shelve in some obscure location.

One useful package of commercial software for writing curriculum guides is PFS (Personal File System). The PFS (may be purchased at Apple and other computer software stores) family of software is available for both the Apple and IBM computers. The PFS family includes:

a. PFS File - a data base program which allows for selected information such as concepts, skills, vocabulary, activities, etc., to be recorded;
b. PFS Report - a program which generates tables of information found in PFS File;
c. PFS Graph - a program which uses information found in PFS File and displays it in graphic form (not an absolute necessity, but it can be useful); and,
d. PFS Write - a word processing program which integrates with the other PFS programs.

It is not within the scope of this article to go into the details of the individual PFS programs. However, briefly stated, a data base of curriculum components is developed and then portions of the data base are printed in a 'typical' curriculum format. Figures 1 and 2 are included in order to demonstrate a typical data base format and a possible report generated from the data base, respectively.

Figure 1 shows the headings of a data base in all capital letters. The example chosen is for a science curriculum, however, the headings could be changed depending upon the nature of the curriculum involved. Each writing member would enter the corresponding information after each heading for a particular segment of the curriculum guide. The information listed here would typically be found on a single page of a curriculum guide. After the specific entries have been entered for all grade levels, a number of printouts can be examined in order to evaluate the scope and sequence of different aspects of the guide.

Figure 2 illustrates one report that can be used to determine the major primary grades life science concepts. This information could be invaluable to the writing team in order to insure that the concepts have been appropriately included. Other printouts containing various combinations of information can also be used to identify duplications and omissions of selected curriculum components. For example, a printout

Figure 1
Sample Primary Science Printout

GRADE: 1 SCIENCE: Earth TOPIC: Seasons
MAJOR CONCEPT: Seasonal changes affect plants.
SUBCONCEPT: The life cycle of a plant is related to the seasons.
OBJECTIVES: The student will observe changes in plants and relate those changes to the seasons.
SKILLS: 1) Infer that changes in plants may relate to the seasons.
2) Communicate inferences through illustrations.
ACTIVITY DESCRIPTION: I. Throughout the year, seasonal changes and their effect on plants should be observed and discussed. Students should be made aware that some plants die with the onset of cold weather (annuals) while others are dormant (perennials) even though they may look dead.
II. Adopt a tree found in a convenient location. Observe throughout the year. Illustrate the tree each season to show changes.
VOCABULARY: Life cycle, annuals, perennials.
RESOURCES: Beastly Neighbors pp. 40-46.

Figure 2
Major Primary Science Concepts

| | | |
|---|---|---|
| K | Human Body | The human body has many different parts. There are five senses. |
| K | Nutrition | People need many types of food. |
| 1 | Plants | There are similarities and differences between plants. Plants reproduce like plants. |
| 1 | Animals | There are similarities and differences between animals. Animals reproduce like animals. |
| 2 | Plants & Animals | Plants and animals are living things. |
| 2 | Animals of Long Ago | Life forms change. |
| 3 | Animals | There are two major groups of animals. |
| 3 | Nutrition & The Body | Nutrients are used by the body. |

listing the development of skills can be traced for continuity purposes.

Consider the possibilities of useful printouts for the classroom teacher:

1. A listing of supplies for all third grade activities.
2. A listing of resources available in the school learning center.
3. The activity itself for the students.
4. A vocabulary list.
5. A tabulation of selected topic concepts.
6. Selected portions of the guide for review purposes.

Curriculum development as it has occurred in the past does not have to continue to be an inefficient enterprise. Using microcomputers as tools of efficiency can improve the process of curriculum development and at the same time create a means of establishing a dynamic document.

Software exists today for school districts to use for writing curriculum. Undoubtedly new software packages will be designed specifically for curriculum development as educators gain greater access to microcomputers.

One microcomputer in the hands of a competent teacher will probably have far greater impact on the overall quality of education than will many microcomputers in the hands of children as they are used throughout many schools today.

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FUTURE ISSUES OF THRESHOLDS IN EDUCATION

| | |
|---|---|
| MAY, 1985 | STATE EDUCATIONAL AGENCIES: LEADERSHIP AND CHALLENGE |
| AUGUST, 1985 | EUROPEAN EDUCATIONAL THEORISTS: IMPLICATIONS OF THEIR IDEAS FOR AMERICAN EDUCATION |
| NOVEMBER, 1985 | STRATEGIC PLANNING FOR THE FUTURE: THE EDUCATOR'S IMPERATIVE |
| FEBRUARY, 1986 | STAFF DEVELOPMENT |

# Using Bank Street Writer in the Classroom

**By James A. Lockard**

Among the uses of computers in the classroom, none has aroused the degree of interest or the breadth of potential use as has word processing. A bibliography of word processing related articles in magazines and journals of just the past two years would fill many pages. Yet many teachers, for all the excitement, are still uncertain about what may be achieved or how to proceed. Writing has come a long way since the days of cave walls, cuneiform, hieroglyphics, and slate boards. With each of these advances in technology has come new potential and problems of application for the educator.

The intent of this paper is to offer some help in the teaching of Bank Street Writer and its classroom applications. It is written for the teacher who is already familiar with the benefits of word processing and committed to implementing Bank Street Writer in the classroom. Persons desiring background material on word processing and its classroom benefits may refer to the bibliography.

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**Conceptually, a word processor is any computer program written to take away most of the mechanical problems associated with writing.**

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Conceptually, a word processor is any computer program written to take away most of the mechanical problems associated with writing. Mistakes are corrected on the screen, so that errors in the final printed copy should be a thing of the past. More complex editing, such as moving words or blocks of text around, is a matter of a few keystrokes. The days of laboriously retyping an entire document because of a spelling error, or revised organization are gone.

As the values of word processing became more apparent, educators began to consider its application to writing in the schools. The complexity of existing word processors made them unsuited to most needs. Furthermore, there was a desire to extend the benefits to ever younger users. For them, a word processor with a multipage "Quick Reference" card summarizing all the commands available was an insurmountable obstacle. Enter the Bank Street College of Education in New York. Firmly convinced that word processing offered enormous potential for improved writing at all ages, researchers there set out to create the Volkswagen of word processors. It had to be inexpensive, versatile, and above all, very easy to use. The result is one of the best selling word processors of all time--Bank Street Writer.

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## Applicability of Word Processing

Teachers often ask, at what grade level should word processing be introduced. It appears that school use of word processing is too new for a definitive answer to have emerged. Proponents of word processing for students tend to argue that it be used from the very beginning. Donald Graves (Green, 1984), a major figure in contemporary composition theory, notes that the composing rate for beginning writers can be as slow as 1.5 words per minute. This may reflect disinterest, lack of confidence, or sheer fine motor coordination difficulties. Further, the poor appearance of youthful printing or writing may cause discouragement about one's abilities. Messiness may become equated with ignorance. Poor early experiences could turn off a whole group of potentially good writers. Graves (Graves, 1982) states, "...(O)ne can imagine starting kids off writing on the keyboard and saving handwriting until motor skills are more highly refined." However, he does not claim to have done so.

The other extreme is to wait until writing instruction has passed the point of sheer mechanics and at least a short paragraph is required of students from time to time. This approach differentiates the physical act of writing from writing as a visual representation of thoughts, writing as "art." The third possibility is to start somewhere between the extremes, because word processing opens doors to more significant writing experiences at an early age by removing the physical barriers between thoughts and visible product.

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**Word processing should never become artificial, it should support and enhance the curriculum as we know it.**

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In the end, it is the teacher who decides what she can be comfortable with. Word processing should never become artificial, it should support and enhance the curriculum as we know it. Yet we must not close our eyes to possible changes in the curriculum made possible by the technology. Perhaps we can expect or elicit more from students at younger ages with this approach. The answer is not clear at this point.

## Keyboarding

A closely related concern among teachers of composition through word processing is the matter of keyboard skills. The term keyboarding means learning to use one's fingers correctly on the keyboard, free from the page formatting concerns

of typing instruction. Should or must keyboarding precede the use of word processing?

Among college students, Feldman (1984) found that non-typists benefitted as much from word processing as did those with typing skills. Palmer, Dowd, and James (984) worked with sixth graders, none of whom knew keyboarding. The students all gained from experience, but these teachers are adding keyboarding to their classes, using a locally written program.

For the very young, one must seriously consider this matter both from a need standpoint and a physical ability standpoint. Just as paper and pencil carry with them motor coordination concerns, so too will keyboarding. If it is not presented, one must wonder about the development of poor habits which will be difficult to unlearn later in life, one of the negative aspects of word processing cited by Jarchow (1984). Perhaps the physical ability to use a keyboard correctly should be the determining factor in selecting an age at which to introduce word processing.

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**One possible approach to keyboarding is to let the computer teach the student these skills.**

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One possible approach to keyboarding is to let the computer teach the student these skills. Andrews (1984) reviewed many of the popular typing or keyboarding programs on the market today. They ranged from very dull versions of old typing lessons to arcade type games. He found them all wanting in some way. The game approach always required eye movements unlike any used in normal typing. Most failed to build up to phrases and sentences, the real meat of the task. Thus, they could at best be considered a starting point. Keyboarding issues need to be addressed by teachers of typing. Perhaps their future lies at the elementary level, rather than in the higher grades. Common sense demands some attention to keyboarding for any computer use, especially word processing. Exactly when and how to provide such instruction is unclear.

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**Although conceived for children, Bank Street Writer has proven very popular with adults as well.**

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Limitations of Bank Street Writer

Although conceived for children, Bank Street Writer has proven very popular with adults as well. In situations not requiring fancy capabilities, it is perfectly usable for any age. It is not a toy, and needn't be like a set of training wheels, something to discard once the skills are mastered. As long as its inherent limitations are acceptable, it is a viable aid to writing.

What are the limits of Bank Street Writer? There are a few which seem to be design flaws, and which are serious to many potential users. First, the indent function affects the entire paragraph being typed. (Remember, with word processors, a paragraph is all text between two returns.) Thus, it is really only useful for block indentation, a much less common need than simple indenting for the first line of a paragraph. One can live with this, as "normal" indentation can easily be achieved with the space bar.

More serious is the lack of an underlining capability. This could rule out use of Bank Street Writer for preparation of any kind of research paper, where at least the bibliography will require some underlining. It also blocks the judicious use of underlining for emphasis within the body of the text. Perhaps the other benefits of BSW are great enough for teachers to permit hand underlining where it really must be used.

Other limitations are far less bothersome for most users, young or old. None of the fancy printing options common to other word processors exists--bold face, double strike, superscripts, subscripts, margin justification. Most of these do not exist with a typewriter, and the others are comparatively rare, especially now that true footnotes at the bottom of a page are all but a thing of the past. There is also no capacity to automatically generate form letters by feeding names and addresses into a model letter. However, it is still far more efficient to type a letter and manually edit the name and address before printing each copy than to type each letter by hand.

A final, common complaint about BSW is its display of only 38 characters to a line on the screen. According to Loheyde (1984), this makes it difficult to proof for poor transitions and problems with organization. The ideal screen display is clearly to see one's work exactly as it will appear on the printed page. While many word processorsgive full width line viewing (usually 65 or more characters), few are able to display a page worth of lines on the screen at one time. Equally rare is the word processor which will show effects like underlining and boldface as anything more than the appropriate command to the printer. Thus, screen editing is inherently limited; printed drafts will always be needed.

