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ABSTRACT

Dial access in education has been found to provide useful instructional experiences, but it is not useful in all conditions for all purposes. Circumstances in which dial access retrieval systems might be effective as part of an instructional program can be identified by examining special features of such systems: the types of audio and visual media they can make available; the qualities which they can impart on these media, such as immediacy, ease and efficiency of presentation, flexibility, and individualization; the various appropriate learning procedures which can be used, such as presentation, programing, drill, audio-tutorial, problem solving, and resources; and the types of access required in the use of the media as in the type dualities of random-scheduled, exclusive-common, and remote-direct. (SP)

"DIAL-ACCESS" AS AN INSTRUCTIONAL MEDIUM

by R. Stafford North*

In 1964 when Oklahoma Christian College first began serious consideration of a dial-access system which would allow a thousand dialing stations to select from any of more than a hundred programs, many said it could not be done within the normal limits of educational enterprises. Costs would be too high, maintenance impossible, materials unavailable, and faculty unwilling. In just four years, however, it is clear that the project not only is possible, but that it has worked successfully.

In fact, the use of dial-access[1] educational facilities, which began in 1961,[2] has now grown to more than a hundred twenty operational systems with above fifty more being developed.[3] About half of these systems are in elementary or secondary schools, and the other

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[1] "Dial-access" is used in this paper to designate any remote-access system whether it is activated by dial, pushbuttons, or other device.

[2] Gabriel D. Ofiesh, Dial Access Information Retrieval Systems: Guidelines Handbook for Educators, Final Report of Project No. BR-7-1042, U. S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research (July, 1968), p. 23. Don Stewart, in his Dial-Access Information Retrieval and Systems for Education Newsletter of September, 1968, places the date of the first dial-access system in 1960.

[3] Ibid., p. 25

half in higher education.[4] Thirty-six percent are used for language study only with the remaining sixty-four percent employed for multi-subject purposes.[5]

The rather rapid spread of dial-access systems in educational facilities is a clear indication that this mode is both electronically possible and financially feasible. This increase is also an indication that there are many who believe that this form of remote-access to information is instructionally sound.

Like almost every new plan, however, dial-access is not without its opponents. Some suggest that it is an unnecessary cost, others that it does not provide sufficient flexibility, and still others that it is too difficult to maintain in working order.[6]

A review of the systems in use and of the literature, then, would warrant the conclusion that dial-access can provide some useful instructional experiences, but that it is not useful in all conditions and for all purposes. The aim of this paper, therefore, is to explore those circumstances in which dial-access retrieval is effective as part of an instructional program and, in such cases, just what contribution it can make. In considering this topic, four questions must be asked:

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[4] Ibid., p. 92

[5] Ibid., p. 25

[6] Jean R. Theumay, "Is Dial Access a Fad?" Audiovisual Instruction, XII (December, 1967), 1079. Arthur W. Lalime, "Tape Teac'.ing: Dial Select or Auto Library?" Audiovisual Instruction, XII (May, 1967), 441.

(1) What learning media can be made available by dial-access?

(2) What special qualities does dial-access give these learning media?

(3) What learning modes can be provided by these media?

(4) What types of access are required for using these media?

I.

What learning media can be made available by dial-access?

The most common media used on dial-access systems are audio and video tape recordings. All present dial systems are designed to receive audio tapes and twelve, in addition, can receive video.[7] But any system which can receive audio tapes can also easily be adapted to receive live radio, a live speaker, a telephone conversation, and disc recordings. Any system with video capability, likewise, can be adapted to receive live broadcast-television, live closed-circuit television, slides, filmstrips, and moving pictures.

But making these media available to a carrel, a classroom, a home, or a dormitory room just by dialing does not, by any means, exhaust the possibilities of remote-access systems. And, indeed, it may well be that some of these additional uses eventually may become the most valuable. Although it has not yet been done in any current installations, a response system can be built into a remote-access system--

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[7] Ofiesh, Dial Access Information Systems, p. 94.

particularly one which uses push buttons. This response system can allow a student to give his answer to questions or problems presented by the material on the system. This response may be received by the same computer which controls the switching system, and a graded print-out can be prepared for the teacher listing each student's responses. Item analyses can even be provided giving the teacher feedback on the overall progress of the class.

