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## Achievement, productivity, and participation as a function of task feedback among kindergarten students

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ACHIEVEMENT, PRODUCTIVITY, AND PARTICIPATION  
AS A FUNCTION OF TASK FEEDBACK AMONG  
KINDERGARTEN STUDENTS

An Abstract of a Thesis  
Submitted  
In Partial Fulfillment  
of the Requirements for the Degree  
Specialist in Education

Catherine M. Hill  
University of Northern Iowa  
July 1981

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Entitled: Achievement, Productivity, and Participation  
as a Function of Task Feedback Among Kindergarten  
Students

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## ABSTRACT

There has been little research which specifically explores the effects of visually charted feedback techniques with kindergarten aged students working independently in a classroom setting. Consequently, the role of feedback, an externally observable event, is not well understood. Using a learning centers approach in which kindergartners worked daily at an independent task, the present study investigated the relationship between two feedback conditions (a) teacher-charting of student progress and (b) student self-charting of progress and the measures of student achievement, productivity, and participation.

Subjects were twenty white, middle-class students who were enrolled in a kindergarten in a mid-western school district. A self-instructional auditory discrimination program was used as the independent task for the three weeks preceding and the three weeks following a break for Christmas vacation. Students were pre-tested and post-tested using a criterion-referenced measure of student achievement. In addition, both student productivity as measured by the accuracy of responses and student participation as measured by the number of lessons completed were also examined.

Data were analyzed to determine what effect teacher-charting and student-charting of progress had upon student achievement, productivity, and participation. Upon examination of pre-test data, ten subjects were eliminated from all analyses due to scores

at or near the ceiling on the achievement measure, leaving five subjects in each group. The results of the analysis of the gains in achievement indicated that student self-charting of progress was superior to teacher-charting of progress. Examination of both the productivity and participation data indicated no significant differences between groups on either measure.

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## CHAPTER ONE

### THE PROBLEM

This paper was designed to explore empirically the relationship between teacher-charted or subject-charted feedback on the subject's completion of an independent auditory learning task. Additionally, the accuracy of the work and the level of achievement was explored. The relationship was examined in a kindergarten environment utilizing an intact classroom and a single teacher. The room was organized in a learning centers environment to promote independence and individualization of learning. Consequently, the role of feedback in this environment is a critical one. In a regular classroom, the teacher is the main source of knowledge and the primary reinforcing agent: in an independent learning environment, the teacher structures the learning tasks, manages the delivery of instruction, and tutors individuals and small groups. If the teacher is to be free to concentrate on this administrative role, it must be established that children can be effective reward agents for themselves.

In this first chapter, the reader will find an organization that starts with the general aspects of individualized learning, learning centers, and the conditions necessary for independent learning. It then focuses specifically on the role of feedback in learning to provide the transition into the questions to be explored empirically. Finally, the importance of and the limitations of the

study will be briefly discussed. At this final point in the chapter, the reader will have the context for the study and the paper will progress to an overview of the related literature.

### Independent Learning

Young children entering school bring with them a variety of past experiences and knowledge, thus producing classrooms with a wide range of readiness skills and educational needs. A goal of education during this initial learning experience is to capitalize on this individuality of students and provide learning opportunities that are appropriate and enjoyable to each child. Such a goal involves a commitment to the philosophy of individualized instruction.

Creating an individualized curriculum at the kindergarten level involves a dramatic change from the traditional classroom. The individualized program is devised upon the premise that we first select a goal, i.e., what we want the student to learn, then we select an appropriate process to allow the student to attain the goal; commonly referred to as a process-product approach to learning. King (Note 1) suggested that in such a program the classroom may be viewed as a production system with student achievement as the output. Classroom components such as teacher, student, and instruction assume roles that are quite different from the traditional classroom.

### Learning Centers

At the kindergarten level, Gueller and Frey (1973) suggested that independence and individualization of learning materials can be achieved through the application of a "learning centers" concept. A learning center is more a way of arranging conditions for learning than a description of a physical area. The learning center approach represents an hour time-block of the kindergarten day during which a number of centers (as many as 12) are available. Each learning center is designed to produce a specific learning outcome, each stated as a learning objective. All objectives can be obtained through independent work by the kindergartner. Centers can be self-selected by the children or prescribed by the teacher.

Individualization of learning is not feasible if the child is dependent upon the active direction of the teacher. In a learning centers approach, the teacher assumes an administrative role, providing a stable learning environment and managing the delivery of instruction. The teacher intervenes in the learning process at a center only when necessary. Instead, she uses this time to pre-test and post-test for skill acquisition and to work with an individual or small group.

In the individualized class setting, the student's role is that of participant and producer of responses to learning tasks. The child is allowed to work independently and pursue a learning task at his own rate. Occasionally the child works in pairs or small

groups but is not locked into either an ability-based group or a group pace. The child is allowed to be self-directed and is free to learn from a wide variety of materials without direct guidance and approval from the teacher. The child is also free to leave a task that is too difficult, without teacher permission, and to choose another without its being teacher assigned. In a classroom where independent activity prevails, King (Note 1) discovered that "student participation is a necessary and possibly a sufficient condition for productivity" (p. 45) and that "student productivity is a necessary and possibly a sufficient condition for learning" (p. 45).

Gueller and Frey (1973) concluded that the individualized learning experience is heavily dependent on the appropriate use and selection of independent materials. Materials are selected for the purpose of producing a specific learning outcome. The child is made aware of the purpose by careful explanation of the intended learning outcome, in simple language. At the kindergarten level, printed materials are avoided and simple pictures and auditory explanations and directions in the form of a taped message are used to facilitate the independent use of learning materials. The development of independent materials requires a commitment by the teacher to the time necessary to develop such a curriculum, and to the skill necessary to select appropriate materials that actively involve the learner in a specific outcome.



### Conditions for Learning

In summary, Smith and Smith (1975) have specified five classroom conditions as prerequisite for a student to function with a process-product approach to learning. It is necessary that:

1. The learning materials can be completed independently and are performable tasks for students.
2. Goals are specified, preferably self determined.
3. The students are trained to function in an independent learning period.
4. The teacher maintains a stable learning environment through consistent rule reinforcement.
5. The students receive feedback on performance and behavior.

In order to assess whether or not learning has taken place, the measure of achievement should be criterion-referenced. A criterion-referenced test measures the achievement of the individual on a specified performance standard (Glaser and Nitko, 1981). When tasks are made to produce a specific learning outcome, the appropriate measure is a criterion-referenced test designed to assess that outcome.

Finally, it should be stated that the process-product approach to learning does not alter the humanistic characteristics traditionally associated with kindergarten. This approach frees the teacher to respond more fully to the wide range of individual

learning needs present in a kindergarten, while at the same time maintaining the warmth and personal identification children of this age need.

