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MODIFICATION OF THE FREQUENCY OF STUDENT-INITIATED HIGHER-ORDER QUESTIONS THROUGH MICROTEACHING AND A TOKEN ECONOMY

A Dissertation Presented

By

MYRA J. SADKER

Submitted to the Graduate School of the
University of Massachusetts in
partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

May 1971

Major Subject: Curriculum and Instruction

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A Dissertation

By

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May 1971

This work is dedicated to my mother and father, Shirley and Louis Pollack, for their encouragement; to my daughter, Robin, for her cheerfulness; and to my husband, David, for his help.

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Modification of the Frequency of Student-Initiated Higher-Order Questions through Microteaching and a Token Economy. (May 1971)

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Directed by: Dr. James M. Cooper

ABSTRACT

An experiment was conducted in which the effects of a token system of reinforcement on the frequency of student-initiated, higher-order question asking of four elementary students was assessed with the use of microteaching as a prompt. The purpose of the investigation was to train and maintain student skill in higher-order questioning, a behavior which occurs infrequently within a classroom setting. The subjects were eight fifth-grade students; four received the effects of the independent variable manipulations, and the other four did not. Five higher-order question types were identified: evaluation, comparison, cause and effect, problem solving, and divergent.

The four selected students were trained in higher-order question asking through a microteaching procedure adapted for students: they were presented with symbolic and perceptual models of the student-initiated, higher-order questioning skill. The four selected students practiced the skill in five-minute microteaching lessons, received supervisory feedback, and viewed their performances on videotape. After higher-order questioning had increased to criteria within the

microteaching lessons, a token economy was established in the subjects' social studies class. Points were used to consequate higher-order question asking by the four trained subjects. These points could be exchanged by the subjects for various toys, games, and educational experiences at a "store" set up within the School of Education. The social studies teacher was not aware that these four students had been trained in higher-order question asking and that a token economy was in effect.

A total of thirty-two experimental sessions were run in the subjects' social studies class. Throughout the experiment, frequency counts of higher-order questions asked by both the four trained and the four untrained students were made by two raters stationed within the social studies classroom. Records were also kept of teacher reaction to these questions. There were five experimental phases: Baseline, Microteaching, Reinforcement I, No Consequation, and Reinforcement II. During Baseline, no reinforcement for student-initiated, higher-order questions was administered. During Microteaching, the same procedures were maintained with the addition of out-of-class microteaching lessons in higher-order question asking for the four selected students. During Reinforcement I, a point was awarded for every higher-order question asked by a trained subject. Reinforcement was terminated in the No Consequation phase and was reinstated during Reinforcement II.

The results of the experiment indicate that effective

control was established over the higher-order questioning behavior of the trained subjects. The instatement of reinforcement as a consequence for higher-order question asking established and maintained high response rates. Reversal of the effects was obtained through withdrawal of the consequences and later reinstatement. No increase in response rate was noted for the four subjects who did not receive the effects of the independent variable manipulations.

Thus, it was shown in this experiment that elementary students can be taught to ask higher-order questions through a microteaching procedure, and that this higher-order questioning can be maintained over an extended period of time through instatement of a token economy.

C H A P T E R I

INTRODUCTION

The purpose of this investigation is to analyze the effects of a teaching methodology on the question-asking behavior of elementary school children. The teaching methodology is composed of a modified microteaching approach and a token economy. The behavior to be modified is the frequency of student-initiated, content-related, higher-order question asking.

Definition of Terms

Microteaching

Microteaching is a teaching situation scaled down in terms of length of lesson and number of students taught. Lesson duration usually varies from five to twenty minutes, and approximately three to ten students comprise the class. The reduced complexity of this teaching situation allows the teacher to focus on a selected aspect of teaching. At this point the teaching process has been broken down into over twenty separate behavioral skills. Cooper and Allen (1969) indicate that microteaching has been used in the training of counselors and, to a lesser extent, of supervisors. However, it has not yet been applied as a method for the training of students.

