Materials Review

A SINGLE STATION LANGUAGE LABORATORY
WITH NOVEL CONTROL CHARACTERISTICS

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ABSTRACT: Language Laboratory instruction is discussed in relation to its instructional goals and its instructional efficiency. A modification is proposed to the control system of the language laboratory which would appear to create improved learning values.

In this paper I am going to present some thoughts about how one could improve on the technical characteristics of language laboratories. I will begin by discussing present language laboratories and how they are used, indicating some respects in which they are inefficient at what they are being used for. Then I will describe an experimental language laboratory that we made to illustrate how a modified language lab could be used for more effective language instruction.

Let us begin by considering the mechanics of use of a record-playback language laboratory. First, the students assemble at the laboratory, each in his assigned carrel. When all the students are in place or at a certain time, the master tape for the group is started. Each student in the privacy of his carrel alternately listens to the master tape and speaks into a microphone, responding to what he has heard on the master tape; the period of alternately listening and speaking—the recording phase of the lesson—typically lasts from 8 to 12 minutes.

At the end of the recording phase, a review phase begins, provided the student is using a language laboratory that provides a slave tape recorder for each booth; laboratories that do not record do not support a review phase. In the review period the student listens to a transcription of what took place during the second cycle for the purpose of critiquing his own performance. In the review phase the tape recorder is under the student's complete control; he may move the tape backward and forward, may select any section of the tape to listen to, may rehear sections, etc. When the student has finished reviewing the transcription made by the slave tape recorder the lesson is over, his tape is not preserved nor reviewed by the teacher.

Thus far I have not mentioned the role of the teacher in language lab instruction. This role varies with the circumstances of the school. Under one favorable administrative arrangement the teacher is pre-

sent in the language laboratory during the recording phase of the lesson, and, from the laboratory console, monitors the class performance by sampling the performance of individual students as they work in their individual carrels. Since the teacher can switch quickly from carrel to carrel about the laboratory and comment privately to each student without interfering with the work of the others, the language laboratory provides the student a work environment that is more active than a classroom, and one in which there is improved opportunity for critical interaction with the teacher. Even so the amount of individual supervision a teacher can give is quite limited; the average active time per student in the recording section of the lesson is typically less than 30 seconds and in the whole lesson is not much more than one minute. Although it would be theoretically possible for the teacher to collect the student's transcription tapes and review them at a later time, it would not be practicable for the teacher to devote that much time to it.

What skills is a student expected to learn by working in a language laboratory in the manner I have described? It would seem that the most important are pronunciation, both in the mode of imitating a spoken model and in the mode of making a spoken response to a spoken stimulus, discrimination and comprehension of spoken sounds, and familiarity with the patterns of the spoken foreign language. Let us consider then how efficiently the language lab can be expected to teach these skills.

Modern studies of the learning process have yielded principles of design of a learning program that conduce to efficiency and effectiveness of learning[1]. From the principles one can infer that a systematic program of language instruction is likely to be characterized by the words repetition, feedback, focus, and mastery. Repetition with feedback is important to perfect the quality of a skill and to make the perfected behavior automatic or habitual. Focus of activities on a single new behavior until mastery is achieved is the most efficient approach to learning.

The pivotal process in behavioral shaping is the feedback through which the learner perceives the different values assigned to different behaviors he exhibits. However, the utility of feedback to the learner depends very much on the time at which the feedback is given; it is likely that for learning such skills as language pronunciation, feedback should optimally occur within a few seconds of completion of the pronunciation task that is to be differentially reinforced. The effectiveness of feedback depends also on its quality in the sense that ideal

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[1]For discussion of principles and a bibliography see B. F. Skinner, "The Technology of Teaching" Appelton-Century Crofts (1968).

feedback should positively reinforce those features of behavior that are desired, and negatively reinforce those features that are not desired.