### Feedback

Feedback is the process of providing information on a performance in order to influence it. Weiner (1956) has diagrammed the process of educational feedback as it is used to influence future performances.

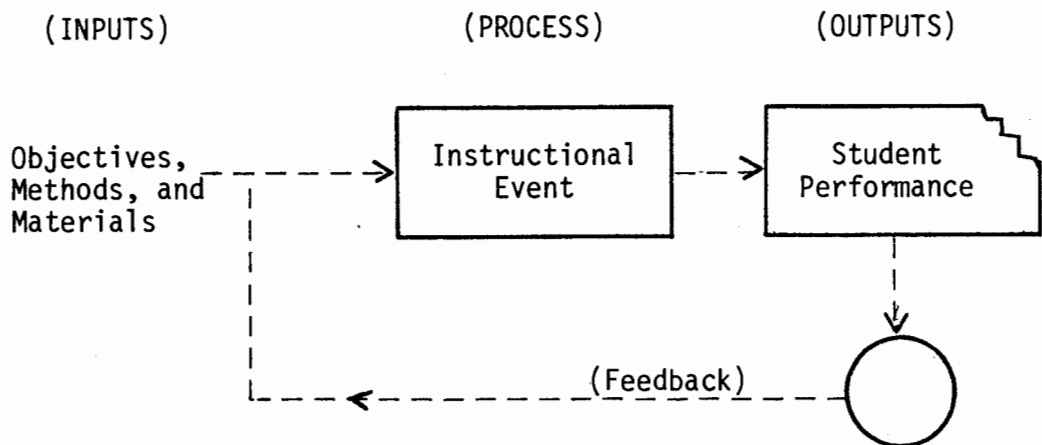


Figure 1. Process of Educational Feedback

In this approach, feedback functions as a cue to task completion and as a signal for movement to the next task. It can also serve as a discriminative stimulus for reward.

A distinction was made between "action" and "learning" feedback by R. B. Miller (1953). Action feedback is any feedback which is used to modify a response as it is produced. Learning feedback

comes at the completion of a response and can be used to modify subsequent performance. This study deals with the latter type of feedback; tasks completed were graphed by the child independently or by the teacher as the child watched.

Graphing has been demonstrated to be a successful form of feedback when utilized in an independent activity. Students can use graphing as an objective, self-administered device to communicate information on progress which can positively affect their work behavior. In a study investigating the use of graphing as a feedback technique to improve performance, Smith et. al. (1969) discovered graphing increased on task behavior during an independent work session.

#### Questions to be Investigated

There has been little research which specifically explores the effects of visually charted feedback techniques with kindergarten aged students working independently in a classroom setting. Consequently, the role of feedback, an externally observable event, is not well understood. It is possible that providing feedback solely on the basis of completed tasks would effect only task completion and not accuracy or achievement. However, for feedback to be an effective tool in the classroom, it must show a positive effect on accuracy, achievement, and number of tasks completed. The difficulty is that only the externally visible procedure of feedback on task completion lends itself to manipulation by both the teacher

and the student. Both accuracy and achievement require assessments beyond the role of task completion and usually require teacher judgments, especially with younger children.

Using an approach in which the students work independently of the teacher, at a learning center, and have the number of tasks completed charted (a) by themselves or (b) by the teacher in their presence, the following questions were investigated:

1. Is student achievement significantly better under one feedback condition than the other?

2. Is student productivity significantly better under one feedback condition than the other?

3. Is student participation significantly better under one feedback condition than the other?

To facilitate the development of the project, a definition of terms was necessary.

### Definitions of Terms

#### Achievement

The Standard Mastery Tasks on Sound Matching which accompanies the Michigan Language Program (Smith, 1975) was used as the criterion measure of achievement. This test was administered as a pre-test and post-test measure.

#### Productivity

This measure is a ratio of correct tasks to the number of listening tasks attempted per 15 minute learning episode.

Each lesson contained from 30-36 discrete listening tasks. The productivity measure provided an index of the quality of production.

### Participation

This is a measure of the number of lessons completed per 15 minute learning episode. Only one lesson was required per episode; however, the freedom to complete more than the required amount allowed for a quantitative measure of productivity.

### Group A

This group included subjects who received self-administered feedback. Students charted the number of lessons they completed each learning episode.

### Group B

This group included subjects who received the teacher administered feedback. The teacher charted, in the student's presence, the number of lessons completed for each learning episode.

In summary, the objective of this study was to explore the functional relationship between (a) teacher-charting and (b) self-charting conditions and (1) student achievement, (2) student productivity, and (3) student participation, all within an independent learning environment.

### Importance of the Study

Assuming that one of the basic objectives of early childhood education is to provide maximum learning opportunities for each

child, an individualized approach becomes necessary to deal with the wide variety of educational needs present in a kindergarten. The teacher must structure the learning environment so that each individual's learning needs are being met, and yet, she is freed to work with small groups and individual children. To accomplish this, the teacher provides carefully structured independent activities for the other students while she provides the individual attention. This study should demonstrate that academic feedback can be used to maintain learning tasks independent of the teacher. The student administered feedback condition is as useful or more useful than the teacher administered feedback condition. This would free the teacher from the role of primary reinforcing agent and allow her to facilitate the independent learner.

#### Limitations of the Study

The generalizability of this study is limited due to the small sample of students and because neither minority groups nor a varied socioeconomic range was represented. Since only one classroom was used, teacher variables may have influenced the findings to a larger extent than if a number of teachers with varying personalities and attitudes had been involved. The teacher of both groups was also the researcher; however, considering the taped format and the independence of the task, her ability to influence the variables was minimal. In addition, since the comparison groups came out of the same classroom, some contamination of treatment effect might have

occurred even though the students were accustomed to working independently during an individualized session of instruction.

#### Summary

This paper was designed to empirically explore the relationship of a feedback condition on a subject's completion of an independent auditory learning task. The chapter described the general aspects of individualized learning, learning centers, the conditions necessary for independent learning, and the role of feedback in this process. The next chapter will examine these same topics in greater detail as it overviews the related literature.

## CHAPTER TWO

### REVIEW OF THE LITERATURE

This chapter presents a concentrated review of four topics significant to the investigation of the functional relationship between feedback conditions and student performance in a learning centers environment. The review starts with variables that have been found to be important to increasing student achievement, proceeds to a focus on the role of independent learning and the value of feedback to learning, and finishes with a discussion of the factors related to an appropriate achievement measure for self-directed learning. At this final point in the chapter, the reader will have an overview of the related literature and the study will progress into a description of the methods and procedures used.

#### The Problem of Student Achievement

In the traditional classroom, the teacher is viewed as the main vehicle of instruction and the teacher-student relationship is viewed as the main process from which the product of student achievement derives. Such a view leads some process-product researchers to focus on the role and the behavior of the teacher as important independent variables. However, investigations which have explored teacher behaviors and their effect upon achievement have found few significant correlations between the two (Rosenshine, 1970). Further, Rosenshine and Furst (1973) discovered that most teaching acts or behaviors are not related to student learning gains. Upon



reviewing some 50 process-product studies, they found that the few significant teacher behaviors that were isolated were poorly defined variables such as "clarity", "enthusiasm", and "variability".