Branching systems are also a possibility through remote-access. In this case, a student's response on a question can determine which material he receives next. Response "A" might be programmed to send him to one track of a tape while response "B" might be programmed to lead him through another. In this way, the remote-access system takes on some of the qualities of computer assisted instruction.

Not only, then, can a dial-access system make available all types of audio and visual materials, but it can also incorporate such other media as response systems and branching techniques. Future developments, undoubtedly, will produce still other uses. Particularly will progress in the remote-accessing of documents bear watching for instructional dial-access systems.

II.

What special qualities does dial-access give these learning media?

The media which can now be made available by dial-access are well known as instructional methods. For years, for example, we have used films, television, and recordings for teaching purposes. While each

of these media has its own character when used in its usual form of presentation, the use of each of these on a dial-access system gives it certain additional qualities.

A. The first quality imparted by the dial-access system is immediacy. A textbook is often two or three years in the making, and journal articles may be many months in preparation and printing. It even takes several days for a teacher to write material and have it reproduced for class distribution. A recorded interview or information just available, however, may be disseminated immediately through a dial-access system. And when students are dialed-in to live radio or television coverage of an event, they are in contact with it at the very moment it occurs.

The quality of immediacy is also seen in the fact that while one copy of a book, or recording, or film may take weeks to circulate among a large group of students, one copy of a recording or film on dial-access may be made available to hundreds or thousands at the same moment. In this way, for example, a movie can easily be seen by the students of a large class within a day or two without occupying class time or teacher time. Or, to take another example, an important speech occurring out of class hours can be heard live or by recording before the next class meeting.

B. A second important quality of materials on dial-access is ease and efficiency of presentation. One of the major deterrents to the use of many instructional media is the difficulty and waste

involved in their use. Many teachers, for instance, do not like to "waste" time setting up equipment; others have never learned to use it; some are even afraid of it. A dial system, however, makes either audio or video material easily available. With a dial position located in a classroom, for example, a teacher may have a film or a recording with no more difficulty, training, or fear than dialing a telephone.

With the same ease, students may dial materials for use in their carrels. One music teacher, for instance, has estimated that students in his music appreciation class listen to ten times as much music with the dial system as when they had to go to a listening room and operate the record player themselves.

Still another factor relating to ease and efficiency of presentation is that students can use material on a dial system without the presence of the teacher. A great waste of teacher-time occurs, for example, during a forty-minute film in class as the instructor sits idle. His time can be used far more efficiently if he prepares the students for the film and then lets them see it without taking his time.

Another obvious saving of teacher-time occurs when the teacher can record certain experiences to be made available to students through a dial system, thus being relieved of repeating that particular material for several sections of students. At OCC, for example, much of the beginning speech course utilizes audio-taped materials on the principles of speaking. This relieves the teacher of repeating

the same lecture to successive sections and allows him to use class time more effectively and efficiently.

Of course, it takes a teacher's time to prepare material for use on a dial system, but this initial investment of time can be more than regained through the use of the recordings or films.

C. The third quality which dial-access imparts to the media used on it is flexibility. A teacher can be in only one place doing only one thing at any given point in time. The materials on a dial-access system, on the other hand, can be in many different places at once--carrel, dormitory, home, classroom, or even a car. And those dialed-in can all be doing different things. Each student can, therefore, be studying material best suited to his own needs. In addition, different students may access the same materials at different times, thus making scheduling simpler.

An obvious example of this flexibility is in the use of recorded shorthand drills. If the teacher dictates in class, all must go at the same speed. If the teacher wishes to save his time by using a recording in class, still all must go at the same speed. But if dictations at 40, 50, 60, 70, and 80 words per minute are placed on different dial numbers, then each student may dial the particular speed which best suits his particular need. This same principle applies, of course, to a wide range of subjects and materials.

But not only is the flexibility seen in that it allows different students to be dialed to different programs at the same time, but it

also allows one student to use a given set of materials more times than another, should this be beneficial to him.

