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ABSTRACT

A detailed report on availability of, purposes for, advantages and disadvantages of hardware and software in Adult Basic Education is given. Problem of how to reduce complexity of using instructional devices, and how to reduce need for readjustments of present programs to install them is discussed. (NF)

HARDWARE AND SOFTWARE IN CORRECTIONS EDUCATION

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Hardware Use in Teaching Educationally Disadvantaged

This paper opens with a discussion of hardware rather than software, and for a good reason. The subject of which hardware is useful in ABE, and the determination of the costs of that hardware, is essential in reviewing the kinds of resource allocations that correctional institutions can utilize. I propose some revolutionary concepts regarding the utilization of hardware. The first principle is that hardware must not only produce a cognitive effect, but that it should enter into the other domains as well. More and more research, as done by Dr. James Farmer, UCLA, and Dr. John Peters, University of Tennessee, shows that affective behavior is modified by instructional hardware. This is not a statement that will reduce the importance of cognitive gain in instructional hardware, but it is a statement of the effect that accrues in the affective, psycho-motor, and volitional domains concomittant with cognitive gain. There are those who would totally overlook the importance of these gains when discussing the importance of instructional hardware. They are totally tied to the improvement in grade level scores.

Instructional hardware ranges from the simple audio-tape recorder to sophisticated and expensive terminal computer units with multi-sensory apparatus. Which of these is most useful is a question that can only be determined by looking at the terminal objectives of the program and at the kinds of students enrolled in the program. Often the instructional

directors of institutions are looking for the panacea -- total instructional hardware.

The determination of which instructional hardware to obtain might follow this format:

1. Review the total hardware available.

   Audio-tapes

   Slide-tapes

   Slide projectors

   Motion picture projectors

   Cameras

   Video-tapes

   Console computers

   Many of these operate in tandem or jointly, such as:

   Slide projectors and film loops

   Computer consoles and typewriters

   Computer consoles and cathode screens

   Audio-tapes and screen presentations

   Photo screens in sequential operations

   Photo screens in binary or tracking operations

   Audio devices with sequential operations

2. Determine the purposes for which the equipment is to be used.

   Two different instructors may start with totally different needs and arrive at the same equipment. Again, two instructors may have the same problem and arrive at two different systems. In both cases they replaced a mechanical

determination of equipment with a rational use of equipment. I recently visited a corrections institution at which the discussion of hardware arose, and I soon determined that the varieties of hardware that were needed were less than the director assumed them to be. It was evident that flexibility was the keystone of his operation and that a fixed investment in too much of the same thing might prove to be costly when much of the equipment might lay idle.

3. Determine the expandability of the equipment.

Many times the level of students is low at the beginning of a program, but as the students gain in knowledge, the instructional hardware needs to be adapted to higher level lessons. If the student population is transient and the number of students at one level is constant, then a heavy investment in non-expandable equipment is justified. If the level of student is to change, and mirror a more or less permanent change, then the equipment must be subject to modification and expansion.

4. Instructional hardware should produce a positive effect on the students.

If the hardware is such that the lessons become rote and repetitious, a negative effect may be produced over the long run. Often, systems of instructional hardware may be exciting for a short period, but prove to be a bore when repeated each day. This can also happen with software.

5. The hardware must be honest and above-board.

Some hardware utilizes many lights (red, blue, green, etc.), and they goad the student on, not by producing satisfaction in learning, but by interesting him in watching the show. It is imperative that the instructional hardware be honest, it must allow for student recognition of false tries, and also for student variation. Above all, it should lead the student to question, ponder, and reason. It cannot just lead him through a maze.

It should be understood that instructional hardware is not just the machine, but what is in the machine also. It is at this point that corrections begins to get a sharper focus. Adapting the instructional hardware to modular units of instruction bodes great benefits for corrections, for the inmate population is often subject to variance in time and in instructional needs. Men coming to the institution are not all cut from the same mold. Modular units adapted to the audio and phono tapes can be developed that "zero in" on specific skills in reading, arithmetic, etc. These can be linked to a computer terminal for easy access, and, with the proper diagnosis and prescription, the student can progress along to a definite terminal objective. This then reduces the need for haphazard determination of the student's deficiencies and how to remedy them. Access dialing is one of the brightest things that has come to the field of corrections, for small groups of students may be plugged into a larger system and problems of large classes, movement of men, and other security considerations can be overcome while still providing an amplitude of instructional modules.

The MT/ST, or Magnetic Tape Selectric Typewriter, is still another device that can be used well, for it will reproduce individual lessons for the student prepared in advance by the instructor, or even commercially produced. It seems likely that an enterprising person who realizes that special lessons are needed for corrections will soon be offering them for distribution to other institutions.

A second device that promises much for corrections is the video-tape recorder. Coupled with closed circuit television, lessons can be "piped in" to sections of the institution, or even cells, for inmates to use. Specific lessons can be developed around subjects of importance to the inmates, and recorded in a studio. These can then be stored or sent to other institutions for their use.

Simple descriptions of all the various instructional hardware items are uncessary here: first, because they are very numerous and often brand items derived from the same concept, and secondly, because they are rapidly changing in nature. A list of these is available in the U.S.O.E. Adult Education Publication, Instructional Technology.

When discussing the advantages and disadvantages of instructional hardware, it is critical to keep in mind the overlying fact that the hardware must produce more than cognitive gain. Each of the pieces of hardware is purported to produce some gain in learning. At the same time, it is conditioning the inmate to certain other behaviors. The chief conditioning is to produce some attitudes toward learning. Instructional hardware that leads to the student seeing only simple cause and effect, or rote type, learning, is conditioning the inmate to consider education to be simplistic and nonproductive. It produces a desire to

get the "right answers" and little else. One should be cautioned against hardware that does not produce some feedback.

Lack of feedback is often seen as a benefit by some. Unfortunately, it is often true that instructors, and far too many supervisors of corrections education, want to "keep the natives quiet." They search for the narcotic-like hardware that does not allow for student reaction. An audio-tape might be better than a reading machine, if the audio-tape allowed for the student to react in some way. Some of the teaching machines do not allow for any feedback and the student plods on his way to the end.