Other process-product researchers have focused on the role and the behavior of the student as important independent variables, and such studies have found significant correlations between the student's effort and behavior and measures of achievement. McKinney et. al. (1975) discovered that as the amount of student activity (participation) increased, achievement also increased. Using multiple regression analysis, they found that specific skills such as reading and writing, defined as "constructive self-directed activity", correlated significantly with achievement. King (Note 1) has indicated, however, that participation alone may not be a sufficient condition for achievement. Productivity, i.e., the correct completing of tasks, is necessary. Using an independent reading task with elementary students, King (Note 1) concluded, "Student participation is a necessary and possibly a sufficient condition for productivity" and "Student productivity is a necessary and possibly a sufficient condition for learning" (p. 45). He found that productivity (i.e., rate of work) on the reading task was significantly related to achievement on a criterion test ( $r = .470, p < .01$ ).

Investigations concentrating on student behaviors have been summarized by McKinney et. al. (1975). "Accordingly, these data indicated that the child who is attentive, independent, and task oriented...is more likely to succeed academically than the child who is distractible, dependent, and passive..." (p. 202). Therefore, if student participation and productivity are important to achievement, it would seem that an instructional mode which allowed the student to be active and which did not require teacher presentation would be an efficient method of instruction.

#### Independent Learning

An independent learning environment would appear to meet the needs of instruction which tend to maximize active student participation and minimize teacher presentation. In addition, independent learning tasks at the kindergarten level provide the initial training of a critical learner trait: independence. In an essay on the importance of developing independent learning as a key to lifelong education, Kolcaba (1980) stresses

A key characteristic of educated persons is that their competencies are self-preserving and self-sustaining....

When these characteristics and capabilities are present, a person is an independent learner.

Being an independent learner is a necessary condition for students to acquire early in their school experience, for without this quality, activities directed toward learning would be destined to terminate, as soon as

external pressures were removed. Educational planners must recognize this need and provide for it in all areas of the curriculum. (p. 15)

### Learning Centers

In order to provide independent activity in all curriculum areas, an instructional approach which varies from the traditional methodology needs to be employed. The learning centers approach to teaching is one such possible variation. Learning centers are classroom areas arranged to provide self-directed study from materials which are designed to produce a specific learning outcome. At a learning center, individuals or small groups can explore a task without direct instruction from the teacher. Cooke (1974) suggests that the learning center emphasizes an "...active, self-selecting and problem solving approach to learning" (p. 23) which is more a reflection of the teacher's attitude towards learning and children, than a "...change in the architecture of the building" (p. 22). Further, this approach can be utilized at any level of education.

A study conducted by Kosmoski and Vockell (1978) investigated the academic growth, self-concept and peer attitude of two groups of students in grades 3, 4, and 5. A group of students who worked in learning centers was compared with another (control) group which was given traditional, teacher led, group instruction. The pupils who used the learning centers had more positive self-concepts, felt better about school, and learned more than pupils who had not.

No investigations were located which utilized the learning centers approach to study kindergarten children. Koep (Note 2) use some instructional components of a learning center; namely, self-selection of activities and teacher-directed small groups. He compared the individual motivational level of 82 kindergartners in three classroom environments which he defined as:

(a) "teacher-directed" small groups where reinforcement was given directly by the teacher for levels of learning, (b) a "social-interaction" classroom where the activities were self-selected and the reinforcement was inherent in the activity, and (c) a control room utilizing the regular kindergarten curriculum. He discovered that significant growth in the motivational level occurred in both the "teacher-directed" and "social-interaction" situations as compared with the control group. Since the learning centers approach combines both instructional components of Koep's teacher-directed small groups and social-interaction with self-selected activities, it would lend support to the premise that the learning centers are an appropriate alternative to traditional instruction with kindergarten students.

Adapting the learning centers approach to a kindergarten classroom requires some additional refinements. In their handbook on the learning centers approach at the kindergarten level, Gueller and Frey (1973) identified two distinct phases of functioning in the learning centers environment (a) the preparatory stage and (b) the

fully functioning stage. These stages were followed in the implementation of the current study.

The preparatory stage. The preparatory stage should begin in the first week of school. Since the learning centers approach to teaching requires the child to function independently and assume responsibility for his/her own learning, a preparatory period of approximately six weeks is required. This is a time for children to develop friendships with peers and teachers and for each individual to feel comfortable about his/her ability to function independently. Instruction is organized to introduce and familiarize the children with the wide variety of audiovisual equipment, art supplies and game activities they will encounter at the centers. A good deal of time is spent developing responsibility for cleaning up after an activity and replacing the materials used.

Ground rules for functioning freely, as an individual, are established on the first day and enforced consistently. Time is spent helping the children understand why certain rules are established and how the rules are enforced. A neutral re-statement of a rule and information about the violation allows the student to modify his/her behavior (Smith, 1977). For example, "The rule is no talking when someone else is talking. You were talking to David and it was Emily's turn."

Gueller and Frey (1973) summarized the time used in the preparatory stages as follows:

1. Having the children begin to realize their capabilities.
2. Motivating their interests and desire in learning.
3. Utilizing ways the child could learn on his own.
4. Helping children to realize that all learn at different rates, and in different ways.
5. Learning to respect each other for what they can offer.
6. Developing a good feeling toward one another so that when in need of assistance, other children as well as the teacher can help.
7. Helping the child realize that his teacher should be his guide, not his sole source of learning.
8. Helping the child realize he is capable of solving many of his little problems on his own. However, we wanted the child to feel that when he needed our security, we were always there.
9. Familiarizing the child with everything he might need or use. He would not have to ask where something was or if it could be used by him, or where to place materials.
10. Insuring that every child felt successful doing something.
11. Developing a sense of independence.
12. Helping the child to attempt to answer many of his own questions. (p. 14)

The functioning learning centers approach. Charles (1976) believes time to be an important element in individualized instruction. He maintains, "...a completely individualized program is a virtual impossibility. No teacher can manage activities where students are all on different time schedules. Therefore, many individualized plans hold time constant" (p. 59). In a fully functioning learning centers approach, a body of time is held constant within the daily schedule. In a kindergarten, approximately an hour of each instructional day is spent in an independent work session. A schedule is established so that the school district's required amount of instructional time for each subject area can be met. However, the daily schedule is kept flexible so that it can reflect the changing interests and moods of the children. The following is a sample schedule which demonstrates the placement of the learning centers time in the daily schedule.

9:00- 9:15 Opening--attendance, calendar, pledge, explanation of centers.