D. This flexibility leads directly into the next special quality, individualization. Most dial-access positions now in use in school systems are located in individual carrels, and this is no coincidence. A dial system certainly affords a student the opportunity to utilize material in the way best suited to his own needs.

Sitting in a location that provides him partial sight and sound isolation and with earphones masking the "outside" world, the student has an experience that is really quite personal. Not only can he dial a program adapted to his particular needs, and at the time most suitable to him, but he has the sense of doing it alone. Often this experience becomes a rather personal encounter between a student and his teacher. One student at OCC, moreover, commented to a visitor that she liked working in a carrel located near others because she could have a sense of partial isolation and yet not feel completely alone.

III.

What learning modes can be provided by these media?

Having seen what media can be made available by dial-access and having seen some of the special qualities which dial-access gives these media, let us next explore the various learning modes which can be provided by this approach. Or, to phrase it another way, what learning conditions and procedures are especially suited to use through

a dial-access system? Those learning modes discussed here are not exclusive to dial-access and are, of course, used in other settings. It is important to note, however, that these are particularly appropriate for dial-access.

A. Dial-access can be used to present information. In almost any learning system there must be some provision for disseminating information. Sometimes this is done by a "class lecture," sometimes by a textbook, sometimes by "outside reading." Another possibility, however, is to use a dial-access system to tapes and films.

Probably the most obvious example of the use of an audio or video format for presenting information is the radio or television newscast. Particularly in nations where literacy is low and distribution of printed media slow, the audio mode via transistor radio is used for large-scale dissemination of information.

Some schools with dial systems record classroom lectures and make them available to students for replay, thus giving them more than one opportunity to obtain the information presented. An even more effective use of this mode, however, is to make available, through dial-access, speeches or interviews by experts or the recording of some actual event related to the topic being studied. Music, drama, or literature are other types of informational presentations which can be dialed.

This learning mode, then, is primarily concerned with simply presenting information to students which they are either to remember

or to write down for later study. Dial-access is one of the ways students may have the necessary contact with this information they are to receive and learn.

B. A programmed format can also be utilized on dial-access. In addition to making information available, as suggested above, the teacher may wish to present information in a form designed to assist the student in mastering the information as he receives it. Such an approach may take the structure of formal programmed instruction with the presentation of a "frame" of information, the opportunity for a response to this information, followed by feedback for reinforcement.

Material presented in this form by recordings frequently uses not only an audio or video tape, but also a workbook in which the student can record his responses. In such a case, the procedure might be as follows: the recording presents two or three sentences of information followed by a multiple-choice question over the material; there is a brief pause on the recording during which the student looks in his workbook at the possible answers and marks his choice; then the recording provides the correct answer for reinforcement.

But why would there be an advantage in presenting this in sound or sight rather than in print? In subject matter areas dealing with sound or sight such as music, speech, literature, drama, shorthand, physical education, foreign language, education, or art, the answer is obvious. Since sound and sight are involved in the desired learning outcome, they should be involved in the learning process.

Even in subjects not involving sound directly, however, audio or video may be useful. Greater variety in the presentation can be obtained by combining the printed workbook with the sound or sight on tape than could be achieved with the print alone. Often, too, the recording can add different voices, recordings of actual events, simulations, musical backgrounds, and other special effects to the words. In addition, many teachers feel that the warmth and personality of voice can add a personal touch.

This is not to suggest, of course, that all programmed instruction should be presented by the audio or video mode, but rather that it is one possible mode for such a presentation. And in this form, it can be utilized on dial-access systems.

An additional word should be added about programmed instruction on recordings. Many teachers have found a "semi-programmed" format to be quite useful for recordings prepared for dial-access. In this case the presentation of information departs somewhat from the strict programmed style and yet retains some of its principles. Thus a teacher might provide an outline map in a workbook, discuss it on the recording as the student fills in points of interest, and then provide a blank map on the next page of the workbook which the student is to fill out from memory. After a brief period of silence during which the student works, the teacher resumes by giving the correct answers as reinforcement.