BSW could have been produced to display full width lines. More characters to a line means comparatively smaller characters on the screen, a potential disadvantage to the young, to say nothing of those with poor eyesight. Instead, designers provided both a PRINTDRAFT option, which mirrors the screen display for easy editing, and a PRINTFINAL option to which one controls margins, line spacing, page numbering, etc. Most layout problems arise when attempting to do such things as place a date and return address at the top of a letter positioned off to the upper right. With proper care, this can be accomplished, though it may take several drafts. Screen display is not a serious impediment.

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**The only way to hope to answer student questions and solve problems is to be intimately familiar with the program yourself.**

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## Teaching Bank Street Writer

Assuming that all prior concerns have been resolved, the first step in using BSW with students must be to thoroughly master this word processor yourself. No matter how you proceed, problems will arise. The only way to hope to answer student questions and solve problems is to be intimately familiar with the program yourself. Once achieved, how does one begin with students?

### Text Entry and Simple Backspacing

The producers of BSW intended it to be introduced with the self-instructional tutorial program provided. This is not viable with really young writers, but can be used successfully with older students. The teacher should be familiar with this disk as well, and judge its usefulness by the class at hand. If it is used with any but adults, it is best to take each of the lessons separately over several class periods. Provide plenty of practice with the concepts of each lesson before allowing students to move on to the next.

If the tutorial is not used, the obvious starting point must be either text entry or text editing on a simple level. Either approach can work, but for the sake of uniformity in the learning experience, it is probably best to first let the learners just experiment with text entry without concern for corrections beyond simple backspace/retype. Stress from the very beginning that the RETURN key is only a signal to end a paragraph or to put a line on the page all alone. This will probably go against the understanding of a paragraph for many students, but they must learn and accept this new definition. This is the first fundamental difference from possible prior knowledge of typing or writing.

After students master the notion of just typing with no concern for the right screen margin, the teacher should create some simple documents, length dependent on student level, for students to retrieve and edit for spelling. This is preferable to asking learners to intentionally misspell words to be entered from a printed sheet, and gives uniformity for group instruction which their own initial writing would not. In so doing, you will need to stress that BSW has two MODES of operation--text entry and editing. The ESC key is the "switch" to move back and forth. Even persons who have used the tutorial seldom grasp the significance of the ESC key, since the tutorial tells them exactly when to press it. Be sure this point is absolutely clear to your students.

The edit mode menu should not be explained at this point, other than to show how to move the highlighter to TRANSFER MENU and select it to retrieve your sample document. The most common problem with transfer operations is forgetting how to get to the transfer menu at all. Do not worry about transfer functions as a group. They can best be explained as need for them arises.

Following these suggestions, CLEAR and RETRIEVE will be the first to arise. Guide students through the process, noting carefully the need to CLEAR old work before RETRIEVE is used. Once the document appears on the screen, note the use of ESC to return to the edit mode.

Most beginners face many problems in differentiating between the entry and edit modes. Stress watching the upper right hand screen corner for the four arrows that indicate cursor movement is available and hence editing, versus the simple menu shown for text entry. At this time, edit mode is only used for cursor movement. Be sure students practice moving about the screen adequately.

The key at this level of editing is positioning the cursor correctly, then ESCaping to text entry mode to correct. Save the ERASE function of the edit menu for much later, as it tends to confuse. Stress, instead, the use of the right and left arrow keys for deleting errors. Of the two possibilities, try to get students to use the right arrow exclusively. If you can focus on the left arrow as a backspace during text entry, you bypass the problem of the two arrows working differently. The right arrow is more logical for editing, as it deletes the letter above the cursor, whereas the left arrow deletes the character to the left of the cursor, a logical backspace. Both work equally well when you are used to them, but together they can be confusing. You can't remove them from the entry mode menu, so you must try to stress there proper use.

### Editing

Do not hesitate to repeatedly stress watching the top of the screen at all times. This is essential to BSW working as designed, i.e., without a need for written documentation to follow. Some 90% of all needed information is present on the screen, but many students, especially older ones, have difficulty in learning to rely on the screen for guidance. Do not answer questions for which the screen contains the needed information.

After mastery of simple editing, move into the other editing functions in the same order as the tutorial. ERASE/UNERASE logically come first, followed by MOVE/MOVEBACK, then FIND. (REPLACE will be treated later.) Each must be practiced a great deal to become second nature. Generally, ERASE causes the most problems as it becomes confused with using the arrow keys. Stress use of ERASE only when an absolute minimum of a full word must be removed. Anything less should be done with the arrow keys, preferably the right arrow.

Another point requiring attention is that UNERASE and MOVEBACK function only if NO OTHER OPERATION intervenes. This means that to UNERASE something, one must carefully look at the result on the screen after an ERASE and decide right then if it should be undone. The same applies to MOVEBACK. These cannot be deferred decisions. On the other hand, most word processors give no such option as UNERASE at all, and MOVEBACK can always be achieved with a second MOVE in any word processor.

### Transfer Menu/File Operations

It seems best to provide a supply of INITialized diskettes for saving student work, although the INIT command can be introduced most any time, if desired. In doing so, be sure to emphasize that initialization destroys any existing documents on the diskette, and is normally done only once--when a new diskette is first taken from the box and must be prepared for use. There is no common analogy for initialization, but it can be explained as the procedure required to allow identical blank diskettes to be used by various brands of computers. Blanks are essentially generic and must be prepared to work properly with the Apple or Commodore computer. Once initialized, they are then unique to that

brand of machine unless re-initialized on another make.

There is potential for confusion over DELETE in the transfer menu. Carefully differentiate between disk functions and those affecting only the document in memory. Students of all ages, unless they have had considerable experience with computers, will find the difference confusing. Be sure to give adequate attention to this. There seems to be no direct analogy to other more familiar things. One that might be tried is to compare the disk to an original record album, the document in memory to an edited version of the album recorded onto a tape. One can change the tape version without affecting the record. This is by no means a perfect comparison, but it may be useful.

Utility Program

Finally, in terms of basics, be certain that you fully understand the use of the BSW Utility program. It seems best to use class diskettes for student work, although students may be allowed to purchase and bring their own, if you prefer. If using class disks, then passwords will be needed. One of the important functions of the utility program is to allow you to determine passwords used on a given disk. Be sure that some student will forget a password. You must try to prevent students from learning of the utility program and how it works, or the security of passwords quickly disappears.

You also have the option through the utility program to customize BSW to your liking. For instance, you may prefer a different set of default values for final printing, such as if your printer normally produces elite type rather than pica, thus necessitating more characters per line. You may also want to switch the draft print mode to only double space to save paper. The possibilities are endless. Study the manual carefully to explore your options, and be sure the students never have access to it.

Advanced Uses of BSW

Often when one is writing, an idea will come to mind which could be used for another assignment. Encourage BSW users to just go ahead and type the idea right then. They can then select the SAVE option from the transfer menu to save only that part of the current document as a new file. When SAVE asks whether to save the entire document, answer NO and follow the next prompts to mark the passage to save under a new name. Finally, ERASE the comments which do not fit the current project.

Despite one's best efforts, the final print out may well contain oddly short lines on the page, giving a very ragged right margin. This may indicate the presence of unintentional carriage returns. To determine if this is so, study the line after the short line to see if the first word appears to be short enough to have fit on the prior line. If so, position the cursor in edit mode to the space after the last word on the short line. Switch to entry mode and use the right arrow to erase characters to the right until the two words join together as one. Then type a space to separate them. If there was a hidden return, this will remove it.

Sometimes when editing as just suggested, the screen layout will appear to be improper when one finishes. Try pressing ESC to switch modes. The screen display should adjust itself.

For older students, the FIND function can be used effectively to improve style. Teach students to use FIND to locate all occurrences of overused words, which can then be replaced with synonyms. Style can also be improved using MOVE and MOVEBACK. Encourage students to experiment with their organization in this safe manner.

Of the edit menu functions, REPLACE is usually the last to be taught. When students are completely comfortable with other recurring typos in their work. REPLACE can also be presented as a means of reducing typing by adopting a shorthand scheme for frequently used words. For example, in preparing this document, BSW was used wherever BSW should appear. When finished, REPLACE easily located and filled in the full wording, saving much typing effort.

FIND can also be helpful in locating a specific place in a document for further editing. Position the cursor at the start of the document and identify a unique word or group of words to FIND. BSW can locate them much faster than you can using just cursor movement.

At some point you will want to teach the few features not found in any menu. When document length reaches at least several screenfuls, introduce the use of large cursor moves in edit mode. The letter B will cause a swift jump to the beginning, E will move to the end. U and D produce moves of 12 lines Up or Down from current position. All speed up moving about considerably.

If BSW is used for lengthy documents, one may eventually reach a point where the document cannot reside in the computer's memory in one piece. Users should learn that holding down the CONTROL key and pressing S will cause the program to tell you how much memory space remains. Periodic checking will permit the user to stop text entry at an appropriate point, SAVE the document, CLEAR the memory, and begin a new document which is a continuation of the first.

Printing the final document in one piece with proper page numbers requires mastery of the options presented for formatting a PRINTFINAL copy. When printing the first portion, one must answer NO to the question whether to eject the last page. After that piece is printed, CLEAR the memory and RETRIEVE the next segment. Select PRINTFINAL again and answer YES to the question whether this document is a continuation of a previous one. In this way, any number of segments stored separately can be printed as one document.

Probably the most misunderstood option in any menu is CLEAR in the transfer menu. Its purpose is to erase the current document in memory to permit beginning or retrieving another. It is like taking out a clean piece of paper to write something new. Users must learn to use this correctly when working on more than one document at a single sitting. If there is less than one printer per computer, printers must be shared among the class. When taking one's disk to a computer with printer, it is imperative to CLEAR that computer's memory before retrieving one's own document. Otherwise, what is printed will be a combination of the desired document and whatever was left in memory by the previous user. RETRIEVE does not clear memory automatically. Rather it brings the requested document into memory at the current cursor location. This can be very useful for intentionally combining files, but it becomes an aggravation for many beginners who do so accidentally.

Classroom Applications

In the early stages of learning to use BSW, cursor movement must be mastered. Teachers can use BSW to prepare a document which is really a maze of characters on the screen, through which students must steer the cursor. You might even allow students to "cheat" by providing in the walls of the maze certain characters which they are allowed to erase using the left or right arrow keys to create shortcuts through the maze.

To gain proficiency in editing on BSW, prepare sample documents and provide them to students on disk. Provide both final printouts, to read for content and organization, and drafts, to enable easiest editing. This can be used effectively to stress the polishing aspects of composition rather than initial writing, as well as the sheer mechanics of editing. It's a good way to approach topics like word selection and overuse of subject-verb word order, especially when the same pronoun begins each sentence.

To stress the need for proof-reading, have students routinely proof one another's work. The writer will benefit, and the reader should sharpen an important skill.

Students can use the word processor as a crude data storage system. Each might enter a personal list of bothersome spelling words, adding and deleting as their spelling improves and new lessons are begun. Name and address files, lists of belongings, catalogues of collections can all be handled using BSW. They offer a perfect excuse for mastering FIND when one wishes to locate a particular piece of information in the file.