In non-technical discourse the reinforcement process is often discussed in such terms as "reward," "punishment," and "motivation." Such a terminology has a certain validity. However, in applying such concepts cne must avoid the dangers of a superficial analysis of what constitutes "reward," "punishment," and "motivation," in a particular situation. It is easy, for example, to overestimate the importance of infrequent but "important" and "relevant" reinforcers, such as final cxam grades, and to overlook the power of frequent small, but immediate values to shape behavior. Indeed some of the most effective shapers of behavior are contingencies that involve minor values which would normally not be considered "rewards" at all, such as seeing a rationale for what one is doing, confirming one's judgment, being allowed to exercise options and generally to manage oneself, finding the circumstances of instruction "convenient," etc. I am convinced that operational convenience, clarity of purpose, effectiveness of moment-to-moment. activity and the existence of a well defined rationale for the learning activity involve motivational values of the greatest import for the effectiveness of a learning system.

In the light of the principles of learning theory the ordinary language laboratory can be seen to be deficient on several counts, most of which have their origin in the 8-12 minute length of the period between practice and feedback. Since a large number of different tasks is presented in the RECORD period, all of which are undertaken before the review period begins, learning is not focused narrowly enough. The RECORD phase has no behavioral contingencies at all. The feedback in the REVIEW phase is delayed much too long for good efficiency; and when feedback is provided, the feedback for many different exercises comes all together, which makes it more difficult for the learner to adequately perceive the values of the various responses.

Current language lab formats are deficient also in some of the intangible values referred to above. The student is not kept aware from task to task of the specific learning goals he is to pursue; he has no means of focusing effort on a particular learning goal, nor indeed, does he have any control of his program; thus the lab provides no sense of either self-management or teacher-management, since the teacher does not even review the student's work. The overall effect may be that the student lacks either a clear rationale for the lab activity or specific criteria to guide his efforts in relation to individual exercises.

THE IBM EXPERIMENTAL LANGUAGE LABORATORY

For the above reasons we felt that a language lab having a much shorter cycle of recording and playing back would be much more efficient and effective than the present type of language laboratory. In that thought, our group at IBM Research developed a model of such a language laboratory, in which this cycle is of the order of 10-20 seconds in length.

Our experimental language laboratory XLL (figs. 1a and 1b) is a single-station language laboratory, that is, each student works with his own independent language laboratory mechanism. Each XLL thus has its own master tape. Each XLL also has a set of controls with which the student can direct its operation in all phases of the instructional cycle.
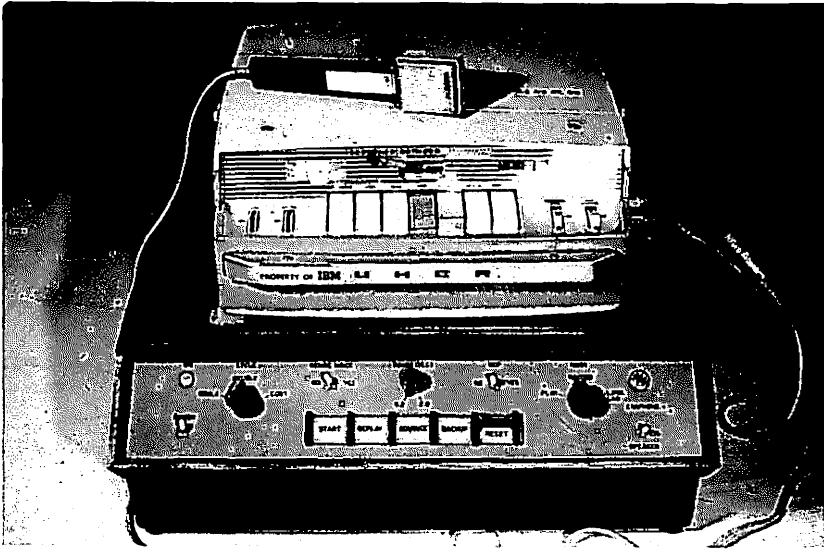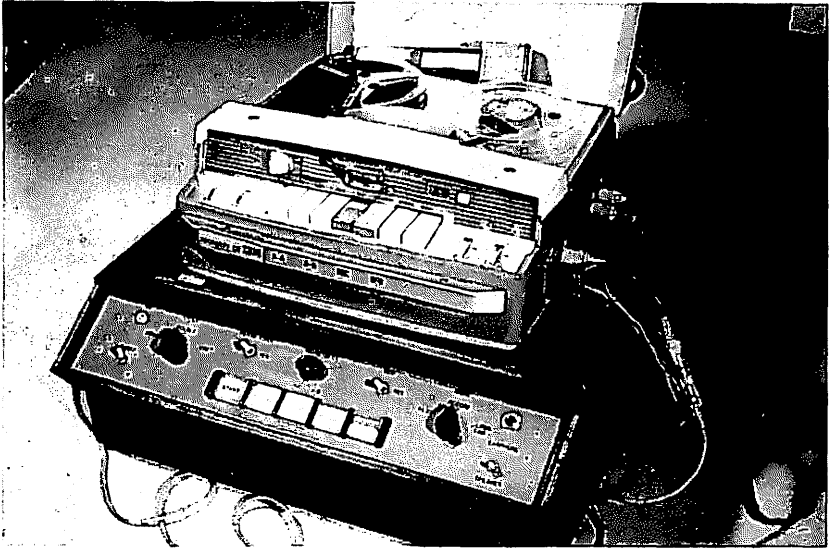