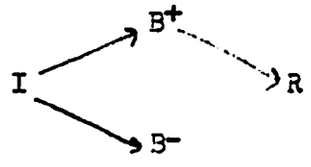
Also, there is a responsibility to turn off the hardware when the students show that there is an obvious feedback that they wish to give. This then allows for independent thinking and synthesis of learning. It is valid to say that the ability to react to instruction is essential if we are to assist inmates in preparing for life on the "outside" where independent thinking and rational behavior are at a premium.

Advantages of Instructional Hardware.

The advantages of instructional hardware are many, and can be listed as to their ability to free the instructor of repetitious tasks, individualizing instruction for the student, allowing for reinforcement and reteaching, economy in terms of manpower, and controlled teaching input. Since almost all of instructional hardware has programming as a major component, the principles of programmed instruction can be readily adapted. This may not apply for the simpler devices such as the audio-tape, but it surely applies to those hardware items that contain software as an integral component. The better hardware allows

for the principle of stimulus-reaction, or behavior and reinforcement. This then guides the student to learn through a series of controlled stimuli, giving the appropriate response and being reinforced by knowing that he has achieved the learning task. This should produce learning, and most developers of instructional hardware will tell you that they are striving for this. For corrections, this has great advantages, for it allows the inmate to see his success and have it reinforced immediately. In a prison environment, successful behavior is often hard to elicit due to the restrictive conditions. The importance of a pattern of success has been recognized since the days when penologists advocated work programs.

Additional advantages come in the flexibility that is allowed the instructor in developing an independence of behavior. The more inmates can be induced to use independent behavior, the more effect will programs of rehabilitation have, for self-management is essential to corrections. This flexibility can also be shown in the development of programs of gradually increasing difficulty, and since the input can be controlled, there is little chance that the reinforcement will be lost in its effect. To put it another way; the inmate soon begins to get greater reinforcement from success as he moves through the program and realizes that the tasks are more difficult. This can produce an affective growth in self-concepts. A two-sided paradigm might be developed in which it can be seen that the student reacts to the material and the material acts upon the student. It would appear as follows:



Input (learning task and learning material)

Behavior (student response or attempt at response)

Reinforcement (knowledge of successful response)

The beauty of this is that the reinforcement can be repeated several times and several ways, and good use of hardware would allow for responses to the material in various settings. This is a principle well-established in arithmetic instruction, in which the arithmetic fact is presented in several ways to the student for better learning, and also for the purpose of achieving a measure of variety.

It is important to remember that the reinforcement that hardware produces is related to the learning task. It is not a pat on the back, gold star, or piece of candy. It is knowledge of successful accomplishment of the task. Inmates who have little success in academic and cognitive work can arrive at the point at which they can measure themselves in terms of the successful responses, and they can be conditioned to look for successful patterns of response. This is essential to both volitional conditioning (wanting to choose responses that work), and affective conditioning (feeling self-growth through success).

Numerous authorities in the field, and several demonstration projects of the Adult Education Branch, have shown that positive reinforcement of self-concept arrives from utilizing good instructional hardware. One project was at the Benjamin Franklin School in Philadelphia, as reported in Adult Learning (Johnson, Vinson, and Dozier, 1967). Yet, it has been found that negative results can occur when using instructional hardware if the reinforcement is not appropriate

to the response. The student feels frustrated and cannot talk back to the machine. He gets a feeling of "do not fold, spindle, or mutilate." There are dangers in trying to decide whether or not the reinforcement for the response is negative, for some apparently negative reinforcement has been shown to give a great benefit in learning. This falls into the pattern of "you have it wrong.....what will you do to get it right." I feel strongly that positive reinforcement is not akin to "babying" students. Inmates won't stand for that. The apparent difficulty is not in the fact that the material is stated negatively. It is in whether or not the material is slanted to a negative feeling on the part of the student. Much of the effect of the reinforcement that accompanies instructional hardware can be predicted with great reliability. These effects can be predicted through the utilization of a knowledge of the reward system that is operant for the student.

There is apparent controversy over what a reward is. One corrections officer said that the people in corrections "pretty well know all the carrots." His greatest carrot was early release and good behavior time. But are those good educational carrots? Very little of the literature on corrections takes up the problem of "educational carrots." The motivation to continue learning may decrease rapidly as soon as the early release time is given or the "goodies" are given. Little attention is paid to the fact that one of the carrots may be the sense of increased learnings and competence. It seems likely that instructional hardware can, through the affective response of the learner, provide some rewards not usually found in a correctional setting.

There is the immediate and positive recognition of growth. Also, it is important to recognize that time away from the hardware allows for a relief and provides a breather so that the student can return to the hardware with a new feeling of searching for growth.

Another advantage in using instructional hardware is to provide different patterns of responses. The old question and answer, or lecture method, can be varied immensely through the use of instructional hardware. This allows for different patterns of responses and thus different patterns of learning. Often the student looses his whole thought while waiting for the pre-determined opportunity to respond. It is much more advantageous if he can respond immediately and get his reward ("reinforcement") immediately. Still another positive effect is that the reinforcement comes after the response. He knows that he has done the proper learning task and is told so. He is not told he can do it, or that he has the ability. He must do it, and then be told he has done it well.

Through the use of such devices as the slide-tape presentation, it is possible to recycle material and then withhold the reinforcement for that material until later. For example, in order to do a two-step arithmetic problem, the student may have to do step one (material previously reinforced) in order to do step two. When he has completed step two, he knows that step one has been done correctly. This can be done skillfully, to the point that the student is accomplishing a number of previous tasks in order to complete the task at hand. This builds attitudes toward perseverance and attention. Good instructional hardware has a "reinforcement schedule" built into it so that the student slowly moves toward longer and more attention-demanding tasks. This

is self-evident as a need in corrections. The hope is that the student will be able to move away from the strict reinforcement-type materials and "go it" on his own. This then allows for return to certain other types of instructional methodologies. Parenthetically, one use of some instructional hardware is to prepare the student for independent learning, the lecture method, and other less reinforcing types of instructional methodologies. It is not wise to continue a reinforcement schedule to the point at which the student is continually doing the tasks simply for their own sake. He should be removed from the material when he gets to that point. But for many inmates, the development of patterns of patience and perseverance are essential. Instructional hardware with a reinforcement schedule can do this.