In Louisville, Kentucky, eighth graders study Romeo and Juliet. The unit was expanded to include research on Elizabethan England. To make the research more meaningful, teacher Alyce Pollitt decided to have students report their findings in newspaper form. This offered the opportunity for varied writing styles--stories, editorials, advertisements for products or services of the age, cartoons, even an advice column. No research project ever produced such excitement, especially among students who generally performed poorly in English (Pollitt, 1984). This idea is clearly adaptable to many other situations.

Judith Scotchmoor (1984) was concerned about problems her seventh and eighth graders had with sequencing ideas. She prepared a 15-20 sentence story using a word processor, then rearranged the sentences randomly. Each student received a copy of the scrambled story on a disk, then used the word processor to place the events into a logical sequence. Students printed out their final versions. Scotchmoor then read them the original story. Students were given time to read their versions, as many had come up with variations. This led to discussion of often subtle differences caused by sequence. With texts of varied lengths and complexity, the idea is usable at lower levels as well.

**One of the problems in learning to write well is audience identification and learning to write for that specific audience.**

A simple variation would be for students to write and scramble stories to challenge their friends.

One of the problems in learning to write well is audience identification and learning to write for that specific audience. Publication of student work can be a key to promoting writing skills development. For whom is less important than that it be done. Audiences can include other students, parents, whomever. All writers wonder who will read their work, other than the teacher. When the audience grows, so does interest in the result. Word processing allows students at any age to produce "camera ready" copy, which can then be photocopies for distribution. Graves (Green, 1984) believes students should assume total responsibility for the publication, from determining what to write to final printing and distribution. He further states that expanding the audience is a key to evoking voluntary revision. A larger circle of feedback brings in more evidence of lack of clarity, excessive brevity, imperfect organization, etc.

Loheyde (1984) suggests that teachers of writing have long lacked an analogy for the writing process. For those whose students have had exposure to computer programming, as is becoming more common, it may be possible to draw an analogy between writing and programming. Both require structure, detail, and clarity. Start with an outline, then use the insertion capabilities of the word processor to fill in. This may help prevent loss of ideas in midstream. One can jump about as the inspiration strikes. Ideas can and should be recorded as quickly as possible, with clarity and detail improved during revision, along with simple mechanical problems.

**Graves and many others stress the need for allowing students to select their own topics.**

A major stumbling block for student writers is topic selection. Graves and many others stress the need for allowing students to select their own topics. Teacher assigned topics impose unnatural considerations on the writer. It is better to work to help the student identify topics of personal significance than to assign them.

At the very beginning of the term, have students prepare a list of possible theme topics. This will require prompting in most cases. Ideally, the computer might pose the questions and store the responses to draw upon later, but no program yet exists for microcomputers to do this. Try to provide broad guidelines, which afford lots of flexibility. Here are some ideas which you can expand upon:

PEOPLE
The ones I most admire or wish to be like.
Those I dislike most (and why).
My most unusual relatives.

FOODS
Foods I love to eat.
Foods I can't stand or mother makes me eat.
Foods I'd like to try but never have.

COLORS/CLOTHES
Favorite combinations.

ACTIVITIES
My favorite summer pasttimes.
Jobs I like to do around the house.
Jobs I have to do around the house.
The best show in TV.

THE FUTURE
Careers I am considering.
Places I want to visit.

VEHICLES
Places I have lived.

The goal is to get students to develop a sizeable pool of potential topics, however brief each may be at this point. Strive for at least twice as many topic ideas as the number of assignments likely to be given in the class.

Students could create a topic file directly with BSW as you prompt their thinking, or later as an early assignment to use it. Each time a topic is required, one can be selected from the list and ERASEd or MOVEd to the end to signal its use.

Older students can help teachers of younger students by entering teachers selected text passages, then deleting words at the specified interval to yield cloze tests for reading.

Many ideas for group projects come to mind. Teacher created outlines can be fully developed as group projects, as well as individually. Students can generate class stories from an initial, sketchy outline. One student enters the first line or two, then another adds to it and so on until a conclusion is reached. This activity can extend over many days by saving and retrieving the partially completed story as needed. For the more adventurous, parts of a story might be assigned for independent development. They would then be combined by retrieving them together into one large file.

Could your class produce a mini-book of their own? Suppose you do a unit on birds. Let each student research a particular bird and prepare the write-up on BSW. Combine all in the appropriate order to create a bird encyclopedia.

A class newspaper can be an appealing project, which may have been too much work to bother with in the past. Whether it be contemporary news of class activities, a holiday issue on vacation plans, or a mock newspaper based on historical research in a social studies class, interest will run high. Student's effort devoted to it will likely exceed that usually given to assignments.

Letter writing could regain its old popularity thanks to BSW. Have students develop this form of writing with letters to family or friends, thank you notes following birthdays or Bar Mitzvahs or holidays, letters of praise or complaint to companies whose products they use or to governmental officials. You might even mount a writing campaign to influence legislators on education issues. Out of the mouths of babes...

Pen Pals may have gone out of style, but BSW could bring them back. Think of the learning that could occur from pen pals in other parts of the country, or even abroad.

**Pen Pals may have gone out of style, but BSW could bring them back. Think of the learning that could occur from pen pals in other parts of the country, or even abroad.**

BSW can be used as a crude electronic mail system for students. E-mail allows for entering messages to other system users and retrieving one's own "mail." This could be simulated by devising a scheme for naming files, using a single class disk, and not allowing passwords.

Poetry writing can be enhanced with word processing
Suggest
experimentation
with word
arrangements
on the page
as well as
within the
poem itself.

Among the supplements now appearing for use with BSW are "writing skills templates" from Learnco (128 High St., Greenland, NH 03840). They are designed to help students of junior high age write in a variety of formats, including campaign speeches, news articles, and mysteries. More than just outlines to be filled in, the templates include lessons which help with generating the ideas, organization, and revision.

**...a very common question from enthused educators is how to implement word processing with only one computer in the classroom, or worse, school.**

Conclusion

If the preceding comments have been helpful, there remain two matters that affect the use of word processing in the classroom. First, a very common question from enthused educators is how to implement word processing with only one computer in the classroom, or worse, school. The answer is quite simple; it cannot be done to any significant degree. Schools must recognize that word processing, for all of its benefits, places higher demands on machine access than any other use except, possibly, programming instruction. Few would attempt to teach much programming with only one computer. What would writing instruction be like if the members of the class all had to share a single pencil? This is the hard reality of what word processing demands.

Finally, there is no ready answer for two related concerns raised by the anti-word processing establishment. Is word processing too big a crutch for students? After all, they can't (yet, at least) carry a computer around with them constantly, as they can paper and pen. The related issue is the effect of word processing on penmanship skills. Will students forget, or never learn, how to write in any manner but at a keyboard?

Both arguments seem to be primarily excuses for not moving into a new approach to writing. Few schools can offer their students so much machine time and word processing instruction as to justify such fears, although this may change. Still, the underlying issues seem quite similar to the controversy generated among arithmetic teachers by the advent of inexpensive pocket calculators. Many chose to sit back and decry the travesty. While they did so, others worked to find creative approaches to using calculators in instruction. Teachers and administrators fearing the effects of word processing would do well to learn from the experiences of their colleagues in arithmetic.

Calculators have had a profound effect on number manipulation. All evidence suggests a similar role in text manipulation for computers and word processing. With BSW, the process has become viable. The experimentation of today will affect the future of written communication.

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# An Artistic Touch: Computerizing the Art Program with Touch Tablets

**By Anna Marie Coveny**

The educational computer age has dawned. The proof can be viewed in the advertising campaigns geared toward both home and school markets, the proliferation of educational software, legislative debates over generous and self-serving corporate offers to equip our schools with particular hardware, publication of special topic issues of respected educational journals, new computer course offerings with accompanying high enrollment figures, computer literacy requirements for graduation, and most convincing of all--the sheer numbers of computers that have been purchased by the school systems.

True, microcomputers exist in the schools, but are they being utilized in the art curriculum? In some school systems, microcomputers are being incorporated in a limited way and in fewer still, they form the basis of complete courses. Operating on the premise that microcomputers are already available in the elementary and secondary schools, the primary reason that they are not addressed in the art program seems to be lack of information as to how and why they can be incorporated into the existing philosophy, goals, and daily lesson plans.

**Students who possess some degree of confidence in their own artwork can be challenged by a new art form—computer graphics, while those who arrive at school with some familiarity with computers may extend their interest into the field of art.**

## Investigate Existing Curriculum Guides

As an illustration of a procedure to set the stage for microcomputing in the art program, the curriculum guide of a suburban high school was obtained to discover whether the inclusion of computer imaging would be compatible with the existing philosophy and goals of the art department. Four paragraphs found in "A Suggested Statement of Philosophy and Guiding Principles" adopted by Hoffman Estates High School (Brooker, 1984) follow:

> A major purpose of art education is to help the student develop a positive artistic self-concept and to awaken in the student a lively and enduring interest in art. This can be accomplished through a sequential program, broad in art experiences and flexible to meet the needs of students according to their degree of maturation and interest.

The students who possess some degree of confidence in their own artwork can be challenged by a new art form--computer graphics, while those who arrive at school with some familiarity with computers may extend their interest into the field of art.

> The art program is not media-oriented with experience in media for media's sake; rather, media should be employed as the vehicle for solving conceptual problems and as a means for a personal expression of the problem. There should be ample opportunity for investigation and experimentation in various media for the sake of realizing the potential and limitations of the media in its applications for possible solution to conceptual problems in the visual arts program.

According to the statements of this school system, pencil, charcoal, acrylic paint, or clay are not manipulated as the ultimate goal but rather used as a means to a greater end. Through these and other media choices, solutions are sought to conceptual problems. The contribution of computer as media and tool would be welcomed in this context.

> The experiences and media manipulation should help the students become more perceptive, more aware, and more critical in their evaluation and should help them in their individual value judgments and personal performance through drawing, painting, sculpturing, printmaking, weaving, etc.

In the above statement, "etc." allows room for the inclusion of computer imaging with its own unique equipment, procedures, and characteristic appearance of the final product, to parallel those of the other art forms listed. The use of the computer can be planned to provide training in design awareness and critical judgment.

**The elements of design and the principles of composition can be introduced, reviewed, and evaluated in computer generated artwork.**

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> In the creative expression of the individual through visual symbols, means, and materials, the images of the artist in his/her time as in every generation, should and will continue to vary. However, the elements and principles upon which aesthetics and creative action are founded will never change, but will remain constant.

What better way is there to convey these particular concepts to the art students than through the investigation of computer graphics? "Should" and "will continue" are strong urgings to acknowledge the influence of modern technology in art. Similar words were once used in the art curriculum. The elements of design and the principles of composition can be introduced, reviewed, and evaluated in computer generated artwork. The "High School District 211 District Art Philosophy" (Brooker, 1984) states:

> A creative spirit evolves from good visual experiences in the media of the Past, Present, and Future. Our purpose is to develop that spirit into a conscientious, aware individual, intent on coordinating with a constantly changing environment. Ultimately he/she will learn to redefine art as life according to his/her knowledge and experience and recognize the symbiotic relationships of all things great and small.