Figure 1a

Figure 1b

The XLL mechanism includes circuits that sense three kinds of special marks on the tape, marks which indicate the boundaries between individual messages and the beginning and ending of student recorded messages. The control panel of XLL contains five tape-control buttons by which the user can direct the motion of the tape. These tape control buttons are labelled START, ADVANCE, BACKUP, REPLAY, and RESET. An XLL tape is marked at various points with control marks, which divide it into sections we will call "records" or messages. Any of these messages may be marked at the beginning or at some internal point with a RECORD mark, which indicates that under some circumstances the RECORD circuits are to be turned on at that point. A message may also in some circumstances be marked at the internal point of the field where student recording ended.

To understand what the tape control commands accomplish let us imagine that we have an XLL with its tape at rest waiting for some command to be received. If we press START, XLL will start its tape moving at play speed and will begin executing the particular function that is indicated by the setting of the various function controls to be described below. If we press FORWARD, XLL will move its tape forward in high speed search and stop on the control mark that marks the beginning of the next exercise down the tape. If we

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press BACKUP, XLL will cause the tape to move backwards in high speed search to the control mark marking the beginning of the previous exercise.

If we press REPLAY, XLL will move the tape in high speed search mode backwards to the beginning of the previous exercise and then start it forward playing what is recorded in the field belonging to that exercise. The command RESET has no effect while the tape is at rest. However, if we press RESET while the tape is in motion, XLL will immediately terminate whatever function was in progress and stop the tape.

In addition to the five tape control buttons XLL has several other controls, which are used to specify the function that XLL carries out. One control selects among the functions PLAY, RECORD, and LANG LAB. With the setting PLAY, XXL will play whatever is recorded on the XLL tape. With the setting RECORD, XLL will play what is recorded in the master tape section of its tape and will turn on the microphone at each point of the tape headed by a RECORD mark. A RECORD light is lit whenever the RECORD circuits are operating. Also when the RECORD circuits are first turned on a "BEEP" circuit emits short tone bursts at 2 second intervals until the user begins to record.

With the setting LANGUAGE LAB, XLL presents one exercise from the tape, first in the RECORD mode and then immediately afterward, and without any other control action being required, in the PLAY mode. Thus if the command START is given when the control is set at LANGUAGE LAB the following sequences of events will occur: the learner will hear a model message, he would then see the record light turned on, he will hear a brief tone indicating that he should record, when he is through recording XLL will then move the tape back to the beginning of the exercise, the learner will again hear the model speaker, he will then hear the message he recorded, after which the tape will stop.