9:15-10:15 Learning centers--all materials and space in room is utilized. Teacher works with individuals, small skill groups, or pre-post tests center activities.

10:15-10:35 Large muscle activity--preferably outdoor games or activities.

10:35-11:05 Skill introductory groups--usually science or social studies-- whatever is not covered in the centers for that week.

11:05-11:20 Music, fingerplays, poems.

11:20-11:40 Stories-- dramatics.

Management. In order to utilize the learning centers for non-readers at the kindergarten level, a special method for identifying and assigning the centers must be implemented. Gueller and Frey (1973) recommended a color-coding procedure. Each learning center is color-coded and identified by an attractive picture. If directions are needed to complete the task at a center, the student is given instructions by a tape recorded message. Upon completion of a center, the student takes a colored paper chip from a bowl on that center's table and places the chip and any completed paper and pencil tasks in a personal file. At the end of the day, the teacher or aide records the centers which were visited by each child. If work is done incorrectly or if additional attention to a certain task is needed, the teacher can assign a center by placing a colored chip in the child's file. The children check for such chips and returned work at the beginning of each daily independent work session. If a chip is present in his/her file, the child knows the lesson must be completed during the subsequent session. The teacher is free to deal with individual learning needs during this 1 hour independent work period.



### Feedback

Marke1 (Note 3) defines the basic components of an educational system as the input, the processing system, and the output. (p. 4)

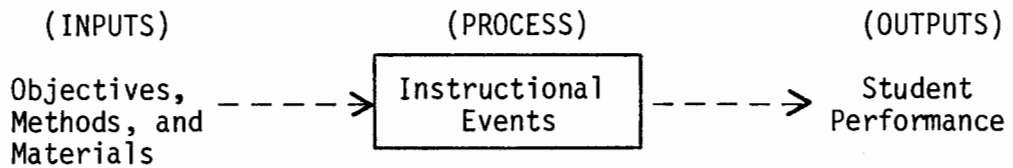


Figure 2. Educational System Components

In this input-out system, the inputs are the objectives, methods, and materials; the process of input to output is called the instructional event; and the output is the task accomplished by the student.

This input-output model becomes more complex when feedback is added. Weiner (1956) defines feedback in terms of the process of providing information on performance in order to influence it.

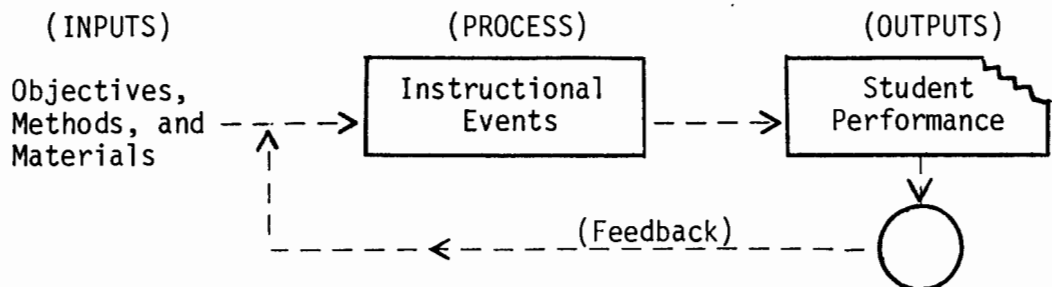


Figure 3. Process of Educational Feedback

Weiner's model is essentially an input-output system with feedback on student performance which is in turn used to influence a future performance. The feedback the student receives is crucial to the educational process, since the performance is modified through the feedback received. Feedback on student performance is traditionally given by the teacher, but it can be provided by the student himself when the instructional material is carefully constructed. At the lower elementary or kindergarten level, teacher feedback on student performance has been traditionally verbal, for example, "That's correct! Good!"

#### Teacher Feedback

A number of investigations have dealt with the positive effects of adult verbal feedback on kindergarten-aged student productivity, behavior and achievement (Bitgood; Gholson; Litow; Dickie, Note 4; Siegler, Note 5; Zimmerman, Note 6). These studies support the traditional assumption that teacher feedback on student performance is reinforcing and thereby increases student productivity and achievement.

#### Self-Evaluative Feedback

Recent clinical studies have investigated verbal self-evaluative feedback with kindergarten-aged students and have found it to be significantly correlated with productivity. Masters and Santrock (1976) found that kindergarten-age, verbal

contingencies, self-placed on a motor task did exercise control over the persistence of the behavior. Children persisted longer when they had independently labeled a group period at a motor task as fun, or easy, or when they expressed pride in the work.

Using an experimental discrimination task with 4 and 5-year-olds, Masters et. al. (1977) discovered that the more rapid and complete learning was produced when the task resulted in verbal self-evaluative feedback as opposed to tangible external rewards.

In an independent learning environment, the teacher frees herself from providing traditional instruction and feedback. Since feedback on the instructional activity is necessary to attain mastery, the role of student self-evaluative feedback must be explored. The studies previously cited have demonstrated that verbal self-evaluative feedback is effective with kindergarten-age students; however, verbal feedback is difficult to monitor in an individualized classroom. A more tangible form of feedback is necessary; graphing is one possibility.

#### Graphed Feedback

Few studies have explored the effects of self-kept, graphed, academic feedback with an elementary-school-aged population. In one investigation, students using a programmed language arts task during an independent work period recorded the total number of problems correct on a progress graph. This resulted in sustained high rates of performance (Smith et. al., 1969).

Willis (1974) investigated the effect of adding both a feedback and a self-charting condition to a tutoring program involving fourth and fifth graders. The subjects received a green chip for each sentence correctly read; at the end of each session chips were counted and recorded on a graph. The results indicated feedback and self-charting substantially increased the rate of sentences read correctly and for some children, reduced the error rate.

Using a programmed arithmetic task with 16 first grade students, Speidel (1975) discovered that both groups could check their work and report it on a graph independently of the teacher. However, when reward contingencies were added, both groups began to inflate their scores.

No studies could be located which employed self-charting conditions in a learning center environment or with kindergarten age children.

#### Achievement Measures

Two types of achievement measures are being used in education today: the norm-referenced measure and the criterion-referenced measure. These measures provide two kinds of information, the principal difference being the standard used as a reference. Criterion-referenced measures use an absolute standard of quality, while norm-referenced measures depend on a relative standard (Glaser, 1963). A norm-referenced test is designed to order or rank a student's status in relation to the performance of a group of

other students who have completed that test (Popham, 1978). Criterion-referenced measures are used to "...ascertain an individual's status with respect to some criterion, i.e., performance standard.... The meaningfulness of an individual's score is not dependent on comparison with other testees. We want to know what the individual can do, not how he stands in comparison to others" (Popham, 1971, p. 20).