There are many variations on this "semi-programmed" style. In

some cases a presentation of perhaps five minutes in length may be followed by a true-false or matching quiz. In other cases a problem may be worked in step-by-step fashion as the student follows in his workbook. Then, while the recording is silent, he works the next problem by himself and is given the correct answer either by the recording or by the next page of the workbook. While this "programming" is not as concentrated as the more formal style, it is simpler and faster for the teacher to prepare.

C. Drill is another learning mode which is easily adapted to dial-access. While education certainly must involve much more than rote memorization, absolute mastery of certain material provides the foundation for many learning experiences. Studying shorthand, foreign language, multiplication tables, chemistry symbols, dates and places, parts of animals, phonetic symbols, and any number of other materials requires the drill and repetition which a recording can provide. In this mode a recording has special benefits for it can repeat as many times as necessary without tiring or losing patience and it can offer the individualization of different speeds or levels should this be necessary.

D. Another learning mode possible on dial-access is "audio-tutorial." This form of recordings has not usually been employed on dial-access systems because it normally requires the student to start and stop the recording himself. It has now become possible, however, for a dial-access system to provide "exclusive" access to students by

allowing the first student dialing a tape to lock out other users until he is through. Another approach provides each student with his own "dubbing" of the master tape so that he can stop and start as he wishes. Because of these new capabilities, audio-tutorial is possible on dial-access and so is here listed among its possible learning modes.

In audio-tutorial instruction, the tape becomes the tutor to guide a student through a learning program. The teacher converses with the student on the tape and directs him to various other resources as necessary. Science laboratories, in particular, have been developed in this way. The student comes to a carrel in a science laboratory, turns on his tape recording, and listens to the teacher. After some background, the teacher may tell him to take out slide No. 27 and place it on the microscope. The student stops the machine and follows this instruction, then turns on the recorder again and is guided as he looks at the slide. The recorder then directs him to Table No. 3 where he is to make a particular observation which the teacher describes to him on the tape. He stops the machine, goes to Table No. 3, makes the observation, and returns to write down his observations. Having started the machine again, the student learns the nature of the observations he should have made.

This plan, developed by Dr. S. N. Postlethwait of Purdue University for botany instruction, has been adapted to many other fields. Particularly have Oakland Community College of Bloomfield Hills, Michigan, and Meramec Community College of St. Louis, Missouri, made

extensive use of this approach.

E. It is also very important to notice, however, that the more presentational types of instruction do not exhaust what can be done on dial-access. Problem-solving and discovery experiences are also possibilities. In many cases a student can analyze, critique, reason, and search while using materials available on dial-access.

Students in oral interpretation, for example, may analyze various styles of reading as they listen to different samples. Counselling students may critique a variety of guidance techniques. Students of group dynamics and communications may observe a group crisis develop and be brought to a solution. Students of music, drama, art, teaching, laboratory techniques, physical education, or any other type of observable performance may watch or hear the performances of others and seek to determine their strong and weak points.

While it may be simpler to use recorded materials in a presentational or drill mode, some of the most effective use of recorded materials has been in the problem solving and discovery mode. Not nearly as much use has been made of this aspect as of others, but it seems to offer important promise for future developments.

F. A final learning mode possible on dial-access is accessibility to resource material. At the present state of the art this use of remote-access must be confined to those resource materials which need to be available to several students at about the same time. There is, of course, little value in using a dial-access system when only one

person may need a recording and that at an unknown time. Eventually, however, it will be possible to dial a page from a newspaper, periodical, or book, as well as to dial a recording of a historical event, music, speeches, drama, discussions, interviews, and other such information. At the present time, then, the use of dial-access in the resource mode is limited, but likely, this will be one of the eventual major uses of dial-access retrieval of information.

These six modes of learning--presentation, programmed, drill, audio-tutorial, problem-solving, and resources--summarize the various types of uses on dial-access systems today. While one recording might combine as many as three or four of these modes into one 30-minute experience, they still serve as useful separate categories for thought in either examining or preparing audio-video materials. By far the greater use now being made of dial-access systems is for two of these categories: presentation and drill. Other uses, however, particularly that of the programmed or "semi-programmed" and problem-solving, appear to be developing rapidly as more instructors and institutions gain experience. Audio-tutorial is also developing rapidly, but more on direct-access machines than on dial-access. The extensive use of dial-access for research into resource materials appears to be awaiting more technological developments.