A second control permits the user to select the options SINGLE, DOUBLE and CONTINUOUS. The option SINGLE is to be used when the entire exercise is contained within a single message. In SINGLE mode XLL will perform the operations described earlier on the assumption that an exercise consists of the single record between two adjacent control markers. The option DOUBLE is to be used when two messages together constitute a single exercise; in DOUBLE mode XLL will treat the next two tape messages as a single exercise, whether in the modes PLAY, RECORD, or LANG LAB. When the option CONTINUOUS is selected XLL will ignore all message boundary markers and will cause the tape to proceed continuously forward in either PLAY or RECORD condition as indicated by the control setting.

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In addition to these five tape command buttons and two main function controls, there are a number of minor controls in our present XLL. A toggle switch selects whether the audio will be heard on HEADSET or SPEAKER. A second toggle may be used to activate a voice-sensing feature that controls the tone generator for cuing the learner to make recordings and marks the point on the end of a tape at which recording was completed. When the voice-sense circuit is being used XLL will automatically skip blank pieces of tape not used by the learner to record any message. A continuously variable "speed" control regulates the time constant of the voice-sensing circuit over the range from 0.2 to 2 seconds. Another toggle marked SKIP activates a feature so that in the PLAY mode XLL will play only alternate records, skipping over the records in between.

Let us now consider a few examples of how XLL might be used for instruction.

Procedure 1. Conventional Language Lab Operation

First, if the controls are set on CONTINUOUS and RECORD (fig. 2), XLL will perform exactly like an ordinary language laboratory in the RECORD phase; the master tape will play messages which
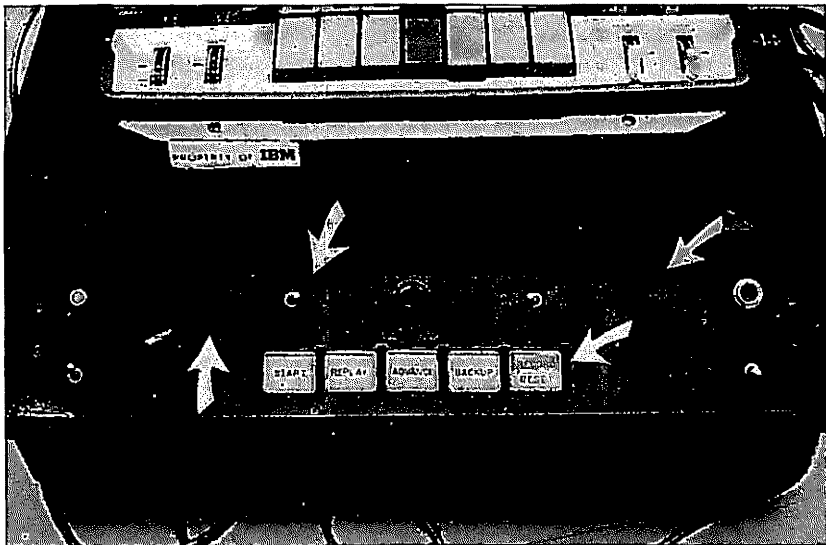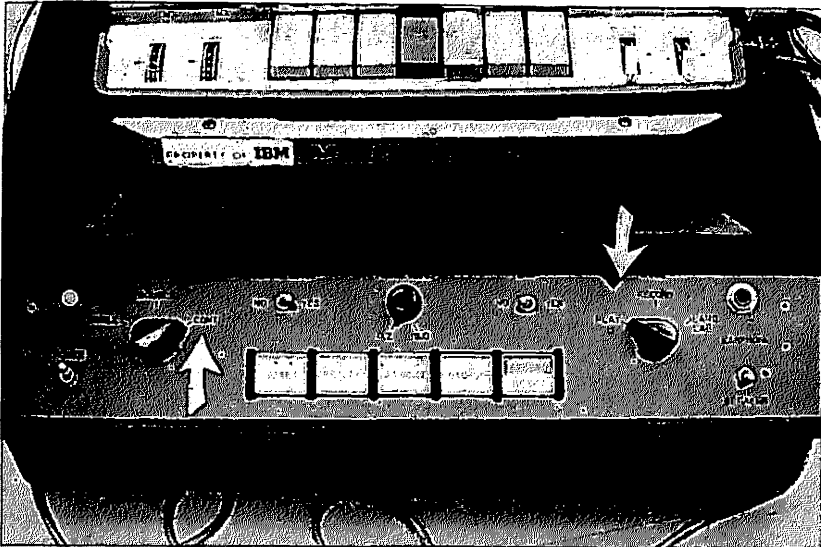