Some have criticized instructional hardware in that it puts the student through many steps to reach the terminal objectives. This is not as important as what happens to him as he goes through the many steps. The Premack Principle says that some of the steps can be unimportant and basically dull, if the reinforcements that arise from the steps are kept interesting, and the terminal reward is important enough to the student. Thus, we can "hook" the student into doing the small steps. We all know that the job or preparing a meal is reduced by the enjoyment in eating it. The same applies if the reinforcement is appreciated by the student; he will move through the many small steps, not nearly so bored as it may appear. There is still the joy in knowing that the uninteresting ones were done correctly and great affective conditioning arises there. Over and over again, students will complete a task and comment on the fact that the material was not that interesting

but that they felt good in doing it and mastering it.

One more statement relative to advantages of utilizing instructional hardware relates to the secondary benefits arising from the autonomous feeling of self-direction so needed by ABE students and inmates. The continuous reinforcement of the feedback produces the effect of independence. This then leads to an appreciation of independent activity. Much of the improve ment in student learning arise s out of the fact that students soon begin to desire to be independent of the instructor and face-to-face input instruction. When this happens, the student is well on his way to finding self-reinforcement. As stated earlier, the student may then be ready for other instructional methodologies, for at that point he becomes self-motivated. This is not to say that the instructional devices themselves are such that the student will develop this independence, but more that the independence is being developed because the devices produce behavior that is self-gratifying. It is dismaying to see people turned loose in Learning Laboratories and not provided with the stimulus for interaction and self-growth. The sharing of knowledge gained through the use of ins tructional hardware is essential for maturation and increased uses of learned tasks.

Disadvantages of Instructional Hardware

The greatest danger that can occur is that unwanted learnings or behaviors can be reinforced. Some students will work through the material just to get finished and get another mark in a book. This

will soon develop into a reinforced pattern of doing to "please" and not doing to learn. This can be further intensified by the assignment of grades at the conclusion of the learning task, so that the grades become additional reinforcers for "grade seeking" behavior. This has been observed in a number of Learning Centers, with students who fall into discussing how soon they will get their "credits" or their "passing grades." This is unfortunate, and often the nature of instructional hardware will intensify this kind of attitudinal set. It is wise to temper this with reminders that the grade is not the end result, though there must be some measure by which to evaluate. I stand strongly on the belief that self-evaluation of performance tasks will reduce this danger considerably.

Still another difficulty is that instructional hardware is often programmed so that the student cannot skip to another lesson that is important and skip material he already knows. This creates boredom and often reduces motivation. Often students ask, "Why should I study this when I already know it?" It is true that review and repetition may be useful, but often that is not the reason for the material being given as a task. It simply is that it is in the program. The ability to move forward or backward is essential in choosing good instructional hardware. This does not contradict the Premack Principle because here there is no direct link between the repeated material and the terminal objective.

To look at it another way, the Terrace technique can be used to transfer this learning situation to another set of materials and in that way the student can be presented with a repetition of the same learning skill with new content. This is highly important in working with inmates who have a wide diversity of backgrounds and who would easily fall into the pattern of feeling that this material is "old hat."

I can recall from a visitation to a learning center recently that one of the greatest criticisms of the students was that they were repeating materials that they had had in regular school. When some manner by which they could develop their own lessons was suggested, great objection was raised by the staff, which immediately brought up the questions of having time and money available to make these individual prescriptions. If one does not have the staff to adequately make these individual prescriptions and diagnoses, one should hold back on installing expensive hardware.

Many persons have found that the problem with some instructional hardware is that it does not give a strong enough reinforcement to certain students. There are those who need to have the reinforcement stated and given in such a manner that there is no mistake about what they are doing and what they have accomplished. Once a student told me that she liked working with a series of mechanical programmed readers, but she was not sure that she was still learning to read. Her reinforcement was not strong enough. This has a reverse effect, in that the reinforcement can be given and the student is still not learning. This is called a "ghost effect." In other words, when the student receives a reinforce-

ment in the material and still has not learned the material, he will soon begin to divert his attention away from learning and try to develop some system to gain the reward without conscious cognitive effort. He looks for a hidden key to the material. As early as 1965, in the Los Angeles City Schools, Central City Occupational Training Center, this problem was uncovered and discussed.

It is of vital importance to recognize that the way in which the reinforcements are varied when using instructional technology is the key to successful learning gains by students. To attempt to let the material do "itself" is to leave open the door to teaching a number of other contingencies that were not intended in the original determination of learning needs.

Expected Outcomes

What are the expected outcomes of utilizing instructional hardware? They are easily categorized as follows. The student obviously increases in the amount of relating to the systematic methodology of the content of the lessons. Students are not allowed to stray away from a sequential and controlled curriculum. With a constant set of reinforcements, the student is pushed toward ever greater task complexity. Soon the student is working on tasks that are considerably more difficult. The result is greater student progress toward higher levels of problem-solving. It builds content mastery in a short span of time.

Another outcome is greater goal-directedness on the part of the student. Conte and Grimes, in Media and the Culturally Different Learner (page 8), point out that one of the typical characteristics of the disadvantaged student is that he has a short attention span. Instructional hardware can track the student into staying on a target and reaching it. This is partially done through the use of the feedback mechanism built into the hardware, the ability to quickly respond to inappropriate answers, and to reinforce correct answers.

Additional support for the effect of instructional hardware in determining successful student-teacher interaction is given by Rex Reynolds in Instructional Technology, in which he points out that the instructor is relieved of the task of constantly providing the feedback, whereas the non-threatening feedback of the machine is often accepted more readily by the student. The student begins to accept his own motivation for studying when he receives the feedback in such a non-threatening manner. It is important to realize that much negative effect is caused by having the instructor provide this corrective type of feedback. For the student, it takes the "monkey off his back." This leads to a discussion of the kinds of benefits and outcomes that arise from the student's obtaining new stimulation and input from the hardware itself.

One of the greatest outcomes of instructional hardware is the ability of the devices to provide materials and inputs that are not available to the ordinary teacher. It has long been known that mdeia can provide knowledges and materials far beyond the reach of the classroom instructor. This then leads to a richness that is unimaginable. The hardware can contain so much that the instructor does not have at

hand, or that cannot be put into textbooks. The student can begin a process of selection and of establishing priorities of learning needs and tasks. With the richness of content in instructional hardware, the student can for the first time begin to select what is important to him. He is not pushed or pulled into learning. He can begin to select what he needs to learn. The import of this is clear to all who think of it. The student begins to become a partner in curriculum selection, teaching methodology, and feedback correction.

