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AVIRS AND TECHNOLOGICAL INSTRUCTION--EXPERIENCES WITH THE NEW EDUCATIONAL REVOLUTION.

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THE AUDIO-VISUAL OR VIDEO INFORMATION RETRIEVAL SYSTEM (AVIRS) HAS BEEN MISUSED AS A SOURCE OF INFORMATION AND AS AN AID TO STUDENTS RATHER THAN AS AN APPLICATION OF BEHAVIORAL TECHNOLOGY TO THE SYSTEMATIC PRODUCTION OF SPECIFIED BEHAVIORS FOR INSTRUCTIONAL PURPOSES. TO AVOID THE NEEDLESS EXPENDITURE OF VAST SUMS OF MONEY, INSTITUTIONS INTERESTED IN TECHNOLOGICAL INSTRUCTION CENTERS SHOULD PLACE QUALIFIED, EXPERIENCED INDIVIDUALS IN KEY ADMINISTRATIVE POSITIONS. THE FIRST ASPECT TO BE CONVERTED SHOULD BE THE BASIC INSTRUCTIONAL UNIT OF THE INSTITUTION--THE DEPARTMENT. THE DEPARTMENT OF LANGUAGES AND LINGUISTICS OF FLORIDA ATLANTIC UNIVERSITY UTILIZES AN INFORMATION RETRIEVAL SYSTEM IN TEACHING TERMINAL BEHAVIOR AT THE FIRST LEVELS OF LANGUAGE INSTRUCTION. WITH INFORMATION-STIMULUS AND RESPONSE-REINFORCEMENT PROGRAMING FRAMES, THE PROGRAM ASPIRES TO SHAPE VERBAL BEHAVIOR IN A SERIES OF CONTROLLED STUDENT ACTIVITIES WITH CONTINUED CONFIRMATION AND CORRECTION. BY THIS METHOD, THE STUDENT SELECTS HIS LEARNING SCHEDULE AND PACE IN A PROGRAM DEVELOPED EXCLUSIVELY FOR HIS NEEDS BY EXTENSIVE RESEARCH AND EXPERIMENTATION. THIS TECHNIQUE DEMANDS A GREAT DEAL FROM THE ENTIRE TEACHING PROFESSION. WITH THE DEVELOPMENT OF COMPUTERS AND COMPUTER-ASSISTED INSTRUCTION, PRODUCTION OF APPROPRIATE MATERIALS, AND TRAINING OF QUALIFIED TEACHERS, AVIRS CAN BECOME AN EFFECTIVE TEACHING SYSTEM IN A SECOND EDUCATIONAL REVOLUTION. THIS PAPER WAS PREPARED FOR THE SECOND AMA INTERNATIONAL CONFERENCE AND EXHIBIT ON EDUCATIONAL TECHNOLOGY, NEW YORK CITY, AUGUST 9-12, 1966. (AB)

AVIRS AND TECHNOLOGICAL INSTRUCTION:

EXPERIENCES WITH THE NEW EDUCATIONAL REVOLUTION

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The term AVIRS which stands for Audio-Visual or Video Information Retrieval Systems is becoming better and better known among educators. The first installation of a dial-assisted audio version of this was a language laboratory at the University of Michigan, about five or six years ago. Since then there have been many such audio installations; however, the first audio-video versions have just been completed. While technically the systems have become more sophisticated the applications have also expanded from just foreign languages to most other disciplines. Thus Dial "E" for education has become the new slogan in the schools.

However, AVIRS when used in schools or colleges is used more as a tape library. Even its name suggests a technological system from which students may collect information on different subject matter. As a matter of fact, in most cases this kind of system is utilized mostly as a teaching aid. This is a result of several interacting factors: Lack of understanding of its potentialities; lack of a trained, qualified staff; and scarcity of appropriate materials or "software." The main reason however, is a misconception of college or school faculties and administrators as to what the new educational revolution is. In many schools and colleges, when a system of this kind is installed, administrators and faculty feel that now they have caught up with progress and are using technological instruction. This is natural, since a common misunderstanding is that technological instruction is merely the application of technology to impart informa-

tion to the students. Yet there is a tremendous difference between a system used as a source of information and aid to the student and a system based on technological instruction which aims specifically at modifying certain aspects of the learner's behavior. The interesting part is that sometimes both systems are technically the same, with just slight operational differences. For instance, with the sophistication of electronic equipment today, any school or college may install very advanced AVIRS. What will make a difference between the systems is whether they are used for information retrieval or for technological instruction. Variations would depend upon many things, but especially the extent to which administration and faculty understand "technological instruction," and are committed to using it for such a purpose.