Figure 2

the student can hear and the microphone will be turned on in the appropriate time slots so the student may record. Similarly when the controls are set at CONTINUOUS and PLAY (fig. 3) XLL will perform like an ordinary language laboratory in the REVIEW phase.

Procedure 2. Single Exercise Language Lab

In this procedure the controls are set either at SINGLE and LANGUAGE LAB or DOUBLE and LANGUAGE LAB (fig. 4). With the SINGLE setting the tape is prepared in a format for which each message contains both a master tape portion ending with a RECORD mark and a portion in which a student can record. With the DOUBLE setting pairs of neighboring records having different formats, the first of a pair being a master tape message, the second of a pair being a RECORD message.

With either format essentially the same options are available to the student:

A. He may press START. XLL will play a master tape message, offer him the chance to record, replay the master tape message, play the message the student recorded, and then stop at the beginning of the next master tape message. The entire cycle will typically require 10 to 30 seconds. This procedure is analogous
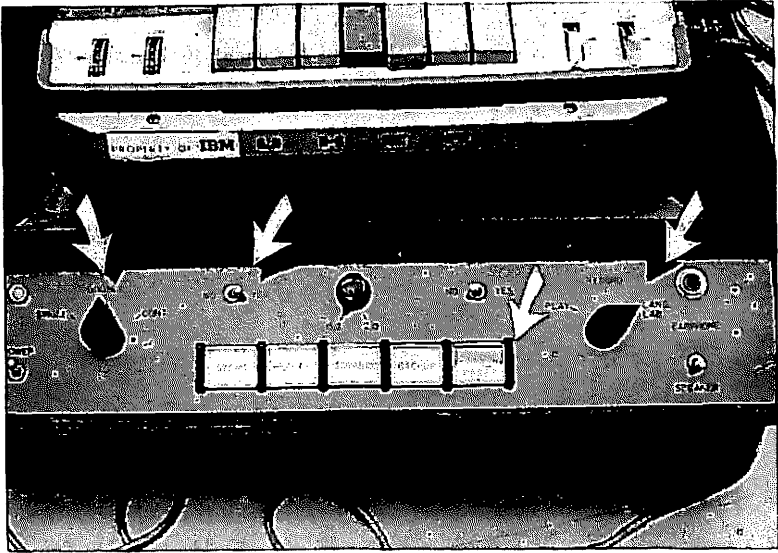
Figure 4

to that in the conventional language lab but the entire cycle has been reduced to the 10 to 20 second period required to a single exercise. Thus FEEDBACK is now immediate.

B. He may press REPLAY. XLL will then move the tape back to the beginning of the last completed exercise, play the master tape and student recorded messages, and stop. This procedure allows the student to make another review of his last recorded effort.

C. He may press BACKUP. XLL will move back to the beginning of the last exercise. This procedure (followed by START) may be used when the student wishes to make a new recording of the just completed exercise. The capability to repeat a single exercise an arbitrary number of times provides for REPETITION and FOCUS of attention and, in principle, allows the student to work on a single exercise until MASTERY is achieved.

The iterative use of BACKUP allows the student to move back along the tape an exactly known number of exercises.

Thus the set of options provided in the LANGUAGE LAB mode provides for a practice cycle that is relatively desirable in that it is consistent with the principles of learning theory.