IV.

What types of access are required in the use of these media?

In considering types of access to audio and video materials, the following three pairs of terms should be considered:

Random	Exclusive	Remote
Scheduled	Common	Direct

A. Random access refers to a system which allows a student to obtain any program he wishes at any time. In the fullest sense of the term, random access implies that a student is assured of getting his choice of material from its starting point and without the possibility that it may be in use by someone else at the time he wishes it. In a more limited sense, random access may be applied to a system which allows students to access materials when they desire with only an occasional possibility of that material's already being in use. One might suggest, for comparison, that although a student has random access to books in a library, he runs some risk that another student will have checked out the book he desires.

Currently the system offering the most in random access is the recently opened facility at Oak Park and River Forest High School.[8] In this push-button system, a student punches in his program, waits

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[8]"Random access learning equipment can serve these students and others in school or at home," School Product News (September, 1968), p. 69.

only a few seconds while an ultra high-speed duplicator copies for his personal use the tape he has chosen, and then allows him not only to listen to the tape but to start, stop, and rewind as he wishes.

This degree of random access offers many advantages although it is, as yet, quite expensive. Particularly it facilitates the instructional modes of audio-tutorial, problem-solving, and the use of resource materials. For straight presentations, programmed materials, and drills, however, scheduled access may be quite adequate and much less expensive. In this case, tapes are scheduled to be played several times a day or as often as necessary to accommodate the users. While a student must be present at a scheduled time to start a tape, he does have a choice among the several times the tape will be played. In this way there may be fifty, a hundred, or more listening to one copy of a tape at the same time. Scheduled access, while being less flexible, is a more economical way of making materials available, and for some modes of instruction and some student situations, it is sufficient.

B. In addition to the "random-scheduled" duality, investigation of the types of access must also include consideration of whether access needs to be exclusive or common. When used in this context, exclusive refers to the provision for one student to obtain complete control of a playback machine so he may start, stop, and rewind at his own discretion. Common access, of course, refers to the opposite of exclusive control and indicates that two or more students can use material at the same time.

Scheduled access and common access, obviously go together for if a tape is scheduled for a given time, it cannot be started and stopped by a single student. It is desirable, likewise, that random access and exclusive access go together, but this is not absolutely necessary. A tape needed by only a few students, for example, may be available on dial start at any time with little likelihood that two would dial it at the same time. Should this occur, there still is no great problem for the second user can either choose to continue listening if the material allows one to begin in the middle, or to dial it at some later time.

Exclusive access has, up to this point in time, been provided primarily through direct access to machines rather than through any remote system. As mentioned earlier, however, the remote system at Oak Park, Illinois, allows exclusive access, and other systems are now being manufactured which will achieve the same result through computer programming rather than through the "rapid duplication" approach.

C. A final duality in types of access is direct or remote. While there are times when it is advisable for a student to have the playback machine and the tape in his own hands, there are also times when it is impractical or impossible to provide each student with this opportunity and thus a remote system becomes feasible. What factors, then, determine at what point one should cease providing tapes and machines to individual students and move to a remote-access system?

1. The first and most important factor in deciding between

direct and remote access is cost, and the key ingredient in determining cost is the quantity of traffic expected for listening or viewing.[9] If class sizes, for example, are expected to be small, then five copies of a tape might be sufficient and the direct provision of machines would be less expensive. On the other hand, if there are five hundred in the class and a tape needs to be seen or heard by all of them within the period of three or four days, making individual copies of the tape and making sufficient machines available would be impractical. With the low cost cassette machines now available, the breaking point at which remote-access becomes feasible is a higher number of students than it was before, but one still reaches the "break-even" point at some quantity. And if the remote system has to be available for some large classes, then it will likely be feasible to place tapes for smaller groups on the system too.