Criterion-referenced testing is a relatively new strategy for measuring achievement. In fact, it has only been recognized since the early 1960's. Because of its recent development, it is not yet an entirely polished method. (Popham, 1978). Curlette and Stallings (1979) identify the following issues as common difficulties in criterion-referenced testing: defining the domain to be tested, methods and objectives of constructing test items, and the determination of cut-off scores.

One of the benefits of a criterion-referenced test is that it allows precise testing of a specified domain of learning. For example, if a teacher designed an instructional task to have students recognize the numerals 1-20, and then tested them on the recognition of numerals 80-100, a relevant measure of achievement will not be obtained. It would seem, then, that the use of a criterion-referenced test is particularly useful when desired student outcomes have been clearly specified.

### Summary

Current literature tends to indicate that while independent activity increases both productivity and achievement in older children, the question of the effectiveness of this method of instruction with kindergarten-aged students remains unanswered. The literature recognizes the importance of teacher feedback on performance for all ages of students and demonstrates that older students can, through graphing, effectively supply their own feedback on academic performance. However, more evaluative research is necessary to determine if graphing is an effectual feedback condition for kindergarten students.

Given kindergarten subjects who complete daily independent tasks within a learning centers environment and given a criterion referenced measure of achievement, the present investigation seeks to determine the following relationships:

1. The relationship of student self-charted feedback to achievement, productivity, and participation.
2. The relationship of teacher-charted feedback to achievement, productivity, and participation.

## CHAPTER THREE

### METHODS AND PROCEDURES

In this third chapter, the reader will find an organization that begins with an overall description of the study, the subjects and their selection, and the measures and materials used. It then focuses on the procedures used to create the environment and the management and scheduling involved. Finally the implementation of the study is described phase by phase. At the conclusion of the chapter, the reader will have the understanding of the methodology employed in the study. The next chapter will present the results of the study.

#### General Description

Kindergarten students worked on independent learning lessons on auditory discrimination for a 15 minute learning episode every other day for a period of six weeks during the winter of the year. The teacher's function during independent learning time was that of behavior manager rather than presenter of information. There were two feedback conditions involving visual charting of the lessons completed: (a) teacher-charting of student performance and (b) student-charting of his/her own performance. Each student received both feedback conditions utilizing a crossover design. Achievement data were gathered at two intervals: (a) before Treatment Phase I and (b) at the conclusion of Treatment Phase I.

Productivity and participation data were also gathered during Treatment Phase I.

### Subjects

Subjects were middle class children enrolled in the same kindergarten classroom in a mid-western community. Ten males and ten females were included in the investigation. The teacher had employed independent learning activities within a "learning centers" approach to instruction throughout the entire year; therefore, the teacher and students were accustomed to the type of independent lesson used in the study.

### Subject Selection

All children (20) in the class were administered the Standard Mastery Task on Sound Matching (Smith and Smith, 1970) during a two day period (see Appendix A). The pre-test scores were rank ordered and the subjects were divided into two groups. Odd numbered students were assigned to Group A and even numbered students were assigned to Group B.

### Measures

#### Independent Variable

The independent variable was feedback, i.e., visual charting of the number of lessons completed per learning episode (see Appendix B). The feedback variable consisted of two conditions: (a) teacher-charting of student performance and (b) student self-charting of his/her own performance. For the



teacher-charting condition, the teacher retained the student's chart. Upon the submission of each completed lesson, the teacher colored in the lesson number on the chart while the student observed. In the student self-charting condition, the student kept a personal chart in his/her mailbox and was responsible for unassistedly coloring in the completed lesson.

#### Dependent Variables

There were three dependent variables: (a) student achievement as measured by the criterion-referenced test, (b) student productivity as measured by the accuracy of student responses, and (c) student participation as measured by the number of lessons completed.

The Standard Mastery Task on Sound Matching which accompanies the Michigan Language Program: Listening I was used as the criterion-referenced test of achievement. The test consists of 38 discrete listening tasks and is based upon a taxonomy of responses required to obtain mastery in the Listening I program. The test items are both ordered in degree of difficulty and sequenced so that later responses are dependent upon mastery of previous ones. Each test item contained three spoken words, which were either all the same or not. The subjects had to discriminate whether the three words sounded "the same" or "different". Subjects responded on an answer sheet by circling "Yes" if the three words were the same and "No" if they were different

(see Appendix A). Following a script and instructions provided by the publisher, the test was recorded on an audio cassette by the classroom teacher. Since the teacher's voice was also recorded on the inserts to the taped lessons, there was control for voice familiarity and continuity. Use of the teacher's voice also provided consistency with other centers in the classroom.

Each lesson contained from 30-36 discrete listening tasks. Student productivity was defined as the ratio of correctly completed tasks to the number of listening tasks attempted per episode. Student productivity was measured using the Response Accuracy ratio (RA). The RA is a ratio in which (C) equals the total number of tasks completed correctly, per episode and (A) equals the total number of tasks attempted per episode.

$$RA = \frac{C}{A}$$

This measure provided an index of quality of production.

Student participation was defined as the number of lessons completed per learning episode. In each 15 minute episode, subjects were required to complete only one lesson although they could complete more if desired. Initial lessons were rather long; thus, it was only possible to complete two lessons in the 15 minutes. However, as the instruction progressed, the time length of the lessons decreased and the student could

complete as many as four taped lessons in a 15 minute episode. The time factor and freedom to choose to do more than the required number of lessons allowed for a quantitative assessment of motivation.

### Materials

The Michigan Language Program: Listening I (Smith and Smith, 1970) was used as the independent learning lessons about which the subjects would receive feedback. This instructional program consisted of 36 sequential lessons on auditory discrimination training. It was designed to develop sensitivity to phonemes, the sounds of English language which signal differences in words. Each of the 36 lessons contains from 30-36 discrete listening tasks; thus, there were approximately 1100 tasks in the total program. The components of each lesson include: (a) a cassette tape which presented the auditory stimulus and (b) a student answer booklet. Each stimulus item (task) contains three words. In a given task, the three can all be the same or one of the three can be different. The subjects were required to determine if the three were the same or not. For each task, the answer sheet contained a picture of the stimulus word and the word "No". The subject was required to circle the picture if the words were the same and "No" if they were not (see Appendix C). The first three lessons were designed to carefully train the child to use the format.

The program as packaged by the publisher contains a single answer booklet and audio cassettes with more than one lesson per tape. However, because young children respond better to small units of instruction, it was necessary that each lesson be self-contained. Therefore, for purposes of the study, permission was obtained from the publisher to divide the answer booklet into separate booklets for each lesson and to re-record each lesson onto separate cassette tapes. Additional instructions (see Appendix C) were inserted on the tape of each lesson to make the lesson as identical in format as possible to the other learning centers in the classroom. Furthermore, each lesson was identified by both drawing a small picture and writing the lesson number on the cover sheet of the answer booklet (see Appendix C). To aid the student in identifying the lesson completed, the charts had identical pictures and numbers on them.