Technological instruction is the outcome of behavioral technology, which in turn is the outcome of a specific relation between learning theory and instruction. The major difference between learning theory and behavioral technology is that while the former is mostly theoretical the latter is mostly empirical, and more interested in how and what behavior is modified rather than the why's and how's which may effect it. Succinctly, technological instruction can be defined as "...the application of behavioral technology to the systematic production of specified behaviors for instructional purposes."[1]

Thus the concern of technological instruction is not so much with the machines or the use of the machines but rather with applications of learning theories to instruction to find out by experi-

mentation, testing, and evaluation, how and what behavior of the learner is modified. For these reasons technological instruction also involves the control components of communication between man-machine systems, from task performance to goal, seeking procedures and behavior-shaping techniques. As in any communication system it also involves many technical components as well as many other technical phases and aspects which require study and systematic formulation.

It embraces all the elements of task performance, from the environmental and behavioral phases to the variables of frequency, latency, and accuracy. It includes measurements of behavior and their interpretation; audio-visual instructional and technical problems of the communications media. It involves programmed instruction with its empirically determined adaptive sequence of sized steps, immediate reinforcement, self-pacing, continuous evaluation of procedures, and continuous control of learning activities. Therefore, the outcome of technological instruction is a "system" which involves subject matter, the media, with the procedures all co-ordinated and designed to produce specific behavioral goals.[2] This "system" is an involvement with instructional interaction, interaction between learner and medium, which seeks the shaping of behavior as well as methods, procedures, and data for evaluation and continuous improvement.

Some time ago at the Second N.S.P.I. Annual Convention, San Antonio, Texas, April 1964, I made the point that some problems of

technological instruction were very similar to some of the problems of modern communication theory, and that in order for instructional programming to be successful there was a need for an audio-video teaching system of as much flexibility as programming itself.[3] Today some of these earlier ideas are becoming a reality. There are more and more dial-assisted retrieval systems being installed, and little by little their potentialities for technological instruction are being explored. With the development of computers and computer assisted instruction, the production of appropriate instructional materials, and trained faculties, AVIRS soon will become the most effective teaching system of the second educational revolution. Mass education was the first educational revolution, and technological instruction is the second. We are now just at its threshold.

The change of an AVIR system into technological instruction changes not only the system itself but forces different instructional aspects of an educational institution to change. To illustrate these changes it will be helpful to bring up some examples from personal experiences at Florida Atlantic University, Boca Raton, Florida. These examples will be taken from our own Department of Languages and Linguistics, but one can easily see how they apply to any institution or other kinds of departments using AVIRS for technological instruction.

For Florida Atlantic University we designed a dial-assisted audio-video retrieval information system,[4] installed by Continuous Progress Education, Norwalk, Connecticut. This system was conceived

with the purpose of utilizing it for technological instruction. For instance, student booths have individual TV receivers with source selection through a dial system. Self-pacing, an important problem in programming TV instruction,[5] was solved by this individual selection and control of programs. Thus a student may view any program as many times as he wants, he may review it or move to another program if he wants to move faster. The system, although designed by the Department of Languages and Linguistics, was intended for the general use of the University. It was part of the general instructional plan of the institution as well as our departmental plan to use technological instruction whenever possible to meet the needs of individual learners. The philosophy of the university is based on concepts of the new educational revolution especially with its emphasis on individual instruction and independent study through technological means.[6] Along with these concepts the courses of the Department of Languages and Linguistics are set in a sort of taxonomy of educational objectives. The basic skills foreign language courses, namely the normal two college years in a language, are called the first level. The terminal behavior of the first level is the responsibility of the AVIRS and technological instruction. Since there are no instructional programs to meet the needs of the Department, the Department has to develop its own. This is a slow experimental process which gives a great deal of experience in technological instruction to everyone involved, from the faculty to the graduate students who participate in this task. It is even a worthy apprentice-

ship for the technical staff of Learning Resources who works on the Audio-Video materials. There is a tremendous amount of work involved in programming, especially this kind. Due to the fact that personnel must be trained beforehand in some program area, our department is, of course, more advanced than others. With the University being in operation for only two years, the educational objectives of the taxonomy in the basic skills courses of some languages have to be met by team-teaching and AVIRS. Thus this system is used temporarily as "information retrieval" with some courses and with technological instruction in the others.