Still another outcome that arises from the use of instructional hardware is the ability of the student to begin to generalize from several points of view. The presentation of one viewpoint and one method through the usual textbooks is balanced with the multi-input approach. With the skillful selection of such materials by the instructor, the student can begin to draw from several source materials as needed. This is a teaching maxim known for a long time, but until recently was so expensive that few could use it. The development of the college library was in response to the need for several sources to compare and weigh for the education of a learned man. The use of various pieces of hardware with varying methods and varying content helps us reach a larger mass of students with variable instructional methodology. This does not mean that the ultimate in instructional methodology is reached through using hardware. There is still a long way to go in developing methods of creating high cognitive gain and more affective responses on the part of the students. Yet, the path is well-marked in that the outcomes are beginning to become sharply defined.

At the conclusion of this section, it seems wise to review some of the most advantageous forms of instructional hardware usable for the ABE student.

Magnetic tape-loops

Reel and cassette tapes, often equipped with headphones

Motion picture projectors

Cassette players synchronized with slide projectors

Auto-tutorial visual and sound presentations

Video-tape players

CATV and closed circuit television

Slide and visu-cast photo projectors

Selfpacing reading machines

Filmed pace-reading slide projectors

Off-the-air televisions

Multi-sensory computer terminals

Software for Adult Basic Education

A discussion of software goes far beyond the discussion of hardware; software has been used over a longer period of time in education and has more varied uses than hardware. It does reduce the mechanical and deterministic bent of some hardware. It can be varied and more readily adapted to the student with a different learning problem than envisioned by the programmer of the hardware. It also reduces the brunt of negative reinforcement in that the instructor can mediate the feedback. It has some definite advantages with certain types of students and in certain learning situations. An accurate description of instructional

software could begin with noting that it is instructional material, usually on paper, that is often consummable and does not need a mechanical assistance in order to provide instruction. Secondarily, it can provide feedback to the student in different settings and modes from that of the instructional input. There is no need to list all of the software, for the list is long, but there can be value in pointing out some of the salient points found in most software.

It can be repeated for drill and retention purposes. On the other hand, it suffers in that often the feedback does not come immediately after the lesson, and in the ensuing hiatus, much may be lost to the student. It also has the possibility of introducing much irrelevant learning into the learning situations due to the ability of the instructor or student to modify the learning structure. It thus lends itself to being evaded or diverted. Much of the student resistance to software is built into the nature of the feedback, in which the instructor is forced to correct materials and thus place the student in a position of being judged. Whereas hardware appears to be non-prejudicial; software often appears to be prejudiced.

Much software does provide good instructional behavior models. It is readily seen that software that is built on the interests of the students and leads them to satisfying conclusions is easily accepted by them. Yet, the problem of software can be seen in the number of students who are cowed by difficult lessons; who are defiant to the corrections of the instructor, and who have anxiety about lessons with vague and indeterminate goals. There is a world of difference between

the development of sound software and the use of vague and misleading software. This is not a brief for software that is "fuzzy" and does not teach, but it does make a stand for software that is clear about its goals and leads the student to a precise instructional goal. The student should not feel rewarded for wandering through an instructional maze. Punishment for incorrect tries must be removed from software, just as it is removed from hardware. The assignment of numerical grades and other spurious motivators only leads to resistance and defiance. Few seem to appreciate this and often instructors take good software and muddy its effects by elaborate systems of grades and evaluations. Each time this is done, it frustrates the intention of the writer of the software.

One effective use of software is its ability to be stopped at any time. Software lends itself to taking "time out." This "time out" is effective in producing a desire to move on. Software can be stopped during the middle of a lesson, for a day, or for a week, and the student can return to it with renewed zest, or after synthesizing learnings to a point where further progress is needed. The "time out" factor in software is seldom appreciated, but is sorely needed. Software has still another factor built into it -- the ability to be used as a vehicle for wide exploration and discovery. Often the software can be a jumping-off place in which the individuality of the student is challenged and he can "do his own thing."

It is well to analyze software in the following manner. Each piece of software was designed by the author to reinforce some particular learning task. When used over a long period of time, software can

produce some effects that are important to the learner, particularly a reduction in the desire to escape learning or in defiance to learning tasks. This is done through the use of varied inputs and varied methods that offer several routes to a task completion. The instructor can always return to a lesson that presented difficulty and not obviate the use of software. It becomes a creative way of approaching learning. The "time out" can be used to reinforce other learnings, or types of learning, and a return to the software can be done when the student is ready for it. This does not mean that hardware does not have this capability in some measure, but it is evident that the machinery, or controlled input, of hardware often makes this possibility less viable than in software.

Software can also be used without the feedback loop. It can be used to simply input instructional materials to the student. It can be used without tests, correct answers, or the need to do a task before moving on to another. This use of software is often overlooked by those who wish to use it as a task-centered instructional medium. Much of software and its uses has been based on "correct answers." Education has customarily tried to place software in that context. The questions at the end of the chapter were a boon to the "lazy" instructor. It produced a series of generations of students who dreaded the end of the chapter and the inevitable questions. Recently, there have been attempts made to produce software that does not have task-centered problems attached, and that instead attempt to provide an instructional system built on releasing creativity. The whole purpose of some of the current software is to produce within the student a desire for self-generated learning tasks.

Permissiveness is not the name of the game described here. This is not a brief for letting the student wander through the materials "willy-nilly." Chapman and Schultz (Teaching Adults to Read) have pointed out that in the Mott Series the instructor should be well aware that letting the students wander through the material will produce low motivation. They emphasize that the choosing of the lessons to perform is a task to be done jointly by student and instructor. The authors rightly point out that this becomes a factor in human relations and that the software is highly useful in building humanistic values. Even programmed instruction, as shown by John Peters, can be a factor in developing greater humanistic values. Software now used in ABE may make an enormous difference in the coming years, for more and more of it is beamed toward the creative tasks of learning. It may be well to think of hardware and software not as mutually exclusive, but as two compatible items used in instruction.