Token Economy

A token economy is the use of secondary reinforcers such as poker chips, points, money, etc., which at a later time may be exchanged for desired objects. It can be used to produce a variety of behavior changes desirable in some educational settings.

Categories of Questions

A content-related question is one associated with the subject matter under discussion. A noncontent-related question is one concerned with classroom organization or procedure or with content which is not under discussion.

The distinction between higher-order questions and lower-order questions is as follows. A lower-order question is one that can be answered through the processes of memory and recall. For example, "Who was president of the Confederacy during the Civil War?" is a lower-order question. Without consulting outside references, one could respond with the correct answer only by remembering previously learned information. In contrast, a higher-order question is one which requires original thought. Following is a list of the various kinds of higher-order questions. They are adapted from the higher-order and divergent question descriptions of Allen, Ryan, Bush, and Cooper (1969).

1. Higher-order questions may ask for evaluations. In

order to respond to such questions, one must set up an appropriate standard and see how closely the object or idea being evaluated meets such a standard. Example: Do you think that Richard Nixon is an effective president? Why or why not?

2. Higher-order questions may ask for comparisons. These questions ask one to determine if ideas or objects are similar, dissimilar, identical, or contradictory. Example: Compare women's clothing styles in every decade from 1920 to 1970, pointing out major similarities and differences.

3. Higher-order questions may ask for problem solving. Such questions require one to use previously learned knowledge to solve a problem new to him. Example: Considering what you have learned in this child-care course, how would you go about solving the problem of diaper rash?

4. Higher-order questions may ask for cause and effect. Such questions require one to perceive causal relationships. Example: Considering changes which have taken place in the past decade, what effects may increased student political consciousness have on campus life?

5. Higher-order questions may ask for divergent, open-ended thinking. They require students to think creatively or to give their reactions to something. Example: What would happen if the next President of the United States were a woman?

Significance of the Problem

Need for More Participatory Student Behavior

Recent research has indicated that the behavior students exhibit in school is mainly passive. Students respond in an environment which is controlled and dominated by the teacher. For example, Arno Bellack (1965) has analyzed classroom interaction in terms of cycles which he considers to be composed of structuring (launching interaction), soliciting (eliciting a verbal or physical response), responding (fulfilling the expectation of soliciting moves), and reacting (modifying or rating what had been said previously). It was found that teachers initiate about 85 percent of these cycles and that they are responsible for structuring, soliciting, and reacting while students are primarily responsible for responding. Also, teachers speak three times as many lines as do students in the classroom setting.

Waetjen (1966) notes that Hugh Perkins, in his work with achievers and underachievers, found that the leader-supervisor role was played by the teacher 88 percent of the time and that at least two-thirds of the time the teacher was either dominant, controlling, or speaking in the classroom.

Recently, this passive student role has been criticized. One major strand of criticism concerning this passivity emphasizes the necessity for active participation in a democracy. Ronald Lippitt (1965) summarizes as follows:

"Participation is the core aspect of any notion of democratic state or community; and further, quality of participation really determines whether any particular organizational life or any particular human democratic process will succeed or fail [p. 44]."

Another major focus of criticism emphasizes the continuity of the learning process. It suggests that the learner must become an active inquirer, an asker of questions, if his curiosity is to be nurtured and if his learning is not to terminate when he officially completes his formal schooling. Ralph Thompson (1969) says:

> Many teachers proceed on the assumption that the learner has much subject matter to learn, time is of the essence and he must learn in a hurry. They conclude that the time consuming procedure of fostering a student's inquiry and the scholarly pursuit of answers to his own questions is inefficient. This argument proceeds from the limited view of efficiency which ignores the essential ingredient in any sound education--the ability to sustain education beyond school and college years by means of a sharpened sense of inquiry [p. 470].

A number of empirical studies also suggest the need for a more active student role. Bloom (1953) found that the lecture evokes primarily those thoughts which are appropriate to the following and comprehending of information while the discussion is more successful in evoking complex "problem-solving types of thought." Porta (1965) analyzed discussion groups and obtained a statistically significant positive correlation between the amount of group-oriented participation of discussion and stated member satisfaction.

