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Completely automated and operated by student feedback, this program teaches and tests foreign language recognition and retention, gives repeated audiolingual practice on model structures, and allows the student to tailor the program to his individual needs. The program is recorded on four tape tracks (track 1 for the most correct answer, etc.). The first phase of the project, construction of a working model of the electromechanical device and an experimental unit in Basque, has been completed. Diagrams of the equipment setup are provided, as are discussions of the program's components (including a projected totally automated motion film), and exercise examples in Spanish. (AF)

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A SUGGESTED AUTOMATED BRANCH PROGRAM FOR  
FOREIGN LANGUAGES

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In 1964, we find ourselves in a serious race between education and extinction by self-destruction. With population exploding in every corner of the earth and the lack of a mass educative system, destruction is dangerously close to winning the race. A system that can educate "en masse" cannot come about until the techniques of automation are applied to teaching. By presentation of automated audio programming through properly constructed "teaching machines," the innate skills of mimicry

and memorization can be recovered. What is more, in many disciplines with the use of proper questioning and "feed-back" from student to machine, we can even bring about the recovery of innate knowledge just as Socrates did with the slave boy Meno 2000 years ago.

Due to the ever growing number of language classrooms, man, teachers do not have the energy nor the time to do things that *only teachers* can do because they, themselves, are doing all the work of the

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machines. Instead, we should give the machine the task of teaching habitual behavior and the teacher that of creative behavior. Some teachers live in dread of automated teaching, but as with many apparent evils, the danger is placed on the wrong elements.

The danger of the machine does not lie in the mechanization of the teaching process but rather in the mechanization of the teacher. The present danger is the dehumanization of education, because the teacher has insufficient time to perform his most important function adequately.

The machine should relieve the teacher from some of the drudgery of teaching and free him for those things for which he, himself, may serve as a model. It can free the teacher to correct the student's pronunciation, based on an individual analysis of his problem. It can enable the teacher to help those who need it without disturbing the pace of the rest of the class. It can relieve the student of inhibitions and cloak him in the anonymity of the device. These things and many more create time for the teacher to work with the nonmechanical values of spontaneity, imagination, creativity, and finally free the teacher to motivate, stimulate, and expound.

Paradoxically, the language laboratory is not yet a labor saving device, nor is it a teaching machine. It is, however, a quality-quantity device. It can enable a good quality program to be used anywhere on any number of students. The coming years will be years of double effort for teachers with language laboratories. Not until a sufficient number of good automated programs are developed will the laboratories begin to be real teaching machines and the panacea everyone is dreaming about. In the development of these programs, it is necessary to maintain a farsighted view in order to avoid their obsolescence by the rapidly developing technological aspects of teaching machines.

The objectives of this program are to teach and test foreign language recognition and retention, to give repeated audio-lingual practice of model structures, and to enable the student to create a program

tailored to his own individual needs as he goes along. This formidable task can be accomplished by the use of a "branch program" which is completely automated and receives its instructions on what to teach next from the students' reaction (feedback).

The program is recorded on four tracks of magnetic tape. Number one is the "right answer track." This track first presents a short, four line dialogue in the following format.

The presentation step is so arranged that the student learns meanings, practices and compares his pronunciation with the master voice, and develops a "language ear."

- a. Student hears the whole dialogue in sequence.
- b. He hears line 1 followed by a pause for his repetition in the target language.
- c. He now hears the English equivalent which is immediately followed by the target language, then another pause for student repetition and correction, if necessary.
- d. Each line is subsequently handled in the same manner (both parts A and B of dialogue).
- e. Student hears the whole dialogue in sequence once more. The entire above procedure is repeated twice.

Now the student starts the accumulation process. This step is designed to enable the student to memorize the dialogue and repeat it all (parts A and B) without cues.

- a. Student hears only line 1, then repeats it.
- b. He then hears lines 1 and 2 (parts A and B) and repeats them.
- c. Lines 1, 2, and 3 are heard in sequence and repeated.
- d. The whole dialogue is heard, followed by a pause long enough for its repetition in entirety.