Some of the advantages and disadvantages of software can be seen by observing how they are to be used. It is evident that the human factor of the instructor is important in developing good usage for software. Yet, the reinforcement principle still applies to software. The reinforcement is different. The reinforcement is not as direct, nor often as precise, but it can be more readily adapted to the individual student. It can be complex in that it stretches through a number of learning tasks, or it can be immediate for one small micro-input of instruction. It can be used for teaching a number of items that evade the hardware, such as self-control, self-management, cooperation, and ethical behavior. It lends itself to a wide diversity of uses.

Software, as hardware, lends itself to "contingency management" in that the student can develop projects, additional research, and group tasks from the software. Study skills can easily be taught through software, and software can often be used as a prelude to hardware. The development of a "set" for hardware is often done through the use of software. In this initial stage, the length of the lesson and its difficulty can be adjusted to the level of the student so that students can use software lessons that develop the attitudes of self-management needed for using instructional technology. Many instructors of ABE attest to this.

Software can also reduce the need for teacher-direction in students. The reasoning may not be obvious at first, but consider the following. Thousands of ABE students are using poor or unproductive patterns of response in problem solving. Software provides a series of alternate paths to problem solving. The instructor allows the students to see what they have done, find out what the incorrect paths are, eliminate them, substitute other paths, and provide feedback when the new paths are attempted. This kind of procedure can produce new learnings and learning strategies on the part of the student. It is simple -- to change the present patterns of the student, the student must see new patterns for learning. Often software can produce a number of alternatives that allow the student to choose one that may help him to learn better.

This is not a system built on good intentions or self-chastisement. This is a desire to provide a systematic way in which the student can participate in the determination of the materials and learning paths to be followed. Software should never be used to provide the student with a pattern of self-resentment. It is not a correct answer that we are looking for; rather a correct path for learning. Good instructional software can produce the effect of self-confidence and creativity. It is essential to judge this factor in selection of materials. There is a difference between software designed to correct and punish, and software designed to lead to stronger self-management.

Often software is criticized because it produces too many different patterns for students to follow, and the instructor is left with a highly diversified group of students. This is a correct assessment. It is compounded by the problem that some authors assume that the development of attitudes is more important than learning task performance, thus causing "preachy" and ineffective types of software. The important fact of software is that it must move the student to the completion of an instructional task, and often much of it does not do this. It may be well to venture to say that most software used up to now has had little emphasis upon changing behavior or behavioral tasks, but has tried to provide changed attitudes, so that the instructor has had to provide the behavioral tasks to be done. This is a failure which hardware tried to remedy. Another difficulty of software is that it often has difficulty in following a path that leads to changed behavior. By its nature, it often confuses changed

behavior with attempts to change behavior. Changing the kinds of lessons to those that satisfy a need will produce changes in behavior that eventually produce changed attitudes.

Mager, in Preparing Instructional Objectives (page 10) highlights one problem when he points out that the instructional software must combine two things: diversity of paths and clear-cut behavioral goals. Of the two, it is evident that Mager places the behavioral goals as the most important priority for our attention. It is student behavior that we are affecting in using software. The concommitant benefit is that the student has different ways of reaching the goal. It is important to realize that affective behavior is greately influenced by software, even more so than in hardware. Students like the feeling of choosing, and of having the instructor respond to their learning tasks. The inter-action with other students can also bring many positive affective responses. However, it is important that we realize that one of the greatest pitfalls in using software is that the reinforcement or response of the instructor must follow the student doing something. Giving of reward cannot preceed the student giving the correct response.

It is evident that one of the greatest drawbacks of instructional software is found in the lack of student behavioral response that often accompanies it. The student is allowed to be a plastic respondent to material and makes little decision as to its use. Poorly constructed

or poorly utilized software can produce weak responses, guilt over incorrect attempts, and ineffective problem-solving behavior. All of these can be corrected by using excellent materials and well-trained instructors who are aware of the possibilities inherent in them.

In summary, it is wise to consider that software is primarily designed to provide instruction, and then changed attitudes as a result of task completion. It is not designed to produce quiet students or passive learners. It has to define the learning task clearly and suggest ways of doing it. When this is done, the student can then follow the materials to successful task completion.

Utilization of Hardware and Software

Learning Resources Center

The Learning Laboratory is a center for utilizing both hardware and software in which the student may engage in such activities as will lead him to an individual instructional goal. It is not necessary to stock a laboratory with only hardware. That smacks of "gadgetry." It is important that the learning goals be individualized and that different students follow different learning tracks to reach their goals.

Inherent in the Learning Laboratory is the thought that the material or programs are built on the principles of learning reinforcement. This differs from the regular classroom in that the method used is closely controlled in order to provide continuous reinforcement to the student. It is supposed that in the laboratory the student will learn more economically. He will move to the terminal goal more quickly and with a greater success rate. Experience shows that students often increase

their learnings at a much faster rate than in the normal "non-contingency" classroom. Also inherent in the laboratory is a minimum of unnatural reinforcements such as bonuses, grades, and instructor approval. The reinforcement comes in doing the work well.

B.F. Skinner can be thanked for providing the conceptualization of the Learning Laboratory in that he developed the basis for programmed instruction. He simply developed a method in which the rewards for instruction could be immediate by having the feedback supplied in response to completion of micro-tasks. The reinforcement is planned in advance and the student moves to the goal quickly. Anyone who has seen a Learning Laboratory will notice immediately that the students are performing a number of small tasks, yet there is a macro-objective in learning a large number of complicated tasks. There is no need to cite studies that show the rapid learning that takes place with the micro-inputs. It is of importance in corrections to remember that the inmates need immediate reinforcement and often large increases in the learning of skills and facts. Another aspect of the laboratory is the ability of one skilled instructor to handle more than a normal classload. Once the student is able to work on his own, the instructor is freed from lecturing or dividing the class into smaller segments, and thus neglecting many of the students.