The growing number of studies emerging from interaction analysis research also suggests benefits which might accrue if the student's role were a more active participatory one. Interaction analysis has its roots in the work carried out by H. H. Anderson (1939, 1945, and 1946). Classroom behaviors were classified as dominative and integrative. Later, the terms direct and indirect were substituted for dominative and integrative. The behaviors typified by the direct and indirect patterns are summarized by Flanders (1967) as follows:

Indirect Pattern	Direct Pattern
(a) accepts, clarifies and supports the ideas and feelings of pupils.	(a) expresses or lectures about own ideas or knowledge.
(b) praises and encourages.	(b) gives directions or orders.
(c) asks questions to stimulate pupil participation in decision making.	(c) criticizes or deprecates pupil behavior with intent to change it.
(d) asks questions to orient pupils to school work.	(d) justifies his own position or authority [p. 106].

Considering these definitions of direct and indirect, it seems sensible to assume that in indirect classrooms students would have a more active participatory role. Campbell and Barnes (1969) summarize twelve studies which indicate that achievement is higher and that student attitudes are more positive in indirect classes--that is, classes where the student's role is a more active one.

It must be noted, however, that the Campbell and

Barnes review has been challenged by Rosenshine (1970). Rosenshine indicates that this review is based on secondary information which yields conclusions inconsistent with the original data. He concludes as follows: "If these twelve studies alone are summarized, it appears that teacher 'indirectness' has consistent but low positive correlation with achievement, one which is seldom significant at the .05 level [p. 446]."

Thus, the current philosophical climate and empirical research suggest that benefits would result if students would become more active participators and inquirers. They would then be more ready to fulfill the needs of a democratic society, and they would be more capable of maintaining inquiring attitudes and continuing their educations when schooling formally terminates. Moreover, Bloom's work indicates that active classroom participation through discussion will result in more complex "problem solving types of thought." Finally, the interaction analysis studies suggest that it is more likely that achievement will be higher and student attitudes more positive when a student is involved actively rather than passively in his learning.

Design Considerations

It is suggested that the behavioral phenomenon under consideration (manipulation of question-asking behavior) can be at least as effectively investigated by single-subject,

multiple-manipulation, multiple-replication as by the multiple-subject, single-manipulation, single-replication type of design. Sidman (1961) states:

> Every demonstration that a behavioral phenomenon is independent of variables that one has reason to suspect would be important factors serves to extend the generality and reliability of that phenomenon. The significance that will be assigned to such a demonstration is not basically a statistical matter [p. 83].

Because of the type of design used in this experiment, statistical procedures common to the interval estimation and hypothesis testing models of experimental design are not appropriate. The criterion for effectiveness of the manipulations performed in the experiment will be determined on the basis of attainment of steady states in the behavioral phenomena under investigation. Eachus (1969) summarizes the differences between the two types of experimental design:

> The descriptive study which is now common in the experimental laboratory deals mainly with behavior in infra human species, as characterized by the work of Ferster and Skinner (1957) on schedules of reinforcement. In the descriptive type of design, the independent variables are fixed over a large number of experimental sessions and the experimenter focuses his attention on transition and steady states in the behavior measured. In manipulative studies of behavior change and steady state, the technique of reversibility of behavior change is utilized. Reversibility of behavior can be accomplished in one of two ways. (1) Systematic replication of behavioral phenomena calls for the manipulation of the levels of the independent variable with more than one subject in different orders. (2) Direct replications of manipulative behavior phenomena utilize single subjects undergoing a series of independent variable manipulations in which steady state behavior undergoes a process of reversal through transition until another

> steady state is obtained. Of principal concern in a design in which direct replication of independent variable manipulation occurs is the establishment of stability criteria [pp. 20-21].

A systematic process was used to select a stability criterion for each of the dependent variable measures. The criterion to be used was visual inspection for stability in the data. When the data did not show large fluctuations from session to session, it was determined that stability had been attained.