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**Justification of the use of the microcomputer is obvious when it is included as present and future media, when it helps students adjust to the constantly changing environment, and when redefining art.**

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Justification of the use of the microcomputer is obvious when it is included as present and future media, when it helps students adjust to the constantly changing environment, and when redefining art. Could there be a more obvious, established rationale? Sentences chosen from Hoffman Estate's H.S. "District Statement of Purpose of Art" read:

> As in all disciplines, basic fundamentals and techniques are required to achieve successful solutions. These fundamentals consist of elements of design, principles of composition, exposure to our art heritage and other ways of unlocking imaginative and creative thinking. Techniques are as varied as the individual--there is no limit to the kinds of techniques a student can learn.

No additional comment seems necessary at this point! In the listing of the "District Art General Goals," there appears none that could not make use of computer graphics in some capacity, such as:

1. Providing experiences which help students adapt to a world of change.
2. Providing opportunities which help students, parents, and other community members demonstrate a positive attitude toward learning.
3. Strengthening a feeling of self-confidence and self-worth on the part of all students.
4. Providing opportunities for students to develop their creativity.
5. Providing opportunities which help students master the basic skills of visual problem solving.

The general goals provide a starting point for generation of ideas as to how and where to make use of the microcomputers. Specific behavioral objectives would have to be formulated for the individual unit lesson plans which offer the microcomputer as a medium for the art students.

Having discovered no direct opposition and, indeed, some clear support of the inclusion of computer imaging in the philosophy, guiding principles, and goals of the selected high school curriculum, an additional example was chosen for perusal. This curriculum guide services a rural elementary school district and asserts in the "Art Philosophy" (Goetsch, 1983):

> Art Education in the Primary Grades and Middle School provides for individual expression in cultivation of the eye to perceive actual form, and then to present it graphically, creating self-expression and awareness of the students' surroundings, a learning experience in different Art media and procedures and an appreciation of artworks of others.

There is nothing in the introductory paragraph to preclude using the computer as well as more traditional approaches. The goals of the art program (Goetsch, 1983) at Seneca Community Consolidated Grade School are then listed:

1. Develop and build individual art skills
2. Develop and encourage the creative thinking process
3. Develop verbal and non-verbal communicative skills
4. Provide a situation for individual expression
5. Develop a means of self-awareness
6. Allow for the use of multi-media experiences
7. Develop a means of personal accomplishment

If computer graphics production is understood to be an art skill, these goals can all be addressed in some measure through well-planned experiences. The philosophy concludes with one more paragraph:

> Through an Art program, the individual student is allowed the use of his/her own unique creativeness. Once the objectives of the Art course have been achieved, a student will have acquired a useable tool for the future.

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**It should be evident that within the approved school district curriculum guide there already dwells the basic rationale for the addition of computer imaging to the more traditional art forms.**

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In addition to the typical valuable skills and attitudes gained from the art experience, some aspects of computer literacy will have been learned. The inclusion of computer graphics into this art program could be done without altering the original philosophy and goals. Rewording would be necessary in the "Developmental Learner Objectives" to allow for the addition of microcomputers since those statements often contain specific media references. It should be evident that within the approved school district curriculum guide there already dwells the basic rationale for the addition of computer imaging to the more traditional art forms. Naturally, successful changes in course content must be approved by those teachers involved in teaching the art classes.

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**The microcomputer can provide planning and designing methods for the art classes.**

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Consider Merits of Microcomputer Use

The microcomputer can provide planning and designing methods for the art classes. Ponder student resistance to creating many thumbnail sketches before proceeding to a major project. Using the microcomputer in the designing process can result in more exercise in critical judgement merely because of the speed at which the art student may visualize the ideas. Images may be altered quickly and often until they are judged suitable for execution in various media. The electronic sketchbook (Holden, 1984) provides a novel approach to practicing fluency and flexibility, two important characteristics of creativity. After the preliminary designs have been completed, they may be used to create drawings, paintings, prints, sculpture, jewelry, textiles, etc. The drawback of this method appears to be convincing some of the students to end their designing sessions and to share the microcomputer with the other members of the class.

With such a variety in student readiness levels to grasp the concepts involved in linear perspective, there is another welcome aid available via microcomputer (Young, 1984). If the parallel side of the box in one point perspective examples were to appear on command in the size and location preferred by the art student without tilting, would not the rule concerning vertical lines be more obvious? If the side and top of that same box were created by continuous lines starting at the front corners and ending at the vanishing point without any turning of the student's ruler, would not that be a more convenient way to realize the concepts of extension lines and vanishing points? The students do not have to give up that ubiquitous railroad track example of one point perspective. Even that can be computer generated! Experiments can be quickly performed with size changes, overlapping, and placement to the right and left of the vanishing point as well as above and below the horizon line. Similar advantages are available in understanding two point perspective concepts as well. Time, paper, and erasers can be spared on these exercises with more time allowed for execution of a final perspective rendering, which may turn out to be in the media of pen and ink, markers, colored pencil, or even a computer printout.

Initial exercises involving the characteristics of the element of design, line, can be tackled with great enthusiasm at the microcomputer. Important in this lesson are the concepts of the versatility of line and the emotional connotations which can be expressed through the use of line. Through the computer generation of line the students can practice using their vocabulary of horizontal, vertical, diagonal, straight, wavy, thick, thin, etc.

If unique holiday cards would make an appropriate assignment, but block printing has been reserved for other purposes and time is at a premium in the school calendar, the capabilities of the microcomputer speed and consistency in repetitive tasks will be useful. Students may cut, fold, and hand color the black and white printouts. The full size printout can be reduced on a copy machine or the small size printout used as is (with its interesting horizontal elongation of the screen image). Paste ups of multiple designs on an 8.5 x 11" sheet can be reproduced on colored paper in the school copier. The resulting copies can then be cut apart, redistributed to the creators who then fasten them as covers to folded paper containing personalized messages.

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**The grid method of enlarging can be used to capture a computer design and translate it into another art form.**

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The grid method of enlarging can be used to capture a computer design and translate it into another art form. With no damage to the original design (which has been saved on disk), lines may be crisscrossed to form a grid of a specific size on top of the original (the second version is also saved on disk). A resulting printout may be enlarged by drawing onto a larger grid on the surface of a wall for a mural or onto stretched burlap for a stitchery or a punchneedle wall hanging. An alternate method would be projecting a slide of the original design and adjusting the projector to achieve the desired size.

An impressive slide show may be assembled for the school board meeting that features the art program, or photographic prints may be used to create a colorful display for the parent's open house. When shooting off of the screen, a 35mm camera on a tripod in a darkened room (or with a black cloth or black cardboard hood) is a must to prevent blur, glare, or reflections from appearing in the photographs. A more expensive suggestion involves colored photographic print enlargements of successful computer images which make significant works of art in their own right.

Art assignments may be collected on a single class disk or on individual student disks to be evaluated by the art teacher, thereby eliminating the use of the camera or the printer. Caution--write the label before it is affixed to the disk or use fine line marking pens. The pressure applied in writing with ball point pen on the disk is often enough to destroy the work of an "electronic Rembrandt"!

## Acquire Touch Tablets

Even by beginning with the established philosophy and goals of the art department, recognizing the opportunity to include computer imaging as an option in planning the units of the art program, and being aware of some uses of the microcomputer which can be formulated into individual lesson plans, there is still a question of equipment needs within the restrictions of a limited budget. Start by taking a count of the number, brand(s), and location of the microcomputers and dot matrix printers already owned by the school system. Note how many of the monitors (similar to television sets) are in color. Color capabilities are not necessary for word processing or programming, but color monitors are often purchased for educational game use. Color as an element of design is important in the art curriculum.

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**Touch tablets make the microcomputer accessible to all, including young children, handicapped individuals, and anyone with varying degrees of technophobia, math anxiety, and keyboard aversion.**

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The peripheral which can be used to accomplish all of the art activities suggested in this article is the touch tablet (Rubenstein, 1984). The touch tablet is an additional piece of hardware (a drawing surface) which operates by means of special software (a disk). Although touch tablets were introduced at a manufacturer's suggested retail price of up to $150.00, approximately half that figure is commonly found with a little comparison shopping. Additional software packages are available for using the touch tablets in subject areas other than art. This provides a good rationale for the purchase of multiple touch tablets in the school system. Touch tablets make the microcomputer accessible to all, including young children, handicapped individuals, and anyone with varying degrees of technophobia, math anxiety, and keyboard aversion.

Operation of the touch tablet is easily learned either by experimentation (discovery method) or by reading the accompanying owner's manual. By using a plastic stylus or even a fingernail on the touch sensitive drawing surface, a cursor (marker) appears on the screen for the purposes of selecting from a variety of commands and directing the placement of the high resolution image on the monitor. Your artistic choice is confirmed by the press of the button (or a particular spot on the tablet on certain models). For example, in the one point perspective exercise the most useful drawing modes will be "frame" (which takes care of the outline of the square or rectangle), "line" (which insures straight lines between two points without a ruler), "lines" (which produces a new line eminating from the end point of the previous line), and "fill" (which allows enclosed areas to be colored automatically). If small changes are desired, areas may be covered with the background color. If more serious errors occur, the entire drawing may be removed with the "erase" command to provide for another try. Design decisions are constantly being required of the art student. There are many modes available for producing both solid and open geometric shapes, freehand organic shapes, and special effects. The menu provides the option of magnifying a portion of the screen in order to permit detailed work or fine corrections. Decisions must be made by the user as to the "brush" choice, thereby controlling the line quality. Color selection is also under user control, subject to the limitations of the particular microcomputer. Students may take pride in the sophisticated appearance of the art work due to lack of creased corners, ragged edges, spilled ink, etc. Both the newness of the technology and the immediacy of the results are motivating factors in student and teacher use of this easy to operate input device.

In conclusion, art educators are encouraged to refer to the written philosophies, goals, and objectives of the school system and read between the lines. Is computer imaging to be found there? An investigation of the brands and models of the microcomputers available in the district and procedures for sharing them should precede the completion of the requisitioning process for a touch tablet (or several), compatible with the existing systems. Next, the students can be offered another art form with which to be creative. Finally, the results of the investment should be shared with both school and community members through art displays and demonstrations.

Table 1 provides a comparison between two popular, easily operated, and readily available touch tablets which are the KoalaPad, manufactured by Koala Technologies of 4962 El Camino Real, Los Altos, California 94022 and PowerPad, manufactured by Chalk Board, Inc. of 3773 Pleasantdale Road, Atlanta, Georgia 30340.

Table 1
Comparison of Two Touch Tablets

| | KoalaPad | PowerPad |
|---|---|---|
| Input peripheral | | |
| Available for Apple II, II+, IIe | x | x |
| Atari 400, 800 | x | x |
| Commodore 64, Vic 20 | x | x |
| Software included | x | x |
| Additional software available | x | x |
| Size of touch tablet | 8x6x1 | 10x17x1.5 |
| drawing surface | 4x4 | 12x12 |
| Suggested retail price | <$125 | <$150 |

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# Logo, Teachers, and Kids: Some Powerful Ideas

By James A. Lockard

A prime characteristic of the early 1980's educational scene has been the flood of microcomputers into the schools. With it comes the inevitable question of how best to utilize this new technology. The buzzword of the age appears to be computer literacy, although the term has thus far defied common definition.

From the moment one unpacks the box containing that new micro, perhaps the most obvious use for it is programming. After all, the thing is nothing but a mass of electronic components that are quite dead and useless without a program to direct their functioning. Many of the major voices in the field of computer education, such as Arthur Luehrman, have argued with great success that the key element of computer literacy is, in fact, being able to make the computer your very own servant. This can only mean being able to program it yourself to do exactly what you wish.