Chapman and Schultz, in The Mott Basic Language Skills Program, Teachers Manual, state four principles that guided them to convert much of their earlier material to a programmed format. Students learn at

their own rate; there is constant re-testing of skills; students can begin work at their own level; and there is positive reinforcement given immediately. These four principles lead to an increase in student motivation and the accompanying affective changes. It surely does not repeat the pattern of earlier years which are often painful to the student. It reduces anxiety as well as fear. Both the agressiveness of some students, and the fear of others, is diminished. It also reduces the tendency toward development of a syndrome of receiving unearned rewards. The students do not get rewarded for being obsequious or fawning. This is a factor that leads to much spurious learning in that the students often work for the reward of approval and not achievement. Rather, they are rewarded for producing, and therefore attitudes toward learning are greatly improved. Learning Laboratories are places of achievement. The instructor is also motivated as he sees the students moving closer and more quickly toward their goals. The result is higher satisfaction on the part of the instructor. There are not many studies on the benefits that accrue to inmates in this area, but there is belief that transfer does apply and that what is working for most adults will work for inmates. It is a pity that few directors of corrections education view the learning laboratory as a viable instructional tool. It is even more tragic that guards and other minor correction personnel view the Learning Laboratory as disruptive of their routine, and as a place in which inmates are "coddled."

Bloom (Taxonomy of Educational Objectives) speaks of a hierarchy of learning tasks. The Learning Laboratory should contain progressively more difficult lessons for the students to master. As they move through

the lessons they learn more complex skills and perform more complex tasks. This can be done through the principles employed in the Laboratory: immediate feedback, small steps, active responses by the learner, and self-pacing. To these should be added knowledge of the terminal objectives.

There can be one danger in the Learning Laboratory and that danger is that the student may become addicted to the reinforcement in the programs. At some point the student should be "weaned" away from the reinforcements of the program and should learn to provide his own reinforcement. This is where "self-management" comes into play. The determination of the learning path and the lessons to be performed is then the responsibility of the learner. He then can begin to determine that his arithmetic is leading him to a goal, for he picks the goal, and with assistance, picks the path to get there. He is then a self-learner.

Materials and Media Centers

A Materials and Media Center is another portion of the instructional technology utilized in successful ABE instruction. It provides a large source of audio-visual and supplemental materials usable for both "on-track" learning and for student exploratory learnings. It is chiefly stocked with materials that accompany or supplement those used in the basic programs, whether they are in software or hardware form. Care should be used in developing a materials and media center to insure that the films, tapes, slides, photos, books, and displays are consonant with the materials used in the Learning Laboratory. Otherwise, there is a great waste of money. The purpose of the Materials Center is to provide further enrichment or teaching materials for the programmed

materials. It is wise therefore to build the center slowly. The materials should also be housed in a manner that will allow for easy access and use. For replenishment and additions, some system should be used to check to see which materials are used most often. Materials that get a low frequency of use should be weeded-out. There should be a way in which the student can have acoess to the materials and not need permission from the instructor. The air of a sacrosanct library should be avoided at all costs.

The Materials and Media Center can reduce the need students feel to hoard learning materials. If they are available for use at all times, they are available for more students and there is less "down time" in using them. Within a short period of time, students can be taught to use the materials when needed, then return them and leave them available for other students. A minimum of ohecking is then required. The Learning Center and the Media Center should avoid giving "brownie" points for utilizing media and materials. The purpose of the media center is not to get a high number of check-outs, but to provide a large supply of materials for instructor and student use.

Klein (Perception, Motives, and Personality, page 210) speaks of the need for experiencing as a factor in behavior modification. This is an essential part of the media center, for it should provide manipulative and simulation materials as well as visual materials. A good media center should be stocked with exhibits, motor projects, games, films, and tape cartridges. It should provide as much realistic material as possible. This helps "lock-in" the learning that has taken place. The student can then experience his learnings in some

situation as near to real life as possible. There are schools that utilize the Media Center as a place where the students can get a multi-media reinforcement for learning. These centers provide materials in visual, auditory, and often mechanical response form, tied together for review, exploration, or just plain "fun." If we consider that learning takes place in an environment, then we must consider how rich that environment is. The Media Center provides a means of enriching the environment. This is extremely important in corrections where the environment is meager and barren.

The Media Center is not to be used as an individualistic learning environment. To show a film in isolation is to provide weak stimulus for learning. To show the film as a part of exhibits, pictures, tapes, and manual projects is to provide a rich stimulus for learning.

It is essential to understand that the Media Center is to provide a new environment for learning. It is not a place to divert the student's attention from the primary tasks he is learning. Often there is great misunderstanding about the Media Center as a fancy collection of materials that somehow will attract the student's attention. Its purpose actually is to reinforce what he is learning in his primary learning track.

Media Centers are not just places to be turned on or off at will. They are not places where the student can go from eleven o'clock till noon. The environment is constantly impinging on the student, and to provide an enrichment for one hour is to provide a spotty and often defeating enrichment. There are instances in which corrections

officers have complained over the ability of the students to use the Media Center at times other than during recreation periods. Yet, it may be at precisely those times that the need for enrichment is greatest. How many persons have found that a great deal of learning is lost when they could not get to the library on a Sunday?

The Media Center often provides the only opportunity to vary the environment as the student is learning. It is a law of learning that the student must be able to respond to his learning needs as they arise. They cannot be deferred to another time.

Media Centers have other difficulties in that they are often tied to rewards not related to learning. The "good boys" can use the Media Center. This negates the purposes of the Center. The reward for using the Center is learning, not approbation. There have been instances where students in a rebellious mood have destroyed much school property, but have left the Media Center intact. This is attestation to the type of attitude the students had toward the Media Center.

There have been numerous critics of Media Centers who point out that they consume much time and money. This may be a true criticism. Yet there has been little in the way of proving that non-enriched learnings are any cheaper in the end. The Media Center may assist the student to reach his terminal goal more quickly and the savings in instructor costs, social costs, and student time have never been calculated. Also it may be that the instructors are threatened that the Media Center is

replacing their expertise. Often this is true. It should be noted that the instructor is forced to adapt new patterns of teaching when a large and resourceful Media Center is nearby. The introduction of a Media Center with closed circuit TV can force an instructor to make drastic changes from the usual lecture/paper-and-pencil/tests methods.

A final observation on Media Centers is due. It seems likely that there will be periods of confusion, disrupted schedules, loss of direction, and so on, when using such centers, but they justify themselves when they assist students in learning faster and more efficiently. It provides a means of reinforcing self-management behavior. This in itself is worth its cost and trouble. The student who can see learning as a multi-faceted thing is more valuable than one who has mastered a few learning tasks. In corrections there is an attempt to provide a new viewpoint to inmate education, and the Media Center is an excellent vehicle for introducing the new viewpoint. It provides a means for the student to test his learnings against a background of the outside world.