The accumulation process is also done twice. During these first two sets of procedure, the student can record his responses on a second track and compare them with the master voice. At any time during the presentation or accumulation steps, the student can stop, back up, and start his machine at will. From this point forward, the program will be on automatic, and the machine will decide when to stop, start, or back up.

The conversation step utilizes only one track, but the student can no longer record because the remaining three tracks

now contain secondary material which may be needed in the branching step that follows the test. Once the student can repeat the lines in sequence, the "conversation" step involves him in a dialogue with the machine.

- a. The student is instructed *not to repeat what he hears* but rather to take the (B) part of the dialogue.
- b. He hears line 1, part (A), then a pause for his retort of part (B).
- c. He now hears the proper retort (B) and a pause for imitation. (This step serves as a safety factor in the event that the student still cannot respond properly. It will be dropped on the second repetition of the "conversation" procedure.)
- d. All phrases are handled in this way.
- e. The student is then instructed to initiate the conversation starting with part (A) when he hears a bell tone.
- f. The machine "answers back" with part (B).
- g. The remaining lines are treated in the same manner.

The second time the conversation procedure is repeated, the principle of "diminishing clue" is observed. The correct response, as in (c) above, is no longer recorded for the student to imitate. When it is the student's turn to begin, for instance, the bell tone is followed by a pause for student's speech (A). Part (B) follows immediately with another pause for the next (A) utterance by the student.

By following such a complex format, the student has repeated phrases many times and in many ways. First, he has imitated, learned the meanings, compared his recorded responses, and then had a chance for correction. Secondly, he has built up the dialogue in systematic accumulation, memorizing all the phrases in sequence. Finally, he has broken up the sequences and used the phrases in response to conversational stimulus. This entire format, heretofore, may be referred to as the "frame," as per teaching machine nomenclature.

The above format has a different sequence and does not use the English equivalent when the film strip is added.

After the "frame" is presented, the student is quizzed. The testing consists of a series of multiple choice questions. Immediately after the final choice of each

question, the machine automatically stops and awaits the student's answer. All of the answers are grammatically correct statements, but only one is completely within the correct environment. Sample questions:

- ¿Quiénes son esas dos chicas?
- a. Son amigos de mi hermana.
  - b. Es amiga de Alicia.
  - c. Voy a la biblioteca a estudiar.
  - d. Son amigas de mi hermana.

(The machine is now stopped.)

On pressing button *d*, the machine moves forward and the student hears: "¿Quiénes son esas dos chicas? Son amigas de mi hermana." Then the machine moves on to the next question.

Answer *b* is more wrong than *a*, but not as wrong as *c*, so the machine moves backward to a track that gives: "¡Muy bien! Una chica es amiga, pero dos chicas son amigas." He hears several more examples in Spanish illustrating this point; then he hears, "Escuche la pregunta otra vez." At this point the machine is back to the question zone and the student hears the same question again for another try.

Answer *a* is the least wrong of the wrong answers, so the student might hear: "¡Muy bien! Chicos son amigos, ¿pero chicas? ¡Chicas son amigas, hombre!" He then is given several examples on this point, then he hears: "Escuche la pregunta otra vez."

The student who chooses *c* is obviously lost with this selection. The machine rewinds all the way to the beginning of the frame, and the student repeats the entire format.

If the student answers the question correctly, the machine will continue on track one, the "right answer track." When a student is correct, he hears the same question again with its proper rejoinder as an immediate reinforcement.

Track number two is the "nearly right answer track." If the student has understood the major portion of an idea but missed some minor point, the machine automatically stops, rewinds, and moves him to track number two. Here he hears added information pointing up the area of his error. Track number three is the "com-

mon wrong answer" track. This track has information treating common errors, which teachers can anticipate with a certain degree of certitude. It is, therefore, vital that teachers with considerable classroom experience be the ones to write these automated problems. Track number four is the "very wrong answer" track. Here the student practically takes the course over again and must repeat it until he can properly answer all the questions of that set.