If one is to learn to program, a means of communicating with the computer must be mastered. We have yet to reach the point where normal English suffices. In 1968, long before most educators even dreamed of computers in the hands of students, the National Science Foundation funded a major research project. One of the outcomes of that project was a new approach to computer use, something called Logo. Today Logo is primarily associated with the efforts of Seymour Papert and colleagues at MIT.

Most educators today have at least heard of Logo, yet comparatively few appear to understand it. One often hears comments about the Logo "language." To be sure, Logo is a language, for it provides a link between human thoughts and computer comprehension. But it is viewed by its creators as something far more. Abelson (1982) writes:

> Logo is the name for a philosophy of education and for a continually evolving family of computer languages that aid its realization. Its learning environments articulate the principle that giving people personal control over powerful computational resources can enable them to establish intimate contact with profound ideas from science, from mathematics, and from the art of intellectual model building. Its computer languages are designed to transform computers into flexible tools to aid in learning, in playing, and in exploring.

An interesting related view of Logo is offered by Burnett (1982). He presents his book, and Logo, in this way:

> The language is called "Logo." The pedagogy emphasizes learner exploration. The philosophy centers about control--the exploration is largely under the control of the learner who is expected to create many of his/her own questions and problems.

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**Logo is simple to use, flexible in the extreme, and almost completely open-ended.**

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## The Nature of Logo

Logo clearly rests upon different fundamental assumptions than is true of computer languages generally. In Papert's terminology, Logo exists to allow students to create microworlds, personal environments. Logo is simple to use, flexible in the extreme, and almost completely open-ended. Logo demands little of its user, and allows nearly anything. It was designed to be used in a totally free environment, to be explored as one would a park or cave. If Logo is to live up to the dreams of its designers, to be the tool for learning

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problem solving that so many teachers and schools dream of, it seems essential to examine the philosophy itself and not just its tangible form, the language. To that end, and far beyond the scope of this article, the first fundamental recommendation for the Logo teacher is to attempt nothing with Logo before having thoroughly read and understood Mindstorms by Seymour Papert (1980).

**...Logo rests on Piagetian educational psychology.**

Papert's book is complex and not light reading, but a few comments may be extracted from it to provide a framework for the remainder of this article. First, one must understand that Logo rests on Piagetian educational psychology. If you are hazy on that topic, do some refresher reading in the area. Papert explains that Logo rests on two fundamental ideas:

> The first is that it is possible to design computers so that learning to communicate with them can be a natural process, more like learning French by living in France than like trying to learn it through the unnatural process of American foreign-language instruction in the classroom. Second, learning to communicate with a computer may change the way other learning takes place. The computer can be a mathematics-speaking and an alphabetic-speaking entity...The idea of 'talking mathematics' to a computer can be generalized to a view of learning mathematics in 'Mathland'; that is to say, in a context which is to learning mathematics what living in France is to learning French.

This is the concept of the microworld, a place where the subject matter and the approach to it are so interwoven as to be a living laboratory. Subject matter is not something dead, to be dissected in the classroom, but something alive, to be experienced and examined as any other everyday occurrence. this leads, in turn, to a discovery-based approach to learning, using Piaget's model of "children as builders of their own intellectual structures."

**To make Logo accessible to the very young, and fun for learners of any age, the entry point was framed in the concept of turtle geometry for the creation of graphics or patterns.**

To make Logo accessible to the very young, and fun for learners of any age, the entry point was framed in the concept of turtle geometry for the creation of graphics or patterns. Originally, Logo was used to control a robot turtle, linked by wires to the computer, which could be moved about the floor. The turtle contained pens of varied colors which could be raised and lowered to leave a trail on paper showing the paths taken. This proved to be a limiting factor, both in terms of expense and freedom to explore. The re-creation of the turtle as a graphic symbol, living and moving about on the screen, opened up new horizons in application.

**...do not try to introduce students to Logo unless you are yourself comfortable with it.**

With that brief background, here are two specific recommendations to the novice. First, do not try to introduce students to Logo unless you are yourself comfortable with it. A certain amount of learning along with the students is fine, but you need a fundamental command as a starting point. If you want to pursue Logo, but lack the knowledge, purchase a copy of Turtlesteps by Pamela Sharp (1984). It is an excellent tutorial for both Apple Logo and Terrapin Logo, side by side in one volume. For users of computers other than Apples, these two Logos are the major implementation forms for microcomputers. One will be quite similar to the version available for your machine.

Turtlesteps covers only turtle graphics, but a companion book Giantsteps should be available by the time you read this. It will treat the much less familiar list processing capabilities of Log. If you master list processing, Logo can become your all-purpose language for writing computer-assisted learning materials, or any other programming need. It is also fundamental for alphabetic use of Logo beyond an elementary level.

Second, if you face the prospect of introducing Logo into the curriculum, but are not ready to do so on your own, you may be interested in the LOGO guided Discover Kit. It offers a complete turtle graphics curriculum for grades 1-8, duplicator masters, puppets, and enrichment activities. It is student paced and is offered with a 30-day money back guarantee. The source is MICROCOMPUTER RESOURCES, 2845 Temple Avenue, Long Beach, CA 90806. Call them at 800-821-1779 nationwide or in California at 800-824-6277.

Teaching Logo--Principles

Papert (1980) stresses very non-directive methods for teaching Logo, yet most Logo teachers find that learners need more guidance than Papert advocates. Is there an ideal, yet practical approach to Logo?

Moore (1983) describes her dilemmas with Logo, the results of wishing to apply the Papert "leave 'em alone" attitude:

> As a Logo teacher, I look at a child and wonder what this particular mind will do with Logo. Will it be something I've never seen before? How can I let it be something I've never seen before? And if each student is to discover the power of Logo in his or her own way, then to what extent should Logo be taught? It seems important to intercept discouragement. It seems equally important not to intercept someone's "Aha!".

The teacher's role with Logo is described more directly by Dale (1984):

> You are not meant to direct learning from a podium and the security of a carefully mapped curriculum. Instead, you are meant to be in the thick of things, sometimes taking an active part in the learning process, sometimes suggesting new ideas, sometimes stepping back and letting explorations continue under student control.

Dale goes on to explain the problems with Papert's hands-off philosophy:

> Why not sit back and let the kids interact with the language? The answer is that simple interaction isn't enough. Sure you need tools to think with just as you need tools to build a house. But you also need an expert to guide and stimulate fruitful investigations and to act as a role model. Furthermore, thinking skills must be used in different contexts to ensure that transfer of learning occurs...The thinking skills that are first tested with Logo on the computer must then be tested in other, non-computing contexts as well.

Critical to finding a proper balance is to be certain never to do the students' thinking for them. WE may tend to want to rush things, when often what is needed is time, not an "answer." So what if the student spends much time typing in repetitive lines which could be replaced with a REPEAT structure? If you watch the students for signs of boredom, rather than their work for signs of "inefficiency," you'll know when it's time for more instruction.

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**Socrates would have loved Logo!**

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Another acceptable approach is to answer questions with questions. What more time-proven method exists for eliciting further student thinking about a problem? Socrates would have loved Logo!

In summary, do not hesitate to actually "teach" aspects of Logo, rather than allowing everything to be "discovered." The critical thing is to do this so as to enhance students' ability to explore and create freely, without needless frustrations. Be cautious about any directives which would stifle creativity. Do not be overly concerned about the "best" solution, especially in the early years of Logo exploration.

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**Often there is more to be learned from the "mistake" than from the original intent.**

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In working with Logo, we must learn to give up our tendencies to view things as right or wrong. Logo is inherently a microworld of serendipity. A mistake, unless it is in basic syntax, is really nothing more than an unexpected outcome. Often there is more to be learned from the "mistake" than from the original intent. Many errors are themselves an opportunity to further extend the realm of the turtle. For instance, the Apple Logo "error" message "I DON'T KNOW HOW TO..." is clearly an invitation to TEACH the turtle "how to..." Encourage students to follow up on such opportunities and let their imaginations carry them. Terrapin's message, THERE IS NO PROCEDURE NAMED..., is less friendly, but serves the same purpose.

Anyone working with turtle graphics, regardless of age, will some time face the question of how to achieve a desired design. Encourage all learners to get up and "play turtle" by walking the pattern they wish to create. This should quickly clear up problems of whether to turn right or left, and may well suggest at least a clue to the number of REPEATS required to complete a geometric pattern or the angle needed. This should cause no embarassment at any age.

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**One of the most important possible outcomes of learning to program a computer at any age is the realization that a given problem may have many equally viable solutions.**

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Moore (1983) describes her concern when she first observed students "borrowing" one another's procedures. Obviously, original work is preferable in most cases. She decided that borrowing was acceptable so long as the borrower could fully explain the workings of the borrower procedure(s). This seems like a natural and acceptable response to the situation, but should have been carried one step further. The borrower should also be held responsible for utilizing the borrowed material in some original way. Thus the borrowing can become a case of not reinventing the wheel, but moving forward based on its invention.

If you use Apple Logo, your dealer has something you will want to obtain. The Apple Logo Tool Kit offers new procedures to enhance Apple Logo, including a very simple 'word processor,' music routines, and a tiny Logo for the very young requiring only one key press to move, turn, etc. The documentation is provided on a second disk, and a third contains sample Logo programs. The material is free, although dealers may charge a copying fee or require that you purchase blank diskettes in the store. Either way, it's a bargain. The documentation is quite extensive and can be printed out using a routine on the disk or, better yet, using Applewriter. If you cannot find these resources in your area, contact the author of this article for assistance.

Finally, a simple tip. If you use Logo on an Apple IIe, and suddenly the most fundamental commands (FD, BK, etc.) produce a message (THERE IS NO PROCEDURE CALLED FD or I DON'T KNOW HOW TO FD), check the CAPS LOCK. Logo cannot respond to lower case letters, and does not display them. It is very easy to end up in lower case and you'll get no other hint of it than that nothing works as expected.

## Teaching Logo--Useful Procedures

Logo has been acclaimed for its ease of use, which makes it suitable for the very young. Abelson (1982) claims successful use at the pre-school level, and Bitter (1984) includes Logo activities at the kindergarten level in his computer literacy scope and sequence. Yet if one looks at the typical introductory exercises with Logo, one must wonder how generally applicable Logo can be at that age level. Normally one must begin with mastery of FORWARD, BACKWARD, RIGHT TURN, and LEFT TURN. RIGHT and LEFT are apt to cause problems for some young children, especially on a vertical screen. More potential problems arise in the need to explain the use of numbers after each command. With FD and BK there is seldom a problem, as students readily accept the notion of telling the turtle how far to move. With turns, however, we are really dealing with angles. The normal terminology would confuse young children and is not needed. Treat turn values as simply numbers like those used with FD or BK, except that they tell the turtle how much to turn from the original position.