Other Uses of Hardware and Software

There are other uses of hardware and software in ABE. First, they are not miracle workers and they still require that the instructor does a good job of teaching. Yet, there are some uses not often associated with education that lend themselves to the utilization of these materials.

One of them is to combine visual cues with motor tasks so that the student can learn a precise series of motor operations. This has particular usages in vocational and technical education.

There are diagramed slide sequences that can be used in teaching trade education in which the student follows each slide as a step in the production of a garment. These slide presentations, when coupled with sound, allow the student to have an accurate path for his motor work in learning the steps of a complex process.

Again, slides and films can provide descriptions of materials to be used, and when coupled with the overhead projector, can allow the students to see fine and delicate operations on the screen. This allows a group of students to see what would have to be repeated singularly for each one otherwise.

Still another use of instructional software can be the comparison of incorrect attempts with correct attempts. Care must be exercised so that the student doesn't think that the incorrect attempt is correct, but this kind of comparison teaching has shown its merits.

Hardware can be modified, either within the hardware itself, or with software, to allow for student affective feedback. The development of group discussions, sessions, and role-play can follow from this feedback. The key to this is the desire to change the total behavior of the student. When these instructional tools are combined with discussion and role-play, significant inputs for behavioral change can arise.

Summary

Instructional software and hardware is revolutionizing adult education. The model of the twenty immigrants sitting at the foot of the "nice American lady" who is teaching them to speak English through rote instruction is fast disappearing. The introduction of micro-input has brought instruction to the point where it can be measured. It now contains curriculum accountability. The question then can be raised: Is the curriculum sound, or is it not? If it is not, this can easily be spotted. When combined with a reinforcement schedule supplied by the author, the instructor knows what he is teaching. The guesswork is gone.

This paper is an attempt to go beyond the usual description of hardware and software used in adult education to discussing some of the philosophy behind the utilization of programmed materials especially as they relate to the basic theories of B.F. Skinner. To those who wish to have simple lists of materials and machines, this paper may not do justice, but, for those who wish to examine the ever-growing field of these materials, the opportunity can be afforded by obtaining catalogs of recent materials or contacting distributors of such equipment.

What kinds of materials are best used with inmates? The answer to this is not clear, for inmates range from those who have few skills to those who have many, but it appears that a cardinal point in determining what technology to use with inmates is the rule of

producing as much educational gain as possible in a short period of time. This would lead to short units in software and instructional programs that are geared to short-term results. One example would be modular components.

What kinds of materials are available? The materials can easily be classified into four categories:

Hardware with software as an integral component.

Hardware with variable software.

Software utilizing the programmed principle.

Non-programmed software.

What are the advantages of using different types of materials? The advantages and disadvantages are most easily measured against program goals. Hardware controls inputs and reinforcements, but can be expensive. Software is flexible in inputs and reinforcements, but requires skilled instructors.

What are some of the expected outcomes of using instructional technology? There is an evident reduction in the need for instructor guidance and an increase in self-determined activity. There is a reduction in guilt and fear of punishment. There is a controlled curriculum input that is measurable.

What kinds of media are available for correctional institutions? Correctional institutions have limited usages of many materials and media. The nature of the corrections environment prevents widespread use of field trips, simulations, etc. Yet there is an unlimited ability to put some material to creative uses within a restricted setting.

What are the advantages of CAI or ETV? Computer assisted instruction and television have great potentiality, yet, often the size of the inmate population is such that many expensive programs could not be profitably installed. Computer assisted instruction would allow the inmates to utilize learning programs "piped in" from outside sources and expand the capability of the instructional program enormously.

Are these advantages educationally significant? Yes. The greatest educational advantages would be in providing an expanded curriculum for inmates. One disadvantage not often mentioned is the "down time" due to prison regulations that keep inmates away from the terminals in restricted activities, i.e. count-downs, lock-ups, checking systems.

What are the expected outcomes of media and technology usages? The greatest outcomes would be a richer and more diverse educational program for inmates. Higher test scores could be achieved, as well as more progress toward such abstract goals as the G.E.D. and the College Boards. In the area of vocational training, an expected outcome would be keeping abreast of current developments in the "state of the arts" in each technical field.

It has been the attempt here to touch on both hardware and software so that the development of an integrated system could be presented to the reader. To speak of either in isolation would be dangerous. To use this material in developing curriculum guides, it is well to consider the terminal behaviors and objectives of each program. The behaviors of the students cannot be predicted, but there is certainty

in predicting the kind of behavior that is expected from each educational activity. There is a danger that an integrated Learning Center may be seen as a model for all others. Discussions of Learning Centers as fixed and formed things is quite subjective. Experience has shown that the mystique of learning centers is enhanced by describing the parameters of one. Often the practitioner in the field assumes this is the learning center.

There are two parallel lines woven into developing Learning Centers. The first line is that utilizing any materials or media is limited by the ability levels of inmates, staff competency, and money. The second line of reasoning is that the status of each program in the "now" is exceedingly important to where it is going in the "tomorrow." The program planner may find that the "now" he has does not fit the "now" of the theorizer. Often the two are far apart, but a system of conceptualizing the utilization of media and materials can be adapted to any "now."

Development of complex systems for utilizing technology that take all of the time of the educational supervisor are self-defeating. This can also be termed the fault of "linear casuality" in which it is assumed that determining possible behaviors will lead to those behaviors. There must be a realization that totally different behaviors might arise from the intended uses of such materials.

There are several reasons for this. Chief among them is that no precise prescriptions can be given. Innovativeness most often arises from the ways the material is utilized. Also, a great deal of "noise" or irrelevant instruction, is introduced into instructional materials.

This noise is often measured or reflects on the measurement of program effectiveness.

Thus, this paper is an attempt to provide a logical framework for the corrections educational supervisor to handle the twin problems of "complex-indeterminancy" -- line one, and "program-indeterminancy" -- line two. It is addressed to the problem of how to reduce the complexity of using instructional devices, and how to reduce the need for wracking readjustments of present programs to install them.

Addendum

In the course of the preparation of this paper, assistance was given by persons who gladly volunteered their time to speak with the author. Sergeant Beverly Hunter, Sybil Brand Facility, Los Angeles County; Mr. Kessler, Director, Camp Gonzales, Los Angeles County Probation Department; Mr. Baylz, California Institution for Men; Mr. Boyd Marsten, Nevada State Prison; and Mr. Jerry Neilsen, State Director of Adult Basic Education, Nevada. Each of them reacted to the ideas of the author. There was no attempt to evaluate their programs. Rather they were functioning as a sounding-board for the author.