Procedure 3. Laboratory Test with SKIP.

While it is impracticable for a teacher to spend the time to listen to ordinary student transcription tapes, such need not be the case for XLL tapes. An XLL tape having a relatively small number of records can be the basis for a substantial amount of student practice if the student is required to work on it until he regards each exercise as mastered. Since the tape itself would serve as the record of the student's achievement, it is reasonable and feasible to require the student over a period of a few weeks to prepare an XLL tape on which he could receive a grade.

The combination of long record spaces and the use of the voice-sense feature of XLL permit the exercises on such a tape to include responses of undefined length including replies to spoken messages, not merely imitations of them. The importance of voice sense here is greatest where relatively long blank spaces are left, but only small portions of them used, since it can save the tedium of playing through the unused sections of tape.

The SKIP feature together with voice sense permits a significant time savings for the teacher in reviewing student tape . With XLL set for PLAY, CONTINUOUS, and SKIP (fig. 5), the teacher can listen to only the messages recorded by the student. These will be played in a continuous sequence with the master tape and unused student record portions of the tape skipped in high speed search mode.
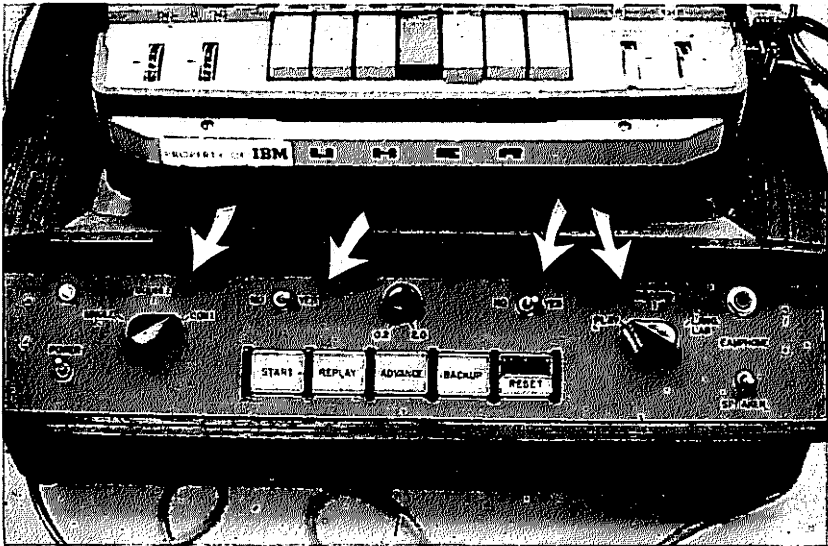

Figure 5

Procedure 4. Use of "Speed" Adjustment.

The functions of the voice-sense circuit are two: first, to recognize when the student has begun to speak so the "BEEP" signal can be turned off; second, to recognize when the student is through recording so the blank part of the tape can be skipped. Once the student activates the voice-sense circuit by beginning to speak, the circuit will terminate recording if he allows his voice to fall for longer than some critical time.

The length of the critical time after which the tape will skip needs to be adjustable if the lab is to be used by students of widely different proficiency. The range of 0.2 to 2 second was thought to represent a very wide range of proficiency; the delay of 2 seconds makes voice-sense slow enough not to interrupt any reasonably continuous utterance of even a beginning speaker, the delay of 0.2 seconds is fast enough to interrupt even an advanced student if he allows his speech to falter. This last point is of potential value in designing exercises for the advanced student, since it permits one to add a fluency constraint on the conditions of recording that provides a meaningful test of his verbal mastery.

SUMMARY

The unique control features of XLL make it possible to use the language laboratory in several new formats and for several purposes that are difficult or impossible to achieve with a conventional language laboratory. A number of experimental language teachers have expressed the opinion that XLL in a high-quality technical implementation would constitute a markedly superior language laboratory. Experimental evaluation through field use awaits implementation.