2. But cost is not the only consideration in determining whether to choose remote or direct. Expansion is another important element. If one ever anticipates a system which will be of such a size to make a remote system feasible, then he should start with such a plan. Converting to a dial-access system after having invested in five hundred tape playback machines, for example, would involve a large loss.

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[9]Donald K. Stewart, "The Cost Analysis of Dial Access Information Retrieval Systems," Audiovisual Instruction, XII (May, 1967), 43-44 and 492-494.

3. A third factor to consider in deciding whether to move toward a direct or a remote system is the amount of student control required when using the tapes.

Theoretically, the control factor is not a distinction between direct and remote access for any type of control which can be made available in the direct use can be done remotely. At the same time, it is less expensive and usually simpler to provide such controls as start, stop, rewind, record in a direct fashion than in a remote.

If one expects students frequently to need the capability of start, stop, and rewind, then this factor would tend to favor the direct use. On the other hand, if most of the material is to be used without stopping and is presentation, programmed, or drill rather than audio-tutorial, problem-solving, or resource material, then the remote access would work quite well. One can, of course, have both by utilizing a remote-access system for the bulk of the material, then making special provision for those uses that require the student to have greater control over the tape.

4. Another factor to be weighed in deciding between a direct and a remote system is maintenance.

A dial system is a rather sophisticated piece of electronic equipment and requires persons with special training to keep it running well. When it fails, the whole program suffers and major adjustments must be made. At OCC, we have found that a large audio system will require one or two full-time men plus student help for adequate operation.

Video systems, of course, require much more in terms of operational staff for they are more delicate and require additional equipment.

A small, direct system would, of course, require less maintenance than a dial-access system. Yet there is a point at which upkeep on a large number of individual tape-players becomes a major task. In the OCC system, for example, there are 1,024 positions, 46 tape decks, and the switching system to maintain. The student position has little to fail except headset cords, loose connections, or a sticking dial. The 46 tape decks are operated only by qualified people and do not require much time in maintenance except cleaning heads, occasional adjustment, and replacement of a relay; and since these are close together, all this is relatively easy. A direct system our size, on the other hand, would require 1,024 tape decks which would, of course, be a major maintenance task.

5. A final factor for consideration here is that of convenience. Convenience to the user must be a matter of prime importance. Students will not use materials that are difficult to access. Their time is important just as is the time of their teachers, and they do not wish to waste it walking great distances or waiting long periods for something to become available.

In some cases the dial-access system has made listening more convenient by allowing students to have carrels available at many points on the campus. Thus they are saved a ten or fifteen minute walk to the listening laboratory and the same walk back. The remote

system serves their needs all over the campus without requiring the staff to carry tapes to all these points and to keep them there in good order. The Ohio State University experience has indicated that the usage of tape-recorded materials will increase dramatically when it is made more convenient to the students.[10]

On the other hand, if the number of tapes to be used is not large and the campus is not sizable, a direct access system in a central place would be convenient and simpler to operate than a dial-access system.

6. These, then, are five basic factors to be weighed in deciding whether one should make audio and video available to students through a direct or a remote access system. It is not enough to make the decision on any one factor alone; rather, all of these must be weighed together.

V.

Conclusion

The rapid increase of dial-access systems for instruction since their advent in 1961, along with the millions invested in them, is clear evidence of the value many see in this learning approach. Yet, there have been opponents and disappointments.

At the least, dial-access, along with other recent technological developments, has placed new emphasis on the values of audio and video

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[10]William E. Biemesderfer, "Ohio State University's DATAGRAM," Audiovisual Instruction, XII (May, 1967), 459.

recordings as instructional tools regardless of the manner in which access is provided. On this point there seems to be general agreement.

On the other hand, dial-access retrieval itself appears to provide an effective way to meet certain instructional conditions. Particularly is dial-access useful when the quantity of the traffic is heavy, the distance separating users is great, or the approach to instruction is flexible.

In sum, there appears to this observer to be a place for dial-access in future instructional systems. It cannot do everything or even all that some have thought it might. But in certain circumstances, it provides the answer to important instructional needs.