The author has drawn some conclusions relative to certain aspects of hardware and software that would not be covered in the paper itself, but are essential.

1. Much of the software should be related to prison experiences, and not express ideas and viewpoints that are foreign or antagonistic to inmates. Materials that admonish "be good" are self-defeating. The

inmates know that good behavior did not place them "inside." Much of the material presently fed to inmates is in the form of state texts and secondary readers of this variety. The need for special materials for inmates is evident.

2. Attention to social problems is at a minimum in much of the material and thus the basis for attitudinal change is lacking. The paucity of materials on the Black and Brown experience is woeful. It is unbelievable that many persons do not recognize that social problems are the root of many of the behaviors that led to incarceration. Instructional materials must attempt to remove much of the behavior that has come from "pre-conditioning." The reaction to social problems has been to ignore them in instructional materials, or worse, to emphasize that they are the problems of the victims. The continuous victimization of the victims will only produce more negative behavior. It is the opposite that will produce changed behavior. Instructional materials will need to be developed that lead the inmate to consider himself in a context of the social environment.

3. There is a need for curriculum material that addresses itself to group concepts, much as proposed by Dr. Joseph Paige in his discussion of life-styles curriculum. The tyranny in the texts of Middle America, with implied derogation of other life-styles, is stultifying to the students. Many inmates are aware that their success will be built upon the development of community support for them, and that they are not "going it alone." Yet, little is in the curriculum that works toward developing sound group identity in the ABE students. The phenomenon of having the ABE student think that he is the sole person

responsible for his plight is a "cop-out" for those of us who are in leadership. There is a complex interrelationship between individual failure and responsibility of the society for providing the fertile ground for failure.

Study of the social environment often is presented as a complete and closed system. The dynamic aspects of societal development are ignored. There is much cause to suspect that texts and materials of this nature are chosen because they please the "powers that be" in that they describe the present system of "leaders and led" as immutable and unchangeable. Few ABE texts address themselves to what society can be, but only to what it is.

4. A great deal of the attention placed on instructional software has been of an utopian nature. Do the lessons and all will be well. The task of determining the benefit of the lessons must be left to the learner. The "shaman" complex of many prison administrators obviates the use of self-management materials. It is not what we think will help the man to improve; it is what he thinks will help him improve and change his behavior that is relevant. Often the software that is used justifies the continuation of dependency. Little has been done to provide a basis for independent action.

5. Software must take into account the kinds of populations in the institutions. What works for a younger group may not work for a diversified group containing older inmates. The solution is to match the instructional software to the needs of the inmates. Most of the materials available and utilized in corrections are beamed to too general an audience. Textbook publishers do not wish to produce specialized

texts, but they are sorely needed in corrections.

6. A majority of the prison population consists of drop-outs from the regular educational establishment. Thus, they do not appreciate rigid controls while learning. Others have had permissive educations, and have become intellectually "spoiled." It may be wise to consider that the instructional hardware should beat a path in the middle, and be neither rigid, nor too lax. There is a fear of turning the student off by demanding correct behavioral responses. This is fallacious. Contingency management requires that the student set a contract and hold to it. Hardware and software, but mostly hardware, can assist in this. In most cases, there should be little fear that the materials can be too rigid, for self-pacing is built into them. There can be a danger of the pace being too slow or haphazard. In the time that the average inmate is in an institution, much must be done to create the basis for self-management. The education program is an integral part of this behavioral change. If it is not, then much valuable time and resource is lost.

7. There are numerous criticisms made of the current software, but few that attack a general problem that is endemic to the nature of current American thought. The development of vocational skills in much of the software and texts for ABE students is for dead-end occupations. The growth occupations, those related to higher levels of decision-making and power, are overlooked almost totally in the curriculum. There is a need to go beyond license plate making, house-cleaning, and janitorial work. There are almost no texts that develop skills in community planning, the arts, and future technical vocations.

It appears that there is a masterful job being done in creating a new slave labor class. This is often done unintentionally by the writers of the books, themselves ingrained with beliefs in superiority and inferiority. One who cannot read and write well must be inferior. The cursory scanning of textbooks will readily show the internal snobbery built into them.

8. Freedom is a concept that is over-rated in the American experience of today. Texts talk of freedom while more and more persons are aware that in our age the pressures of society reduce the traditional freedom found in the "frontiersman." Little is said of ethical behavior and societal responses to individual growth needs. It would appear that some of us have forgotten that the cry of increased self-enhancement without being related to social responsibility is the clarion call of "robber barons."

9. There is little in the way of developing the concept that much behavior is needs-oriented. Correct assessment of needs and how they can be met is essential for persons who have few well-established patterns of needs satisfaction. The interaction between personal needs and societal restraints is presented in terms of self-sacrifice, defiance, or cause for punishment. Little is said of finding ways to temper needs-satisfaction, defer needs-satisfaction, or demand needs-satisfaction. There is cause to fear that some ABE texts sublimate legitimate needs-satisfaction and create mental health hazards.

10. One aspect of hardware that is encouraging is that it can readily adapt to the increasing sophistication of the ABE student. Texts become fixed and remain that way, whereas hardware can be re-programmed and brought up to date. It appears that one of the consequences

of using good programming in hardware may be the ability to develop higher decision-making skills. This may be a way of resolving the dilemma we presently have among large portions of our population in that we reduce the possibility of developing decision-making skills and then expect the population to make many decisions in politics, social life, and vocational selection.

11. Little material is beamed toward continuing education. The push for vocational education and terminal GED has obscured the fact that the inmate has just as much, if not more, need to learn when he "goes outside." Changed behavior is just as much a part of self-management as bad behavior; good motivation is as essential as punishment; good teaching as important as rote learning. It is essential to understand this in working with adult students. It cannot be said any more softly. The learner will learn something. It is up to us what he learns.

Appended to this paper is an adaptation of a program done at University Extension, UCLA. This was an adaptation of material produced by Behavioral Research Laboratory of Palo Alto, California, and was not intended to supplant it, but to provide a lower vocabulary for use with para-professionals, not professionals. In it you will find the principles of programming and instructional monitoring.

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