Newer programs like Delta Drawing from Spinnaker were created to further simplify early access to computer graphics. Since Logo is so open to extension, why not use IT to create an even easier entree to computer control. Here are some Logo procedures to do so. Examples are given in Terrapin Logo for the Apple II family. Conversion to other Logo implementations should not be difficult. NOTE--Be sure you thoroughly understand the difference between "SIZE and :SIZE. These are fundamental to the following examples, as well as many interesting and slightly more advanced Logo applications. "SIZE is the NAME of a variable. :SIZE is the VALUE of the variable. Values are assigned to variables as part of calling a procedure (e.g., FD 50) or with MAKE (e.g. MAKE "SIZE 50).

```
TO S                    TO L
MAKE "SIZE 10           MAKE "SIZE 100
END                     END

TO F                    TO B
FD :SIZE                BK :SIZE
END                     END

TO T
RT 30
END
```

To use these procedures, create them with your Logo editor and save them onto a disk. At the start of a Logo session, load them for the children. The child now has a set of single letter commands available with which to explore. You must explain that the first command given is always S or L to tell the turtle what size steps to take each time. Then, the user need only remember F to move forward, B to move back, and T to turn. Each may be used one at a time, followed by a RETURN, or they may be combined. For instance, to produce a small square, the child might eventually type:

S F T T T F T T T F T T T F (return)

While this is somewhat inefficient compared to 'normal' Logo, it avoids use of many keys on the keyboard, the whole question of the numbers to be entered after FD or BK, left and right, and angles. Obviously, it also limits the creative output, but many figures of common interest, except circular ones, can be created with this 'Little Logo." Fiday (1983 in the November/December issue of Gifted Creative/Talented) describes a successful program using a similar approach to Logo in grades K-2. He reports that by about mid-year of second grade, students are ready to proceed into real Logo.

Newcomers to Logo are usually given an opportunity very early to simply move the turtle about. The following version of golf can be played with the 'Little Logo' commands, o the full FD, BK, and turn commands. The student types PLAY to begin. A 'hole' is drawn randomly on the screen; the turtle is positioned at home. The object is to move the turtle into the hole in the fewest possible strokes, counting only FD or BK moves as strokes. Count turns as well if you wish to make the game harder. After each hole, type CS or DRAW, then PLAY to try again. You can add classroom competitions as described.

```
TO PLAY
HT START GOAL
PU HOME PD ST
END

TO START
PU SETXY (RANDOM 240) - 140 (RANDOM 150) - 75
   PD
END

TO GOAL
PC 2 REPEAT 4 [FD 20 RT 90] 1
END
```

If played using 'Little Logo' commands, you may want to reduce the amount of turn produced by the T procedure to allow for better aiming. Difficulty can also be adjusted by altering the size of the hole. Just change the FD value in GOAL to suit your needs. A circle was not chosen for this due to the longer drawing time involved.

The preceding ideas focus on simple line creation. To give the student access to complete figures to manipulate without first creating them, provide the necessary procedures. Add to them ease in adjusting size and changing color. Here are samples, which should guide you in creating others of your own choice. Short one or two letter procedure names could also be used to again minimize typing.

```
TO BLUE          TO ORANGE          TO GREEN
PC 5             PC 4               PC 2
END              END                END

TO LITTLE        TO MEDIUM          TO BIG
MAKE "SIZE 10    MAKE "SIZE 25      MAKE "SIZE 50
END              END                END

TO SQUARE                       TO TRIANGLE
REPEAT 4 [FD :SIZE RT 90]       REPEAT 3 [FD :SIZE
END                             RT 120]
                                END

TO CIRCLE
REPEAT 36 [FD :SIZE/5 RT 10]
END
```

In CIRCLE, :SIZE is divided by 5 to produce figures of a more reasonable size on the screen. Other divisors are possible as desired.

Putting these together, a student can now create with commands like:

BIG BLUE SQUARE (return)

LITTLE GREEN CIRCLE (return)

Size and color will, of course, remain unchanged if not specified on succeeding commands. The set of procedures can be easily expanded to cover all

colors, other shapes, more variety in sizing, etc., depending on the specific needs at hand and how simplified one wishes to keep the whole process.

Here is another interesting procedure:

```
TO JUMP
PU
SETXY (RANDOM 280 - 140 (RANDOM 150) - 75
PD
END
```

Now the student can create a LITTLE BLUE SQUARE, then JUMP to an arbitrary new location, and ask for a BIG GREEN TRIANGLE. Of course, if the student does not like the new location a second JUMP without drawing after the first will relocate the turtle again. Some quite interesting screen designs can originate this way. If you remove the PU and PD commands from the JUMP procedure so that the turtle's trail is visible, interesting patterns can be created by use of only JUMP, i.e. REPEAT 10 [JUMP].

To add further to projects, offer students a procedure for randomly picking a color.

```
TO COLOR
PC RANDOM 5
END
```

Intriguing results can be achieved with user commands like:

```
REPEAT 12 [COLOR CIRCLE JUMP]
```

or, if the pen is left down in JUMP, just:

```
REPEAT 25 [COLOR JUMP].
```

The student may not learn as much mathematically as in a traditional approach, but here's the easy way to complete an irregular geometric shape without determining the final angle required or the number of steps needed to get back to the start. Just create all but the very last side of the figure, then use HOME as the last command. This assumes, of course, that the figure began at the home location in screen center.

Another alternative is to know the initial coordinates for the figure. They are 0,0 for the home location. For any other location, they can be determined using XCOR and YCOR. If the goal were to complete a figure as above, with the turtle off-home to start, you would save the initial coordinates before starting the figure, draw all but the final side, then complete the figure with SETXY using the saved values. The framework of such a procedure follows:

```
TO ODDFIGURE
   |
(POSITION TO OFF-HOME LOCATION IF NEEDED)
   |
MAKE "XSTART XCOR
MAKE "YSTART YCOR
   |
(DRAW FIGURE, except for the final line)
SETXY :XSTART :YSTART
```

---

**Why not consider a one or two session 'adult education' class for parents, teaching them Logo just as their children have learned it?**

---

One of the most important possible outcomes of learning to program a computer at any age is the realization that a given problem may have many equally viable solutions. Too often, the world of education is one of blacks and whites, right and wrong answers. Papert noted that Logo at its heart is a land of serendipity. Aside from such 'accidental' learning, there are strong lessons about the real world to be gained from recognition of the validity of alternate approaches to a problem. As Fiday (November/December, 1983, Gifted/Creative/Talented) explains, "The attitude that there is more than one way to solve a problem fosters independent and divergent problem solving." An example may suffice to stimulate your thinking.

A very early task for many Logo learners is to develop procedures for producing common geometric shapes. Certain to be among them is the circle. How does one instruct the turtle to draw a circle, especially after normally experimenting with common polygons, usually squares, rectangles, and possible hexagons or octagons? Even adults seem not to intuitively grasp the notion that a circle is actually a polygon of many, many sides which we view as a smooth figure. To stimulate this discovery, the idea of 'playing turtle' will work. Have the learner get up and first walk a square. Note the steps involved. Move then to a hexagon and other figures with more sides, looking for the insight that each increase in the number of sides requires a smaller turn at each corner. Eventually a circle will be seen to be a figure based on very small turns and lots of them. Still, early efforts in Logo are apt to produce only arcs or other partial circles on the screen.

This is a natural lead into the Total Turtle Trip Theorem, which posits that to return to one's origin, one must turn a total of 360 units (degrees to the vocabulary conscious). Thus a circle must somehow involve 360 unit turns. Now the limitations of the computer's display come into play. Generally, the first idea of how to create a circle focuses on the sequence REPEAT 360 [FD x RT 1], where x governs the size of the circle drawn. If for no other reason, a desire for smaller circles than even FD 1 can produce will lead students to look for alternatives. Most will quickly see or discover that a turn of more than 1 with an FD 1 will decrease the diameter.

How far can this be pursued before the circle becomes clearly a polygon? Generally, a pattern of REPEAT 36 [FD x RT 10] is still an excellent circle on a monitor. Once students have experimented with circle production, move into a discussion of polygons in general. Here is an all purpose polygon procedure which allows for playing easily with both variables, requiring only that the user specify the size of a side and the desired turn.

```
TO GENPOLY :SIDE :TURN
REPEAT 360/ :TURN [FD :SIDE RT :TURN]
END
```

Experimentation will produce anything from a circle (GENPOLY 1 10) to a triangle (GENPOLY 50 120). Encourage experimentation with :SIDE held constant and only :TURN varied, and vice versa. A lot can be learned about the interrelationships of shapes with this one procedure. It can also become an important building block to use to produce more complex graphic designs.

Among the most powerful, and least understood, of Logo's features is **recursion.** A recursive procedure is simply one which 'calls itself.' For an excellent look at one teacher's initiation into recursion, which also offers

genuine insight into the process, see McCauley (1984).

Here is one simple example of recursion in Logo, with an interesting use suggested by its author. Moore (1983) advocates showing students who perceive themselves as behind the others, some little thing the more advanced students have yet to see. This she calls 'intervention to save face.' Her example:

```
TO V
FD 1
V
END
```

This simple recursive procedure need not be explained at all as to its workings. Suffice it to show that it produces a turtle constantly on the move, the result of which depends upon its initial heading. Anything less than perfectly horizontal or vertical will produce an interesting display.

Taking this example one step further, try modifying it to use a larger step and add in the random color procedure shown earlier for a very colorful display. The entire modified procedure follows:

```
TO NEWV
COLOR FD 10 NEWV
END
```

These recursive procedures are endless, as written, and must be halted with CONTROL-G. More useful applications of recursion are beyond the scope of this article.

The procedures given above are useful in their own right, but will hopefully also serve to stimulate your thinking about other ways to simplify student access to Logo or to allow more interesting results through use of teacher-preparation procedures.

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**Logo can be an important and enjoyable step in the development of problem-solving skills for all.**

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## Concluding Thoughts

Perhaps your district is one where parents question the expense of computers already in the schools. Maybe parents are just curious as to how computers are being used, or puzzled by the strange lingo coming home with their children. In each case, a need exists to involve parents more directly. Fiday (1983) presents some worthwhile ideas on getting parents involved, from which will likely come higher levels of support for computer education. Just as Logo provides an ideal beginning for kids and computers, so can it also function for parents. Why not consider a one or two session 'adult education' class for parents, teaching them Logo just as their children have learned it? Time permitting, a 6 session program such as Fiday outlines makes even more sense. It can provide parents the broad background of understanding most will not have when it comes to computers. You can help parents become computer literate, and win much needed support for your work.

With parents on your side, you should find the use of Logo in your classroom an exciting and rewarding experience. Logo can be an important and enjoyable step in the development of problem-solving skills for all. The teacher must master Logo personally, but also develop a suitable approach to inducting others into its ways. Moore (1983) summarizes the case well:

> Knowing when to intervene and when not to seems to be the secret of artful Logo teaching. Doing it right all the time is an impossible ideal. What helps us do it right at least some of the time is to watch the student, not the screen. And never interfere with intense concentration no matter how repetitious or mindless, no matter what seems to need to come next to make the program at hand more elegant.
>
> The ideal is to let our students know what the Logo language comprises without telling them where to use what...We supply the technology. The child makes the discoveries. We intervene in order to avoid intervening. It is at once a paradox and an ideal. It is how to teach Logo. It is how to avoid teaching Logo.