On the section of the tape where the test is recorded, all four tracks have the same material so that after any given set of questions is properly answered, all students, dullards and brains alike, begin the next set on the "right answer track" number one.

"The little black box" which drives this program is smaller than a shoe box and fits snugly alongside any tape recorder. By tying into the power line, it automatically stops the tape after each question. The tape then coasts into the answer zone and awaits the student's reaction. The student must first answer orally in the target language. The "feed-back" is received by the machine upon the student's pressing the A, B, C, or D button which matches his oral answer. The machine then decides if there has been an error, and if so, what the nature of the error is and either continues forward or rewinds to the specific corrective material on the proper track. The reward element of more new material creates very strong student motivation.

The taped program is prepared by prearranging metallic tabs after every set of answers. The first tab stops the tape. The answer tabs put the machine into motion again. Let us suppose a student chooses B, a not so wrong answer. The B button makes contact with the tabs which tell the machine to do two things: first, rewind until it gets to the beginning of the set where another tab will again stop the tape; second, energize the head which will play back information dealing with his specific error. The secondary information is, of course, all prerecorded on four tracks reading in the same direction. A random

variety of answers is achieved by changing the position of the right answer, then arranging the metallic tabs to match the recording. A small silk screen rig can be built to print answer zones with metallic ink.

The electromechanical part of phase I of this project can be completed with existing commercial equipment with the above mentioned applications. Time and effort will be required for the many refinements still lacking. Even more time and specialized effort is needed to complete the most important part, the branch programming in several languages which will be the heart of the entire project.

Frames will consist of more than dialogues. Pattern drills, pronunciation exercises, paragraph listening, and paragraph repetition practice will also serve as frames. The formats will employ the total number of steps which are applicable to each case.

Phase one of this project has been completed to the extent of a working model of the device plus an experimental unit of the program in Basque. Such a rare language was selected in order to prove the efficacy of the program on its own merits and to avoid the factor of linguistic sophistication of the control group.

A working model of the selection device has been built and tested. Schematic wiring diagrams and descriptions of completed models have been drawn. The present "little black box" works with "linear" programming only. It cues a model T-1500 Wolensak recorder to stop and start again on a proper answer, or flash a red light in case of error. To drive a branch program, an automatic solenoid operated machine such as the Wolensak T-1600 could be used. The principle of operation and the diode logic of the final Audio Testor will be the same as the present device with added capabilities.

To my knowledge, there is no such device nor automated audio branching program extant for any foreign or domestic language. There are "linear" programs available, but they lack the ability to alter themselves in order to teach specific material selected on the basis of student error.



Some of the eight possible messages which can be given with metallic tape cues are shown here.

By the use of both sides of the tape and two sensing posts, the Audio Testor can control the tape recorder in a variety of ways.