### Procedures

#### Environment

The learning center was arranged at a long table with plasterboard dividers separating three distinct work areas. Each area was equipped with a tape player and headset. Each divider was constructed to obstruct the student's view into other work areas in order to minimize distractions.

### Management

The subjects were required to obtain the tapes and answer booklets from the teacher. This procedure insured that the tapes were used in the correct sequence and that no subject would extend the learning episode beyond the allotted 15 minutes. Upon return of the tapes and booklets, the teacher verbally reminded each subject, "Don't forget about filling in the chart." The teacher colored in the completed lesson number for the teacher-charting group while they observed. The student self-charting group kept their charts in their mailboxes and were responsible for marking their own progress.

Ground rules for functioning freely as an individual were established on the first day of school and were, therefore, well established by the time of the study. Rules were enforced consistently in a neutral voice. The rules in effect during the instructional task were:

1. Speak quietly when working. You may not disturb the other workers.
2. Walk in the room.
3. Keep your hands to yourself.
4. Leave each center as you found it.

### Scheduling

Due to the physical dynamics of the room and equipment constraints, only three subjects at a time could use the

designated learning center. Students were assigned to the experimental learning center according to the procedure identified by Gueller and Frey (1973). When it was his/her day at the center, the student received a blue colored chip in his/her mailbox. In order that the entire group of 10 students could complete the listening center daily, the hour long period allotted to learning centers was divided into 15 minute segments with up to three subjects being allowed at the center during each 15 minute segment. After completing the required task at the center, each subject was free to move to another center.

The 10 subjects who used the center on a given day were all the subjects in one of the two experimental groups. Therefore, each experimental group used the center on alternate days. For example, in Treatment Phase I, the self-charting group (Group A) used the listening center on instructional days one, three, five, seven, etc. and the teacher-charting group (Group B) used the center on instructional days two, four, six, etc. The subjects knew it was their day at the auditory center if the colored chip associated with that center was present in their box at the start of the learning center period. If a subject was absent on the the assigned day, the lesson was completed during the period assigned to the other group on the alternate day. This insured that the subject would complete the treatment phase in the

allotted time and also avoided the subject's completing the learning center twice on the same day.

### Implementation

#### Criterion Pre-test

The Standard Mastery Task on Sound Matching which accompanies the Michigan Language Program (Smith and Smith, 1970) was used as the criterion pre-test measure. The pre-test was administered to all subjects on the Thursday and Friday preceding the onset of Treatment Phase I the following Monday.

#### Training Phase

All children received training in the use of the headsets and tape recorders previous to this study. All were familiar with independent work procedures in the room. Training with the instructional task was not separated from Treatment Phase I. The Michigan Language Program: Listening I trains the children in the correct discrimination and response procedure in the first three lessons. All subjects received this training as part of the instructional program in Treatment Phase I.

#### Treatment Phase I

During the first treatment phase of 15 days, the subjects worked at the instructional lessons for a 15 minute period every other day. Group A received the student self-charting feedback condition and worked on the odd numbered instructional days. Group B received the teacher-charting of

student performance feedback condition and worked on the even days. The subjects knew it was their day at the auditory center if the colored chip associated with that center was present in their box at the start of the learning center period. The teacher kept a record of the time and reminded the subjects when it was their turn at the center. The teacher gave each subject the necessary tape and booklet upon request. Upon completion of a lesson, the subject returned the materials to the teacher who reminded him/her, "Don't forget about filling in your chart." Group A subjects were entirely responsible for coloring their own charts, but the teacher did unobtrusively check the accuracy of the charts daily. The teacher colored in the completed lesson number on the Group B charts. If a Group B subject wished to specify the color used to mark the chart, the teacher responded with, "I am keeping your chart for you. I have chosen the color I will use." An identical color progression was used to mark the charts when the treatments were switched.

#### Criterion Post-test

The two groups worked at the instructional lessons on alternate days for a total of seven treatment days each. The children received the Standard Mastery Task on Sound Matching again as a post-test measure on the 15th day of Treatment Phase I.



### Break

Treatment Phase I ended shortly before the Christmas holiday and the subjects were away from school for a two week break before Treatment Phase II was begun.

### Treatment Phase II

Upon return from the holiday, the teacher reviewed the discrimination and response procedure with each subject individually during the learning centers period. The new 15 day treatment period began upon completion of the procedural review. Each child continued the lessons at whatever individual point he/she had left them before the break. In this phase each experimental group received the other feedback condition. Subjects in Group A now received the teacher-charting of student performance feedback condition. Subjects in Group B now received the student self-charting feedback condition. Group B worked the odd numbered days; Group A worked the even numbered days of the treatment phase.

This second treatment phase was designed solely for the student's personal benefit. It was unknown whether there would be a differential benefit to the feedback conditions. Consequently, the conditions were switched in Phase II to assure that all subjects received any benefits from both feedback conditions.

### Data Analysis

The data gathered in this study were subjected to statistical procedures as follows:

1. The pre-test achievement scores were analyzed by an independent means t-test.
2. Achievement was analyzed by an independent means t-test applied to the gain scores.
3. Productivity data were analyzed by independent means t-tests applied to response accuracy, the number of correctly completed tasks and the number of tasks attempted.
4. Participation was analyzed by an independent means t-test applied to the number of lessons completed.

## CHAPTER FOUR

### RESULTS

The goal of this study was to investigate the effect of two feedback conditions upon three variables: (a) student achievement as measured by a criterion-referenced test, (b) student productivity as measured by the accuracy of student responses, and (c) student participation as measured by the number of lessons completed. The results of the study will be presented under the headings Subject Deletion, Student Achievement, Student Productivity, Student Participation, and Summary.

#### Subject Deletion

The Standard Mastery Tasks on Sound Matching (Smith, 1975) was used as the criterion-referenced achievement measure. Upon analysis of the pre-test scores by visual inspection, it was observed that ten subjects already demonstrated knowledge at or near the ceiling (a score of 36) of the test. An inspection of the histogram (Figure 4) indicated that 10 subjects had a score of at least 32, close enough to the ceiling of the test that the treatment would not have been appropriate. Therefore, these 10 subjects, by chance exactly five in each group, were eliminated from all analyses. The Data Matrix (Table 1) presents, for each of the remaining 10 subjects, the raw data for all variables.