The AVIR system is programmed using two kinds of frames: One, an information-stimulus, the other a response-reinforcement. The approach is linear since this type of programming with its pattern development fits better with the patterning of verbal behavior. In these frames sometimes still pictures or caricatures are used. Sometimes when conversation is required, pictures and live people are shown.[7] The programs build up from sounds and letters to morphological and syntactic structures. Psycholinguistic theories and communication theories are applied in the development of the programs. The shaping of the verbal behavior of the learner is done by a process of reducing his "information" in the target language and offering him as much "redundancy" as possible in the stimulus frames through pictures and grammatical cues.[8]

The drawings of the still frames were made into 2" by 2" transparencies which were placed into two Spindler Sauppe projectors

and were projected into a vidicon camera. This source was recorded on an Ampex VR-1500 video tape recorder which serves also as a source in the AVIR system. While live persons are not seen in parts, the man and woman whose voices the students are going to hear in a level are introduced at the beginning of each level. Live persons are introduced in conversation or story problems by an R.C.A. TK 60 4 1/2 inch image orthicon camera in the studio.

The objectives of the programs are to shape the verbal behavior of the student in a programmed fashion, in a series of controlled student activities, with continuous confirmation and correction. For writing purposes the programs are also in booklets.[9] The terminal behavior of the program (vocabulary, syntactic structures, and mastery of the four skills of the target language) is based on the national objectives for two years of college.

After experimentation and evaluation the programs become part of the instructional taxonomy of the department, and they are used for total self-instruction. Technology greatly affects our department. There is no incidental use of technological instruction as may be the case in other places, rather, the whole department is centered around this concept. There has been a great deal of writing about the fact that technological instruction is going to change traditional concepts of organization in the school, courses, teacher's role, and even grading.[10] This is why it has been suggested that administrative responsibility and participation are so important to the success of any aspect of technological instruction.[11]

If the industrial revolution changed every aspect of our society, undoubtedly the technological revolution in education will change every aspect of the educational institution. So far there has been a great deal of speculation about these changes in tomorrow's schools. So far, the major changes that have taken place have been the installation of huge multi-media audio-visual communication centers called Learning Resources, and the appointment of technical personnel to run them. The overall organization of these educational institutions, however, has changed very little, if any. Some time ago, based on personal experiences, this writer made the point that the first change which should take place in any educational institution interested in technological instruction should begin at the basic instructional unit, namely, the department.[12] Here is a first-hand impression of the way a department has changed with technological instruction.

Florida Atlantic University is a senior university. That is, there are no freshmen or sophomores. However, since the different colleges which form the University require proficiency in a foreign language for graduation, and many students come either without having fulfilled this requirement, or may transfer with deficiencies, the department of languages and linguistics has to offer basic skills courses at the freshmen and sophomore level, as any other four-year college. As a matter of fact, due to the tremendous amount of transfers there are more problems in these courses than at the advanced levels. Thus, the first change based on technological instruction begins with the courses. As explained before, the courses

were set up to meet educational objectives of the taxonomy of the Department. They are organized in such a way that different groups of courses lead to a level. For instance, the beginning two years in a language will form the level of basic skills of that language. There are levels for advanced conversation and stylistics; culture, civilization, and literature; applied linguistics; and so forth. While each course has its terminal behavior, there is also a terminal behavior for the levels. Some levels might be a prerequisite to the next level, and certain levels lead to the completion of the language major, which also has its terminal behavior. While this scheme does not seem a great departure from tradition, the break is in the fact that the emphasis is on behavioral goals; i.e., performance, not credits. Courses or levels are not unrelated units but have content, procedures, and objectives leading to a specific behavior. For student placement is excellent because it is known exactly where each one fits and what each one knows.

An example of how the concepts of technological instruction work in this plan may be the terminal behavior for the level of applied linguistics which has a terminal behavior based on some objectives of the culture, civilization, and literature level. The student does not need to have taken this level completely but only some aspects of it which may have been imparted by the AVIRS.