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# Merit Pay and Excellence

By Linda F. Annis and David B. Annis

Merit pay is needed to help stop "the rising tide of mediocrity" threatening education in the United States. So spoke the National Commission on Excellence in Education. President Reagan is pushing merit pay for teachers; the National Governors Association has embraced the concept; the Merit Pay Task Force of the Committee on Education and Labor of the U.S. House of Representatives recommends it; a number of state legislatures are considering merit pay proposals; and a recent Gallup Poll shows that 61% of the public supports merit pay for teachers. It is commonly assumed in business, industry, government, and by the public that merit pay, basing pay on performance, motivates people to do a superior job, and that people who do a better job deserve higher pay than those who do not. But what exactly is the doctrine of merit pay? Is there reason to believe that it promotes excellence as is commonly assumed? What is the justification for this common reward structure? These questions are examined in this paper.

## The Doctrine of Merit Pay

A minimal version of (MP) the doctrine of merit pay consists of a relevancy condition and a distribution principle:

Relevancy Condition

Performance is a relevant factor in distributing salary.

Distribution Principle

Salary is to be distributed in proportion to performance.

According to MP, one factor relevant to the determination of a person's salary is how well the person performs in that job. "Performance" refers to how well the person actually performs, not merely to the person's knowledge, potential, or effort expended. Other relevant factors may include the amount of training necessary for the job, length of service, market factors such as supply and demand, equity considerations, and a host of other factors (see Note 1). Stronger versions of MP would weight performance more heavily.

MP does not merely state that performance is a relevant factor to salary, i.e., it should have some impact on pay. It specifies the kind of distributional impact that performance should have, namely, those who perform better are to receive higher wages; those who perform equally are to receive equal wages; and those who perform less well are to receive lower wages. MP, however, requires more than distributing salary in this ordinal fashion. This is consistent with there being huge disparities in salary for minor differences in performance or minor disparities in salary for great differences in performance. One who ccepts MP wants a finer fit between performance and pay than this. If $S_1$ and $S_2$ are not too different in performance, then even though $S_1$ does better than $S_2$, the salary increment for merit given to $S_1$ should not be too different from that given to $S_2$. This requirement for a finer fit may be expressed in terms of the Proportionality Principle: Pay should be proportional to performance.

A minimal version of MP gives some weigh to this principle, but again it may be balanced along with other factors. Even though $S_1$'s performance is superior to $S_2$, $S_2$'s longer seniority may result in $S_2$ receiving a greater salary or salary increment. Stronger versions of MP again would weight the principal more heavily.

One who holds MP is not committed to accepting it for all jobs. The justifying conditions of MP may be satisfied only for certain jobs. For example, if the nature of the job in general results in little performance variation or it is very difficult to characterize what constitutes superior performance for that job, then MP may not apply.

The justifying theory behind MP which is to be found in the literature is in general based on two main tenets:

The Motivation Thesis

Merit pay will motivate people to do a superior job.

The Desert Thesis

People who do a better job deserve higher pay than those who do not.

The first thesis looks to the consequences of MP, and is part of a utilitarian justification of that doctrine; the second tenet looks to what a person has done, and justifies MP in terms of rewarding people in proportion to their just deserts. Let us consider these two approaches to justifying MP.

## The Utilitarian Approach

MP is justified from a utilitarian point of view if and only if there is a body of evidence E (a set of true epistemically justified statements) such that E describes the benefits and costs of MP and alternative salary schemes, and E epistemically justifies the statement that MP, in comparison to the alternatives, will produce the greatest balance of benefits over costs. One problem with the attempt to justify Merit Pay on the basis of utility is that it is difficult to

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satisfy the epistemic requirements of such a justification.

Consider the issue of motivation. Two basic tenets of motivation theorists are:

Incentive Value Requirement

To motivate a person maximally to perform a task, you must maximize the positive consequences to the person.

Contingency Requirement

The positive consequences will motivate only if they are clearly made contingent on the desired behavior.

Applied to the issue of MP, the first requirement implies that money must have incentive value. To be more exact, the salary differential between an employee who does merely a satisfactory job and one who does a good job must be highly motivating. But...the motivational impact of money, especially incremental salary, is not at all clear.

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**There is at least some evidence which indicates that money may be less of a motivating factor for teachers than the intrinsic rewards of the job.**

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Researchers distinguish between intrinsic and extrinsic rewards. The satisfaction derived from doing an interesting and challenging task illustrates the former; pay is an example of the latter. There is at least some evidence which indicates that money may be less of a motivating factor for teachers than the intrinsic rewards of the job (see Note 2). There is even evidence which suggests that emphasizing certain extrinsic rewards such as pay may actually reduce a person's intrinsic motivation. When pay is attached directly to the performance of a task, intrinsic interest in the task seems to decrease. The individual appears to focus on the pay rather than the performance of the task itself (see Note 3). If these studies are correct, then MP may not satisfy the Incentive Value Requirement.

For MP to satisfy the Contingency Requirement, we must be able to accurately describe what constitutes good performance (the desired behavior), and the procedures for evaluating the performance of the employees must be valid, i.e., in general yield correct results. But for many, if not most jobs, it is difficult to specify what constitutes good performance, and producing valid procedures has proven elusive (see Note 4).

To satisfy the Contingency Requirement, the distribution of the rewards has to satisfy certain equity constraints, namely similar cases have to be treated alike (horizontal equity) and dissimilar cases in a different way (vertical equity). When it is difficult to accurately characterize good performance, equity problems arise. Furthermore, since the Proportionality Principle of MP requires finer gradations and the more individualized treatment of employees, it tends to exacerbate these equity problems. The same situation has occurred in the context of criminal punishment. Individualizing punishment so that it is proportional to culpability has given rise to a lack of uniform treatment of criminals and to violations of equity (see Note 5). The tension between the Proportionality Princple and equity constraints makes it difficult for MP to satisfy the Contingency Requirement.

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**Given the complexity of motivation in human beings, it is doubtful that we can generalize across individuals and justify the motivational assumptions underlying MP.**

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Utilitarianism recently has been criticized for overlooking the distinctness of persons (Rawls, 1971). This also tends to be true of the overly simplistic motivational assumptions behind MP. Any adequate theory of motivation must consider the individual's personal characteristics, needs, the value to the individual of various incentives, and the interactive effects of all these. Given the complexity of motivation in human beings, it is doubtful that we can generalize across individuals and justify the motivational assumptions underlying MP.

Even if the supposed benefits of MP could be documented, there are associated costs. Besides the problem of diminished intrinsic motivation discussed above, it has been claimed by many that MP creates unhealthy competition and hostility. Since salary dollars are limited, employees are forced to compete with each other. Hostility increases; interaction and communication between competitors decreases. Since effective institutional functioning requires an integration of individual efforts, such competition is usually dysfunctional. It is also claimed that MP results in lowered self-esteem. Research indicates that most people rate their job performance as above average. Since the salary increases most people would get under a merit plan would not reflect this, the effect on people would be primarily negative. Their self-esteem would be eroded. Since people with high self-esteem consistently outperform people with low self-esteem, the result would be a decrease in performance (see Note 4).

One alternative salary structure is a salary schedule which sets pay in terms of such factors as the amount of education or training a person has and years of service or seniority, etc. The salary schedule has been the dominant scheme in public education and the Civil Service. It is not clear that any salary system treats performance as irrelevant to pay and hence denies the Relevancy Condition of MP. It may be that performance is treated as having a threshold effect. If a person's performance is unsatisfactory, the individual is not retained or no salary increment is awarded. But once the minimal threshold of satisfactory performance is achieved, the salary schedule determines where the person falls. The difference between this system and MP is the more individualized treatment required by the Proportionality Principle.

A frequent claim made in favor of a salary schedule is that it avoids many of the costs associated with MP noted above. It is further claimed that since it bases pay on more objective factors such as the amount of education or years of service a person has, it is perceived as being

fairer in the long run. The criticism that it encourages mediocrity presupposes the motivational assumptions underlying MP, but these are questionable. In balancing the benefits and costs, it is argued that a salary schedule is a better system (see Note 4).

What is definitely clear from the discussion so far is that the epistemic requirements of a utilitarian justification of MP are not satisfied. Clearly more empirical evidence is needed. The paucity of careful empirical studies is surprising. But there is also some empirical reason for thinking a utilitarian approach to MP will not be successful (or at least that its successful application would be very limited). Given the problem of characterizing good performance, and the tension between the Proportionality Principle and the equity constraints, it is difficult for MP to satisfy the Contingency Requiment. Hence it is somewhat doubtful that the supposed benefits of MP will occur, and of course there are the costs too.

Even if these problems could be solved, a utilitarian approach to justifying MP seems inadequate for it leaves out individual desert. One of the main reasons offered in support of MP is that people who work hard and do a good job deserve higher pay. A utilitarian approach to MP looks to the consequences of basing pay on performance. But from a desert perspective the consequences are irrelevant.

Attempting to justify MP, while leaving out individual desert, gives rise to the same classical objections leveled at a utilitarian justification of punishment (Golding, 1979). A utilitarian approach to MP justifies taking a person who has done a very poor job and rewarding the person in public to encourage others to do a good job. The person does not deserve the reward and it seems unfair. Furthermore utilitarianism justifies paying very small salary differentials for large differences in desert or large salary differentials for small desert differences. Again this seems unfair. "How much" is determined by what will motivate and not in terms of desert.

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**...even if all the other problems with a utilitarian justification of Merit Pay could be solved, which is doubtful, a pure utilitarian apporach is not adequate.**

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The Proportionality Principle requires looking at individual desert and rewarding in proportion to this. Thus, even if all the other problems with a utilitarian justification of Merit Pay could be solved, which is doubtful, a pure utilitarian approach is not adequate.

## A Deontological/Desert Approach to Justifying Merit Pay

Perhaps by appealing to individual desert, rights, or justice, where these are explained deontologically, or by appealing to other deontological principles we may justify MP.

Consider the analysis of personal desert (see Note 7). Desert is supervenient property, a property possessed in virture of some other property. Hence "S deserves X" implies that there is a desert basis F in virtue of which S deserves X. The desert basis must be a fact about S. This fact, however, cannot merely describe the consequences of S's having X or being suitably related to X. Utility is not a desert basis. "S deserves X because giving X to S would maximize utility" is inappropriate. Instead the desert basis must consist of some characteristic S possessed (or possesses) or some prior (or present) activity of S. Among the characteristics will be personal traits, skills, abilities, physical attributes, etc.

As Joel Feinberg notes, to say that S deserves X is to say that there is a certain sort of propriety in S having or being suitably related to S (Feinberg, 1970). But this, of course, is true of being eligible for, qualified for, entitled to X, and even true when S ought to have X. Hence we need to distinguish the kind of propriety distinctive of desert. According to Feinberg, to deserve X, S must satisfy certain conditions of worthiness. There must be facts about S which describe personal traits, skills or other features or actions of S in virtue of which S is worthy of being suitably related to X.

It has been argued that desert is a fundamental component of morality (Becker, 1977). For it to be appropriate to apply a moral sanction (reprobation, blame, punishment, approval, praise,

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**One way in which we may treat persons unjustly is to deny them what they deserve.**

---

reward, etc.), it must be applied only to an agent who deserves or is worthy of it. One must be praiseworthy or blameworthy. Moral sanctions are not just instrumental acts to be applied when they yield a desirable result. Desert also seems essential to our understanding of justice. Some have even said that justice is getting what one deserves (Hospers, 1961). Although justice is not this simple, desert is one aspect of justice. One way in which we may treat persons unjustly is to deny them what they deserve.