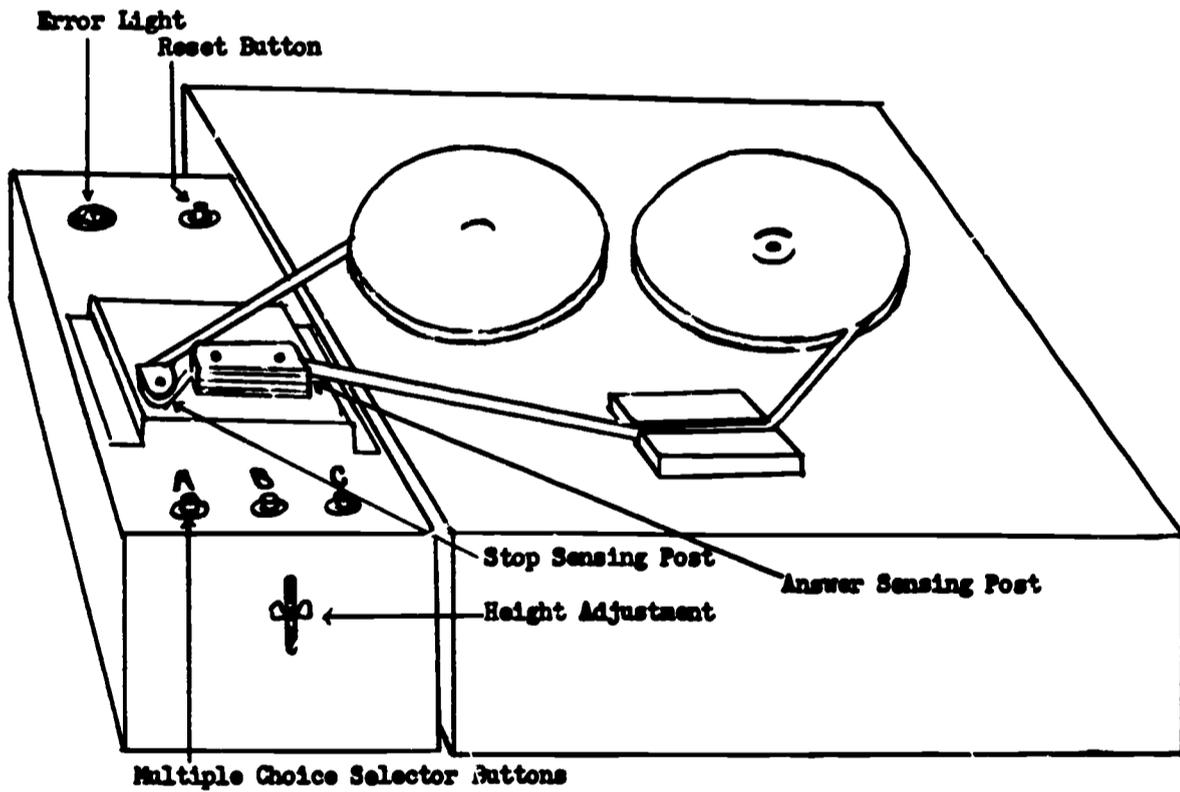
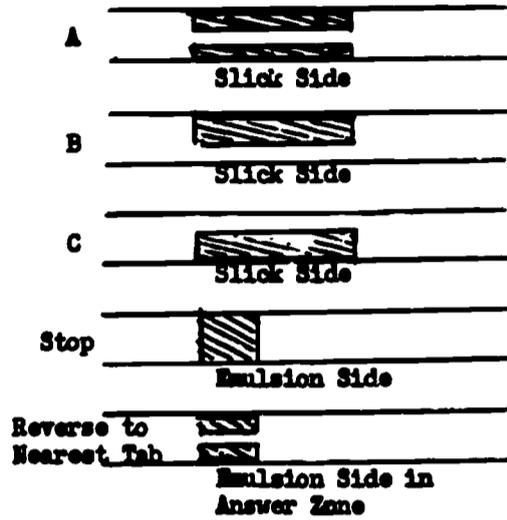


Fig. 2 - Audio Testor

probably have to be made with 35mm. film strip. Each 35mm. frame will be divided into four 8mm. sections. The picture on the 8mm. sections corresponds to the branch information on the four tracks of

tape. The film strip will run parallel to the tape, and the four 8mm. apertures can be triggered in the same way and at the same time that the various play-back heads are energized.

The description that follows is one of motion film which would be the final step. To my knowledge, there has never been a teaching film produced which is completely automated. By this I mean a film which is edited from start to finish so that the projector keeps moving but the action on the screen stops to allow time for student imitation. Some films have built-in sound pauses, but this occurs simultaneously with continued action which is too often not relevant to the phrase being repeated. The films under consideration in this project would be short dramatizations that would lend themselves to a controlled vocabulary that can be acted out so that the meaning is absolutely clear. After each phonic group, the film would be edited so that only the last frame would appear for as many seconds as it would take the student to make the utterance. This procedure is marked in the pilot unit which follows by the word "stop." By applying the same techniques as with the film strip mentioned above, such a film would perfectly complement the automated audio program and make the English equivalent unnecessary.

*Approximate Time*

½ minute A. A whole sequence of ten lines at normal speed without stops.