Some basic skills courses are already totally self-instructional using the AVIRS. In these courses the student at registration receives written instructions on what to do, and when and how to

take the final examination for the course. He is told that he can take this final examination whenever he is ready, that meanwhile he is responsible for his own learning and his own testing, since the programs have self-evaluating tests for the student to evaluate his own progress. He is also advised that an instructor is available at all times for consultation should any problem arise. Very few students avail themselves of this assistance. At present, final testing is evaluated by instructors; however, as soon as arrangements are made, the testing and evaluation will be made by the computer which will grade the test and pass a grade to the student and registrar's office. The use of the computer will also help in many aspects of task performance, program selection, and testing, as well as in other different tasks. The grades for the total self-instruction courses are only A, B, or Incomplete; this grading has been experimental and with the results it seems there should be only two grades: A or Incomplete.

There are myriad advantages of technological instruction for the student. He does his work with the system when he can, at his own pace on his own time, and he does not have to attend regimented classes. For a student of good language aptitude this approach frees him to dedicate more time to other studies. All the differences of achievement become only differences of time. Furthermore, a student can learn more and better than in a conventional classroom situation because he does not have one instructor teaching him, but the best of a team of several instructors who spend numerous hours

of research and experimentation to develop that program exclusively for him. It is interesting to notice that this approach has changed the student-instructor ratio from about twenty or thirty students in a classroom for one instructor, to six or seven instructors per student. In this age of overcrowded education how can one offer better instruction?

Instructors are freed from routine work and are able to work on the more abstract levels. Classroom space and manpower hours are saved from a lot of different large sections in basic skills courses while courses on the abstract levels can be made up of small groups of students, with more intellectual stimulation for both instructor and students, and more individual attention. Thus, with technological instruction a large university is able to offer in this age of "overcrowded" education, a type of education which was before the prerogative of only the small liberal arts colleges.

The department must now use many different talents in its staff. Instead of a conglomeration of individuals it has become a team. It is still a place for individual research but also a place for team research and experimentation. The traditional concept of the department or the traditional concept of faculty teaching load does not work with technological instruction. The department is now composed of individuals of different talents, aptitudes, and even training, but all working towards specific instructional goals. Some may be teaching, some may be doing research and experiments, some may do both, but all are working out instructional problems.

In a department of languages and linguistics, there are individuals interested in applied linguistics, literature, basic skills courses, computer assisted instruction, experimental psychology, programmed instruction, technology, and so forth. There is a need for all these people because education is becoming more and more highly specialized and scientific. Many universities and colleges have measured their scholarship by the number of the Ph.D.'s in their faculties. This is no longer so. The Ph.D. training has been under criticism for a long time because it has been falling behind the times. Apparently some universities have already started an innovation in their programs leading to this final degree. It is unfortunate that these changes are still behind the times since they are not made with awareness of the realities of the new educational revolution.[13] Whether the candidate for a degree must write a dissertation or not, is not important. What is important is the need for a new training based not only on specialties of the subject matter but on the specialties of the roles in the department in relation to that subject matter.

For instance, according to the organizational profile our Department at Florida Atlantic University has to have group discussion leaders, lecturers, program project directors, testing director, language Learning Laboratory co-ordinator, research director, programmers, typists, and so forth. Just the name of these different tasks and roles may give an idea of the different specialization as well as training needed, and in addition, all these people who form the Department must have a background in languages. Many

teachers look with awe at this prospect of their changing role, but to paraphrase a statement by Professor Brunner, technological instruction is just an extension of the art of teaching,[14] and one may add that it is a very difficult, demanding and complex art.

The role of some teachers has indeed changed with technological instruction, but due to the different specialties needed, departments will always require different kinds of roles from its faculty. For this reason there is still and always will be a need for teachers. The difference is simply that while some deal face to face with students, others are more like TV producers or directors and teach through technological means.

Experience points out the fact that in order to be successful, technological instruction cannot be handled by individuals alone. Here and there in some institutions some individuals try new approaches and experiment with it; this is very important and very valuable. However, institutions interested in technological instruction should place qualified individuals with broad experience in key administrative positions as chairmen and deans of instruction. The academic organization brought forth by new educational revolution needs experienced leaders at this moment more than it needs teachers. As one can gather from the previous discussion of technological instruction, instructional procedures have to be considered as a departmental project, and since they involve many aspects (teacher load, budget, curriculum, grading, team work, division of labor, and so forth) they require organization and direction by experts. There is a great deal

of money wasted today buying equipment or setting up Learning Resources Centers without experienced leadership or faculty.