May we appeal to a (deontological) desert principle to justify MP? Lawrence Becker (1977) gives the following argument for a fundamental desert principle. Desert requires a basis; desert bases inclue personal deeds and character. But the very notion of desert is that good things (prizes, rewards, benefits) are what befit good deeds or character. Therefore:

> A person who, in some morally permissible way, and without being morally required to do so, adds value to others' lives (does a good deed) deserves some benefit for it.

According to Becker, this is true by definition. It is entailed by the concept of desert. He goes on to argue that this desert principle must include a proportionality requirement (benefit proportional to the value added). Others have expressed similar sentiments. According to A.C. Ewing, it "is not merely that we think the good ought to be happy but that we think they ought to be recognized or manifested as good, and the most impressive form of recognition is by bestowal of

the means to happiness" (Ewing, 1929).

If we apply Becker's desert principle to the issue of MP, then doing a good job is the good deed, adding value to the lives of others, so the person deserves a benefit proportional to it. A greater salary is a conventionally recognized way of expressing our appreciation and recognizing the good deed. It is a befitting reward. Hence MP is justified in terms of this desert principle. If MP does motivate people to do a better job, that is an added benefit, but it is not essential for the justification of the doctrine.

Let us examine Becker's desert principle. Good deeds, deeds adding value to the lives of others, are desert bases, i.e., properties in virtue of which a person can deserve things. If S does a good deed, then S is praiseworthy or worthy of a positive moral sanction. In part, for S to be morally responsible for an act or state of affairs is for S to be worthy of a moral sanction. Hence we can support a minimal desert principle which states that when S voluntarily does a good deed, then S deserves a positive moral sanction. Given our understanding of morality, this principle follows. But there is a considerable gap between this principle and the one Becker puts forward. Good deeds may deserve some minimal recognition. But why does one deserve the means to happiness (Ewing) or any economic or social benefit (beyond the mere minimal recognition)? That does not follow merely from our concept of desert as Becker claims. And it certainly is

**Furthermore since the minimal desert principle does not imply anything about the distribution of economic or social benefits, it does not justify merit pay.**

controversial. From a moral point of view, we can justify the minimal desert principle, but this principle does not imply Becker's stronger principle. Furthermore since the minimal desert principle does not imply anything about the distribution of economic or social benefits, it does not justify merit pay.

What is needed is a desert principle concerning the distribution of economic goods. Some scholars, of course, have used a contractarian approach to argue in favor of certain distributive principles. Jobs are one example of an economic or social good. Thus it has been argued that rational contractors under the veil of ignorance would select the principle that the best qualified for a position should be hired. They would want a fair chance to compete for jobs on the basis of something over which they have at least some control, their work, effort, and achievement. They would also favor competency hiring as a way of maximizing social goods; hiring incompetent people would decrease the amount of social goods available (Goldman, 1979).

Even if we could justify competency hiring by a contractarian approach, it is not clear it would work for MP. The problem is that there are important differences. If we fail to hire by competency, it is likely that we would suffer a great loss of efficiency and social welfare. Hiring incompetent employees would actually harm people. But not paying on the basis of competency

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in the way envisioned by MP may not have that great of an effect. If money, especially the amount involved in salary differentials between satisfactory and superior performance, is not a great incentive, it seems little would be lost by adopting alternative salary schemes. Hence it is not clear that a contractarian approach would justify MP (see Note 8).

## Institutional Desert

Feinberg (1970) claims that desert is a "natural" moral notion, one not logically tied to institutions, practices or rules. To deserve something, one must satisfy certain conditions of worthiness which are not necessarily written down in any legal or official regulation. For example, to be worthy of the presidency of the United States, a person must be intelligent, honest, fair-minded, have a good program for the country, etc. But these conditions are not required by public regulations; instead they are principles of the sensitive voter. The moral notion of desert is prior to a system of public bestowals; one of the aims of such a system is to give people what they deserve.

Furthermore the labor-wage system may have a variety of goals. In a world of plenty, social production may not be as important a goal. Hence qualifications may be less important. Goals such as social equality, skill development, self-actualization (Maslow), autonomy, liberty, and so on, may be weighted more heavily than they are in a less bountiful world. Given the wage-labor institution with these goals, a person would not necessarily deserve the job in virtue of his superior job knowledge or skills. He might deserve it for other reasons (e.g., because he had not had the prior opportunity to develop certain skills). Also if skill differences were considerably less among workers, then skill might be stressed less. Different goals or factual situations result in different desert bases (Rawls, 1971).

Merely because there is a social institution I which specifies worthiness conditions F for X, it does not follow that S deserves X in virtue of satisfying F. A society may have an institution of slavery or discrimination against minorities or women. Being white or male are specified by the institution as worthiness conditions for jobs, pay, and other benefits. But the favored group does not thereby deserve such treatment.

For an institutional desert statement to be true, the institution must satisfy various moral constraints. The goals and means of achieving them must not violate individual rights nor be unjust, nor violate other moral constraints relating to overall welfare, respecting autonomy, liberty, equality, and other moral values. In short, whatever constraints morality would impose on the institution must be satisfied. If the

institution satisfies these constraints, and S fulfills the worthiness conditions defined by the institution, then S deserves X in virtue of F.

The above point is quite significant and has been overlooked. The upshot is: to show that an institutional desert statement is true, one must show that the institution satisfies various moral constraints. But this raises a host of difficult issues. Hence justifying an institutional desert claim is a very complicated affair.

It is true that the concept of desert is not logically tied to social institutions. Thus a person deserves to be treated fairly, deserves respect, deserves to have his or her interest considered and so on. These are moral truths based on human worth. When a desert statement does not imply the existence of a social institution, we may call this a "natural desert" claim.

Many desert claims, however, presuppose an institutional framework. The extent of such "institutional desert" in general has been overlooked. Thus, for example, Feinberg's presidency case is really an instance of institutional desert. The social institution of the presidency defines the worthiness conditions and not all of these need be written down. These conditions are not simply "private standards"; they are part of our understanding of the institution. One of the aims of a system of public bestowals may be "to give people what they deserve," but another aim is to define the worthiness conditions without which people would not deserve various bestowals in the first place.

In the case of institutional desert, "S deserves X in virture of F" implies that there is a social institution I (as characterized by a set of social rules, practices, and understandings) such that the institution defines the worthiness condition F in virtue of which S deserves X. This implication does not hold in the case of natural desert.

Consider the issue of competency hiring. If Jones is the most qualified for a position, many feel that she deserves the job. But as Richard Wasserstrom (1980) notes, why do the most qualified deserve anything? That S is the most qualified does not imply that S deserves the job. However, if we consider the cooperative social institution of a wage-labor system, the connection is more compelling. One of the goals of such a system is the production of goods and services. Given the goal, qualified people are needed. The institution with the goal specifies the worthiness conditions relevant to achieving the goal.

We do not usually think about the institutional setting of desert. Thus it seems "natural" to say that the most qualified person deserves the job. But being the most qualified is not a desert basis independent of the wage-labor system which defines the worthiness conditions.

If we apply all this to MP, it follows that we cannot justify the doctrine on the basis of an institutionally independent desert principle such as "hard work deserves reward," "superior performance deserves higher pay," etc. It is the social wage-labor institution which defines hard work or performance as worthiness conditions. Hence to justify the desert claim that superior performance deserves higher pay, one must consider whether the institution and the practice of basing pay on performance within this institution can be justified. Given our factual situation including the distribution of skills, production needs and resources, and the moral constraints, what are the legitimate goals of the wage-labor system and what is the proper weighting of these goals? Does the practice of merit pay further these goals? Does the wage-labor institution or practice of merit pay violate rights or treat people unfairly? Do the institution and practice satisfy a proper balance of utility, autonomy, liberty, equality and other moral values?

For example if we hire by competency, this at least in part rewards a person's native abilities, and philosophers have been troubled by this. The practice has seemed unfair to many. If in addition we reward salary on the basis of competency, this again at least in part rewards the same natural contingencies, only it compounds the unfairness problem. Thus we may wish not to adopt an MP reward structure because of the fairness issue. More generally, different theories of social justice will have different implications for hiring and reward practices. Since justice is one of the constraints on social institutions, whether MP is ultimately justified would depend on which theory of social justice is acceptable (see Note 9). Justifying MP from a desert perspective thus becomes much more complicated than most writing on the subject have realized.

Although the doctrine of merit pay is quite popular, it remains unjustified. At present we do not have a utilitarian justification of it, and there is some doubt whether such a justification could be produced. Furthermore there is no non-institutional desert principle which justifies the doctrine, and an institutional desert approach rests on complicated issues, some of which have not been solved, so at present the doctrine remains unjustified from a desert perspective, too. This lack of justification seriously undermines the merit pay reward structure so prevalent in our society, and certainly calls into question whether it is a path to excellence in education.

## Notes

Note 1. For a discussion of some of these factors, see Michael Armstrong and Helen Marlis, A handbook of salary administration (London: Kogan Page, 1980). Howard P. Tuckman, Publication, teaching, and the academic reward structure (Lexington, MA: D.C. Heath, 1976) discusses factors relevant to the salaries of teachers in public and higher education.

Note 2. See, for example, Dan C. Lortie, Schoolteacher: A sociological study (Chicago: University of Chicago Press, 1975), ch. 4; Thomas J. Sergiovanni, "Factors which affect satisfaction and dissatisfaction of teachers. Journal of Educational Administration, 5, 1 (May, 1967):66-82.

Note 3. Edward L. Deci, "The hidden costs of rewards, Organizational Dynamics IV, 3 (Winter, 1976):61-72. It has also been found that positive verbal feedback (an extrinsic reward), when it is perceived as informational rather than an attempt to control behavior, increases intrinsic motivation. Edward L. Deci, Intrinsic motivation (New York: Plenum Pub. Co., 1975). Hence other reward systems may be more motivating than MP.

Note 4. Herbert H. Meyer, "The pay-for-performance dilemma," Organizational Dynamics III, 3 (Winter 1975): 39-50. For the teaching profession, see ERS Report, Merit pay for teachers (Arlington, VA: Educational Research Service, 1979); Merit pay and evaluation (Bloomington, IN: Phi Delta Kappa Center on Evaluation, Development and Research, 1983-84); "Setting pay raises for faculty members: How colleges in 4 states go about it," The Chronical of Higher Education XXVII, 9 (April 25, 1984):17-20.

Note 5. The whole series of Supreme Court capital punishment cases from Furman v Georgia 408 U.S. 238 (1972) to the present illustrates this issue.

Note 6. This analysis borrows heavily from Joel Feinberg, "Justice and personal desert," reprinted in his Doing and deserving (Princeton: Princeton University Press, 1970), pp. 55-94; John Kleinig, "The concept of desert," American Philosophical Quarterly, VIII, 1 (January, 1971): 71-78; James P. Sterba, "Justice and the concept of desert," The Personalist LVII, 2 (Spring 1976):188-197.

Note 7. Goldman, Justice and reverse discrimination, pp. 42-43 recognizes the independence of hiring by competency and salary reward structures. See also Norman Daniels, "Meritocracy" in Justice and economic distribution (eds.) John Arthur and William H. Shaw (Englewood Cliffs, NJ: Prentice-Hall, 1978), pp. 164-178.

Note 8. See Daniels' discussion of justice and reward structures in his "Meritocracy" cited in Note 7.

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