1½ minutes B. Action and sound stop after each phonic group, retaining only the last frame on the screen. The sound phase is two times the length of the phrase. (In this pause the student repeats the phrase he has just heard which pertains to the action he has just seen and is still being stimulated by the last frame.)

1½ minutes C. Repeat B.

1½ minutes D. Repeat only visual part of B without sound. (In this section the student is challenged to supply the target language in the pause. By now he has heard it three times and repeated it twice in imitations. He also has the visual clues to the action, the lip movements, and the gestures to rely on.)

½ minute E. Repeat A.

The entire format is then repeated from B. A ten line or ½-minute dialogue presented in this way takes approximately five

minutes. By repeating the section again, the student has heard the dialogue seven times. He has imitated it four times, and he has been challenged to produce it twice in ten minutes. A program of this type directly involves the student in the action, thought, and sound of a language at the moment he is seeing, hearing, and thinking about it.

The following is a sample automated unit on sound film:

*Pilot Unit No. 6*

This script represents two ten-line segments, enough for a 30-minute class period.

Scene: Camera scans professor's office with desk, two chairs. On the desk are three books, a fountain pen, one sheet of paper, and a calendar pad. (A knock is heard at the door.) The professor looks up, and the camera moves in for a close-up.)

Professor: *¡Adelante, Pasa!*  
(Close-up) Stop.  
*Buenos días, señorita. ¿Qué tal?*  
(Professor stands as Consuelo enters. They both extend hands in greeting.) Stop.

Consuelo: *Muy bien, gracias ¿Y usted?*  
(Handshake) Stop.

Professor: *Bien, gracias. Siéntese en esta silla.*  
(Professor makes gesture toward the nearest chair.) Stop.

Consuelo: *Gracias. ¡Ay qué calor hace hoy!*  
(As Consuelo sits, she fans herself with papers she has in her hand.) Stop.

Professor: *Tome usted este libro.*  
(Professor hands Consuelo the book.) Stop.

Consuelo: *¿En qué página está la lección?*  
(With book open, she holds one page up with an inquisitive look.) Stop.

Professor: *Aquí, desde la página diez hasta la quince.*  
(Professor points out five page section with camera focusing on numbers 10 and 15.) Stop.

Consuelo: *¿Tengo que estudiar todo esto para mañana?*  
(Consuelo flips through ten pages, then makes a long dash motion and a spiral forward with her hand.) Stop.

Professor: *Sí, todo.*  
(Long dash with hand.) Stop.  
*Pero no para mañana.*  
(Lifting one leaf of calendar.) Stop.  
*Para pasado mañana.*  
(Turning to next one.) Stop.  
*Día cuatro.*

(Camera focuses on number 4.)  
 Stop.  
*Lo voy a escribir aquí.*  
 (He begins to write.) Stop.  
*Caray, esta plumafuente no sirve.*  
 (He pokes his pen sharply forward.)  
 Stop.

Consuelo: *Tome usted la mía.*  
 (She offers hers.) Stop.  
 Professor: *¡Ah! Ahora está bien, gracias.*  
 (He makes scrawls on paper, then  
 writes on calendar.) Stop.