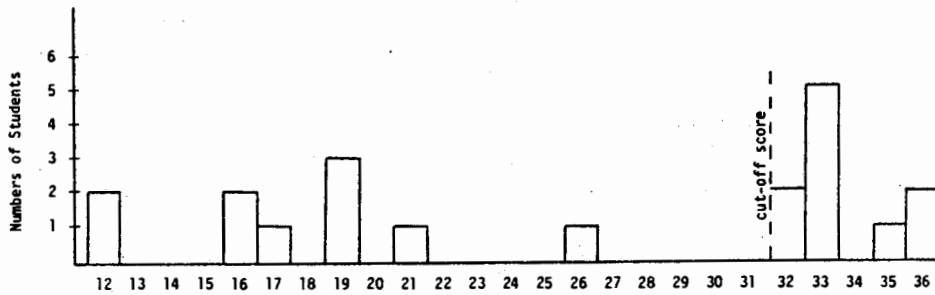


Figure 4. Pre-test Scores

Table 1  
Data Matrix

Subjects	Group*	Achievement			Productivity		Participation
		Pre-test Score	Post test Score	Gain Score	Number of Items Correct	Response Accuracy Ratio	
1	A	21	27	6	80	.49	8
2	A	19	36	17	91	.67	7
3	A	17	33	16	120	.89	7
4	A	16	27	11	311	.79	15
5	A	12	21	9	136	.82	8
6	B	26	32	6	114	.84	7
7	B	19	29	10	129	.78	8
8	B	19	20	1	63	.47	7
9	B	16	10	-6	48	.46	6
10	B	12	17	5	131	.50	11

\*Group A is the self-charting group and Group B is the teacher-charting group.

### Student Achievement

When the pre-post achievement test scores were examined, it was noted that the scores varied widely between individuals. This also produced wide variability in gain scores, ranging from a -6 to +17. An independent means t-test was applied to gain scores computed for the achievement data (Table 2). The resulting t-value of 2.52 was significant ( $\alpha = .04$ ).

Table 2  
Mean Scores, Standard Deviations, and t-test  
Values for Achievement

Group	<u>n</u>	Pre-test $\bar{X}$ (SD)	Post-test $\bar{X}$ (SD)	Gain Score $\bar{X}$ (SD)	t
A	5	17.0 (3.39)	28.8 (5.85)	11.8 (4.66)	2.52
B	5	18.4 (5.13)	21.6 (8.96)	2.3 (6.06)	

The t-value is significant at  $\alpha = 0.036$  (two-tailed).

### Student Productivity

The quality of student productivity was measured by computing a Response Accuracy ratio of the total number of tasks completed correctly to the total number of tasks attempted. An independent means t-test was applied to the mean Response Accuracy ratio for each group.

Table 3  
Mean Scores, Standard Deviations, and t-test  
Values for Response Accuracy Ratio

Group	<u>n</u>	$\bar{X}$	<u>SD</u>	<u>t</u>	$\alpha$
A	5	.73	.16	1.11	.298
B	5	.61	.19		

As can be seen in Table 3, there were no significant differences between groups on Response Accuracy. In order to further explore the quality of the student's production, the Response Accuracy ratio was broken down into its two component values, the number of tasks correctly completed and the number of tasks attempted (Table 4).

Table 4  
Mean Scores, Standard Deviations, and t-test Values for  
Number of Tasks Correct and Number of Tasks Attempted

Group	<u>n</u>	Tasks Correct				Tasks Attempted			
		$\bar{X}$	<u>SD</u>	<u>t</u>	$\alpha$	$\bar{X}$	<u>SD</u>	<u>t</u>	$\alpha$
A	5	147.6	94.03	1.11	.298	198.8	110.15	.68	.514
B	5	97	38.81			160.4	60.63		

An independent means t-test was computed to examine each value by groups. Inspection of Table 4 indicates there were no significant differences regarding either number of tasks attempted or number of tasks correctly completed.

#### Student Participation

The quantity of student participation was measured by charting the number of lessons completed. An independent means t-test was computed to compare the participation of the groups.

Table 5  
Mean Scores, Standard Deviations, and t-test  
Values for Participation

Group	<u>n</u>	<u><math>\bar{X}</math></u>	<u>SD</u>	<u>t</u>	<u><math>\alpha</math></u>
A	5	9	3.39	.69	.511
B	5	7.8	1.9		

As can be seen in Table 5, there were no significant differences between groups on the participation variable.

## CHAPTER FIVE

### DISCUSSION AND CONCLUSIONS

Using a learning centers approach in which kindergartners work daily at an independent task, the present study investigated the relationship between two feedback conditions, (a) teacher-charting of student progress and (b) student self-charting of progress, and the measures of student achievement, productivity, and participation. The study is unique to the literature in a number of ways.

1. The instructional mode in the kindergarten utilized a learning center environment which allowed active student participation and self-selection of tasks. Previously, early childhood researchers have concentrated on studying the young child either in small clinical groups or as individuals rather than in a real classroom environment.

2. The study employed a daily independent task to measure the effect of the feedback condition. Few studies have employed an independent activity as a variable.

3. Kindergarten subjects used graphing as a form of self-evaluative feedback. While some investigations employed verbal self-evaluative feedback, this method was difficult to monitor in an independent learning environment. Studies with kindergarten subjects which utilized a more tangible form of feedback, such as graphing, are not apparent in the literature.



4. The effects of the feedback condition on achievement, productivity, and participation of kindergartners were examined for the first time. Previous studies have used one, or at most two, as the dependent variable(s).

5. A criterion-referenced test has been employed as the achievement measure. In the past, norm-referenced measures have been used.

After the study was completed, a problem was encountered with analysis of the pre-test data. Half of the subjects scored so near the ceiling (a score of 36) on the pre-test that gains could not be measured, and as a result, ten subjects were not included in the analyses. By chance, this left exactly five students in each group. Had a larger number of possible subjects been available, the pre-test should have been given as a means of selecting subjects for the study. This would have designated those subjects for whom the independent task was most appropriate.

While some would suggest that a criterion-referenced measure with more test items would preclude many subjects from approaching the ceiling, the use of a test other than the one articulated with the instructional material would not have been appropriate. In addition, the criterion-referenced measure, by definition, includes only testing items from a specified domain of learning.

The results indicate that when students work on an independent learning task in a learning centers environment, students who

chart their own progress achieve more than students who have their progress charted for them by the teacher.

The result of the analysis of student productivity is surprising. One would expect that if the groups differ significantly on the achievement variable, they would also differ on the productivity variable. The lack of a significant difference may be due to the small number of subjects used in the study. Therefore, group differences may have obtained with a larger population. Alternately, it is possible that the length of the treatment did not allow for difference to become evident. Significant results may have obtained if the number of learning episodes had been greater.

The result of the analysis of the participation variable is not surprising. Although one might expect that the group which achieved more would have participated more, this does not need to be true. Students who complete more tasks but do not get them correct may not achieve much whereas students who complete fewer tasks but get them all correct are more likely to experience gains in achievement.

Finally, teacher observations indicate that the students in this study were all capable of working independently and keeping a chart of their own progress.

### Implications

The results emphasize the importance of the feedback variable on student achievement. Given an appropriately structured task with a specified goal that can be performed independently of the teacher and other students, the student can independently chart his/her own progress and achieve more than the student who has had the teacher chart his/her progress. This knowledge is important to increasing the kindergarten child's independence in an individualized curriculum. The teacher is freed to help the individual or small group who would benefit most from her instructional skill.