There has also been a great deal of writing, research, and discussion about whether total self-instruction is possible. Here one has to believe with Skinner that the failure of a student in a programmed course is not the fault of the student but of the materials and medium. Student reactions to technological instruction vary according to programs, conditions and so forth. However, one must understand that individuals accustomed for so long to one mode of communication cannot change immediately to a new one. American students have been accustomed so long to educational spoon feeding and teacher-centered classrooms that they cannot adapt instantaneously to total self-instruction. For this problem two suggestions may be offered which have proved worthwhile for our department: Constant evaluation and development of better programs, and not giving a choice to the students when the evaluation of the program proves its validity. For instance, in our first experiments with total self-instruction about 80% of the students received a grade of "Incomplete." This percentage becomes lower each time. A criticism of technological instruction has been that it will dehumanize learning; however, as this example shows, it does more than teach subject-matter; it teaches responsibility and develops maturity as well as provides more individual contact with teachers on abstract levels. For the student, technological instruction makes teaching more human and more individualistic because, as a matter of fact, in the new

education the individual is the measure of all teaching. For the teacher it is the greatest educational challenge. As the founder of Cybernetics the late Professor Wiener predicted,

> the world of the future will be an ever more demanding struggle against the limitations of our intelligence, not a comfortable hammock in which we can lie down to be waited upon by robot slaves.[15]

Thus, technological instruction demands more and better teaching and teachers, better schools and universities, but above all, demands more from the teaching profession -- a change and a new training to meet the complex needs of the second educational revolution.

1. W. A. Deterline, "Learning Theory, Teaching, and Instructional Technology," AV Communication Review, Vol. 13, No. 4, (Winter, 1965), 407.

2. See Learning Resources for Colleges and Universities, (Hayward, Calif.: California State College at Hayward, Sept. 1964) especially p. 26.

3. J. Estarellas, "Some Concepts of Modern Communication Theory As They Apply To Programming An F.L. Course," Paper read at the Second N.S.P.I. Convention, San Antonio, Texas, April 3, 1964.

4. See J. Estarellas and T. F. Regan, "Tomorrows' Language Lab Today," The Florida F.L. Reporter, Vol. 4, No. 2 (Winter, 1965-1966), 3-4.

5. S. K. Gryde, "The Feasibility of 'Programed' Television Instruction," AV Communication Review, Vol. 14, No. 1, (Spring, 1966), especially 73-75.

6. See Report of the Planning Commission for a New University at Boca Raton, Board of Control, Tallahassee, Florida, June 1961, especially 12-13.

7. This program was discussed in detail in J. Estarellas, "Programmed T.V. Instruction in a Foreign Language," A paper prepared for the Fourth Annual Instructional Television Conference of the National Association of Educational Broadcasters, University of California, Santa Barbara, California, April 3-5, 1966.

8. The theories behind these works were discussed in J. Estarellas, "Applications of Psycholinguistic Theory to Foreign Language Teaching," Paper read at the Second Southern Conference on Language Teaching, Atlanta, Georgia, February 4, 1966.

9. See J. Estarellas, Syntactic Structures: A Programmed Self-Instructional Audio-Visual Course, Norwalk, Conn.: Instructional Materials Div., Continuous Progress Education, 1966.

10. See for instance, J. E. Coulson, "Automation, Electronic Computers, and Education," Phi Delta Kappan, Vol. XLVII, No. 7 (March 1966), 340-344.

11. See R. W. Burns, "How to Introduce and Administer Programmed Instruction," Educational Technology, Vol. VI, No. 8 (April 30, 1966), 1-9.

12. See J. Estarellas, The Problem of 'Learning Resources' in the New Instructional Trend, Florida Atlantic University, Boca Raton, Florida, 1966, 15-16.

13. See "Teaching: Ph.D. Under Attack," Times Magazine, Vol. 86, No. 33 (June 10), 75.

14. J. R. Bruner, The Process of Education, (New York: Random House, Inc., 1960) V234, Vintage Book, 33-34.

15. N. Wiener, God and Golem, Inc., (Cambridge: The M. I. T. Press, 1964), 69.