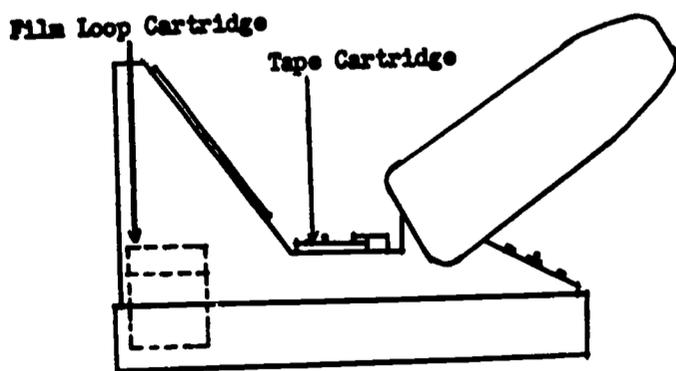
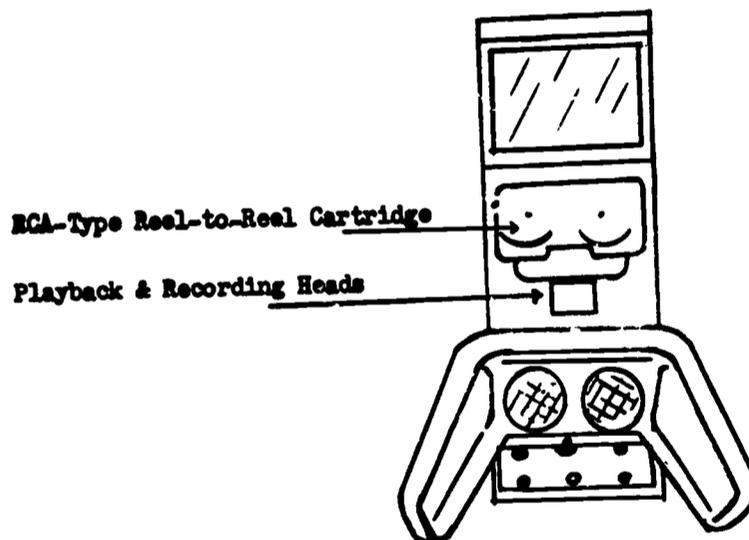
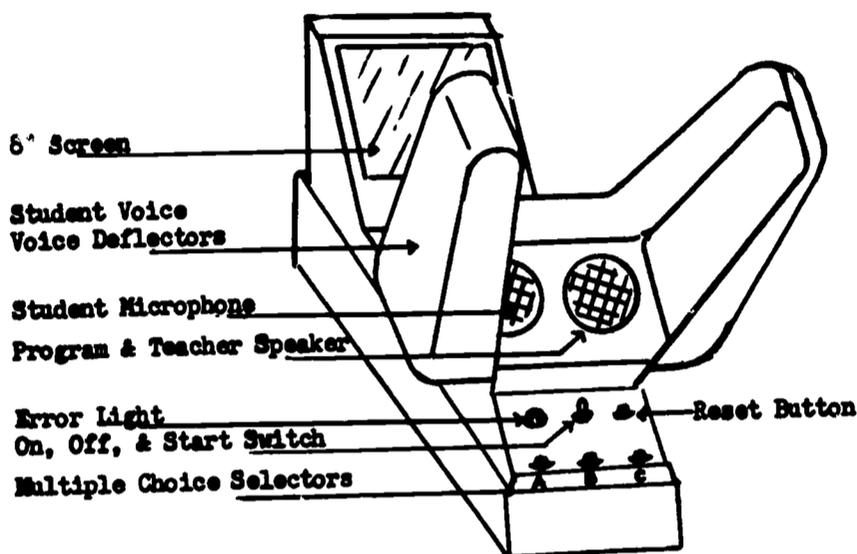


Fig. 3 - Complete Automatic Program Unit

Consuelo: *¿Entonces nos vemos aquí en su oficina?*

(She indicates both persons, then points straight down.) Stop.

Professor: *Perfectamente, señorita.*

(Nod of agreement.) Stop.

Consuelo: *Bueno, profesor. Adios.*

(She begins to leave.) Stop.

Professor: *Hasta pasado mañana, señorita.*

(Hand wave)

(Spiraling forward twice) Stop.

This is the end of a frame which, after having run through the aforementioned format, is followed by a test as described above.

The goals of Section 602 of the National Defense Education Act all lead to the upgrading of foreign language teaching in America. This project could mean a breakthrough on a mass basis. It would result

in completely self-instructional programs that could be administered with a minimum of supervision. As mentioned above, such a development could relieve our best language teachers for work in areas where the machine cannot function. The area where the machine can function effectively, however, is much more extensive than we have ever imagined. It is precisely in such an area that this vital study is concentrated.

Industry has far outstripped education in its use of automation in all fields. It is time that we, in education, move at least at the same pace as industry in the direction of doing the greatest good for the greatest number. One way to start on this long hard road is by programming and automating courses.

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