Future research should continue to investigate the relationship between achievement, productivity, participation, and feedback on performance in an independent learning environment. A group design using a larger number of subjects needs to be employed. A crossover design which switches the individual's treatment at a designated lesson number would provide a counterbalanced design which would allow for an appropriate investigation of the effects of both feedback conditions within and between groups. Another possibility may be the use of N = 1 multiple baseline design.

### Conclusions

Within the limitations of generalizability due to only one teacher and the small number of kindergarten subjects being

utilized in this study, the following conclusions appear to be consistent with the findings: Given independent instruction with appropriate material in a learning centers environment, (a) kindergarten students show more gains in achievement under the condition of self-charted feedback than teacher-charted feedback and (b) kindergarten students demonstrate no differences on either productivity or participation as defined in this study.

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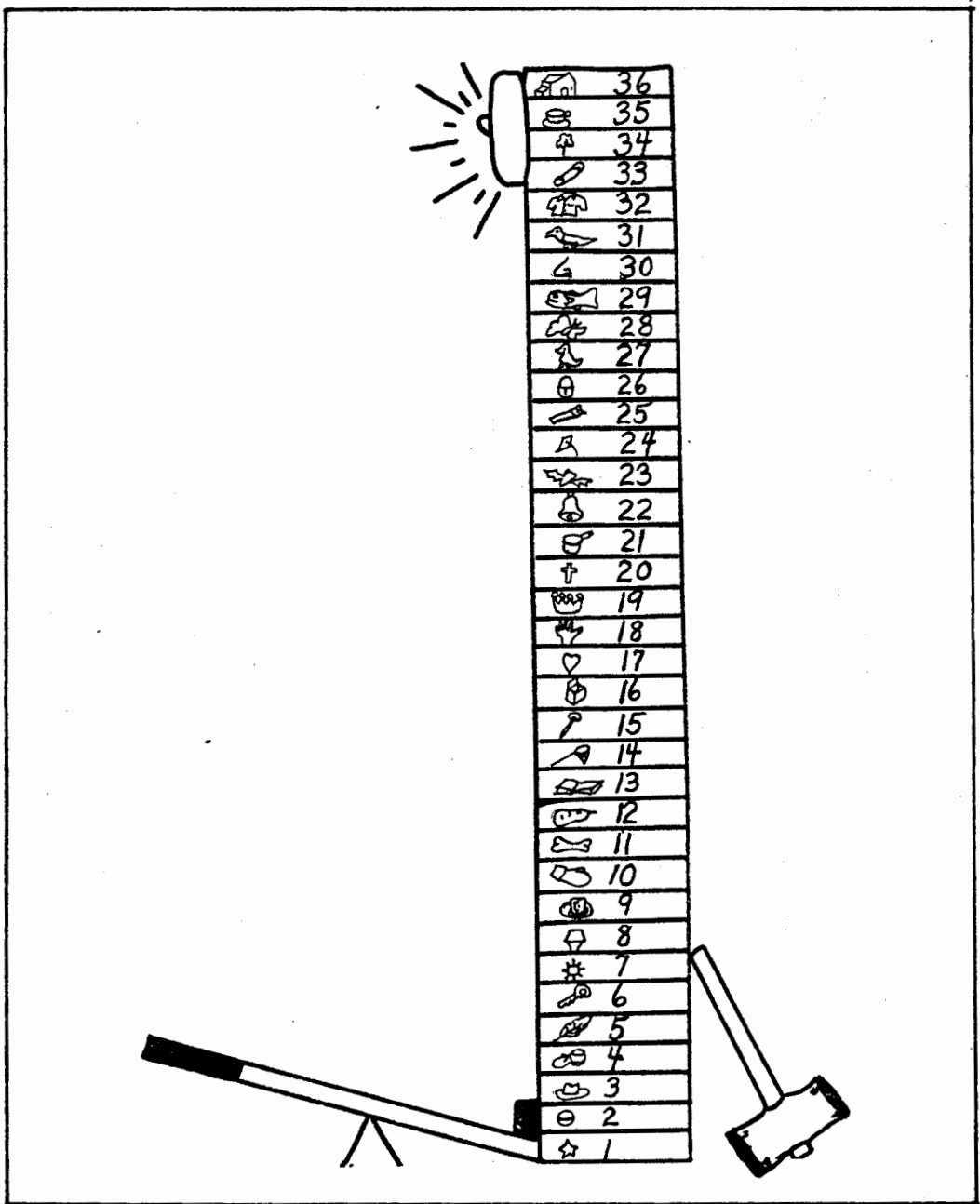
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APPENDIX A  
SAMPLE PAGE FROM THE CRITERION  
ACHIEVEMENT TEST

Taped Auditory Stimulus		
1. tea - tea	1.	YES NO
2. bat - bat		
3. tie - tea	2.	YES NO
4. toy - toy		
5. gate - gate	3.	YES NO
6. fix - fox		
	4.	YES NO
	5.	YES NO
	6.	YES NO

Response Sheet →

APPENDIX B  
FEEDBACK GRAPH



APPENDIX C  
SAMPLE COMPONENTS OF THE  
INSTRUCTIONAL PROGRAM

## Title Page of a Lesson Booklet

**13**THE MICHIGAN LANGUAGE PROGRAM  
LISTENING I

Donald E.P. Smith, University of Michigan, 1964

Copied by permission of the author.

Directions Inserted at the Beginning and  
End of Each Lesson Tape



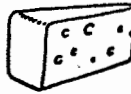

DIRECTIONS INSERTED BEFORE LESSON TAPE BEGINS:

Hi, boys and girls. The purpose of this center is to help you learn to become a better listener. This is the tape for Lesson #\_\_\_\_. For Lesson #\_\_\_\_, you should have the worksheets with a picture of a \_\_\_\_\_ and the number\_\_\_\_ at the top of the page. You will also need a pencil for this task, so take one out of the can on the table and have it ready. Settle back now in a comfortable position and get ready for Lesson #\_\_\_\_. Good listening!

DIRECTIONS INSERTED AFTER LESSON TAPE HAS ENDED:

Hi, boys and girls. You have just finished Lesson #\_\_\_\_. If you would like to keep working at this center, you will need to get up and get the tape and worksheets for Lesson #\_\_\_\_. If you are tired of working here, you can choose another activity now. Before you go please rewind the tape. Don't forget your chart for Lesson #\_\_\_\_. Thank you. Good-bye.

Sample Page From a Lesson

				68	
Response Page →					NO
					NO
Taped Auditory Stimulus					
<u>Page 68</u>					
rose	-	rose	-	rose	
news	-	news	-	news	
nose	-	gnome	-	nose	
news	-	noon	-	news	
cheese	-	cheer	-	cheese	
nose	-	nose	-	nose	
					NO
					NO