Educational Objective

A teaching methodology was developed for training students to become more active participators in their learning by increasing their classroom questioning. This methodology was directed at increasing the frequency of student-initiated, content-related, higher-order questions.

The basic procedure used in this experiment was to present students with instruction and training in higher-order question asking through a microteaching procedure adapted for students, and then to control and maintain this higher-order question asking through a token economy.

Explication of the study in the remaining chapters is as follows. Chapter II is composed of a review of literature pertaining to application of token economies within educational settings and to student questioning behavior. The methodology of the study is described in detail in Chapter III. The two remaining chapters are composed of analysis and interpretation of the findings and implications for further research.

C H A P T E R I I

REVIEW OF RELATED LITERATURE

The review of the literature related to this study will consist of two parts. First, a brief overview of behavior modification principles as applied to the classroom, with a particular emphasis on the token system of reinforcement, will be presented. Secondly, the pertinent literature on question-asking behavior of students will be reviewed.

Classroom Application of Behavioral Principles

A number of techniques which can be used in classrooms to modify behaviors of students have been developed. These "indicate that behavioral principles, reliably demonstrated in learning laboratories, are also applicable to managing, modifying, building and maintaining the behavior of children who function in special education classrooms [Whelan and Haring, 1965, p. 283]."

The adoption of reinforcement techniques is of particular interest. Studies using social reinforcement within a classroom setting have been reported by a number of experimenters. A particularly clear illustration of the use of social reinforcement within the special classroom setting is given by Zimmerman and Zimmerman (1962). In their work,

unproductive classroom behavior was eliminated in two emotionally disturbed boys by removing social consequences of the behavior. Tantrums were ignored and behavior which was more adequate and efficient with respect to social and scholastic adjustment was shaped and maintained with social reinforcers.

Application of social reinforcement within a regular classroom is reported by Allen, Hart, Buell, Harris, and Wolf (1964). In this experiment, a preschool girl who exhibited a low rate of social interaction with her peers was helped to achieve sustained play relations through systematic use of behavior principles. A positive reinforcer, teacher attention, was given consequent upon interaction with another child, and withheld consequent upon solitary play or attempted interaction solely with an adult. The subject's interaction with children rose markedly.

The literature pertaining to classroom application of behavioral principles is vast. Since the experiment conducted by this researcher deals with the token system of reinforcement, this technical strategy will be discussed at greater length.

Token Economy

Ayllon and Azrin (1968) summarize the advantages in using a token economy. They indicate that tokens bear a simple quantitative relation to the amount of reinforcement,

and they are portable and can be in the subject's possession even when he is in a situation different from that in which the tokens were earned. Moreover, these authors note that tokens bridge the delay between response and reinforcer; they allow the response to be reinforced at any time; and they allow sequences of responses to be reinforced without interruption due to delivery of the reinforces (Ayllon and Azrin, 1968, p. 77). Advantages of the token system of reinforcement within educational settings are noted by Eachus. He summarizes as follows:

> The events which are available to teachers as consequences for student behavior in many situations may not be effective in controlling behavior. The common teacher behaviors used as consequences (such as praise, attention, and approval) may not operate in sufficient strength to modify or maintain desirable rates of responding on the part of students. In such cases a token economy . . . may be used to produce the kinds of behavior changes desirable in some educational settings . . . . Moreover, teacher attention, approval, and praise can be paired with the delivery of tokens, thereby establishing a neutral stimulus-positive reinforcer relationship in which the neutral stimulus gains strength as a secondary reinforcer [Eachus, 1969, p. 6-7].

Criticism has been directed against the use of systems of token reinforcement within educational settings. Most commonly, it has been argued that material reinforcement is a form of bribery, and that the desired student behaviors do not continue when the material reinforcers are stopped. Advocates of the token system of reinforcement suggest that a material reinforcer is not bribery any more than

is a grade or is pay for work done. Moreover, it has been shown that it is possible to transfer control of the desired behaviors from the token and back-up reinforcers to the reinforcers existing within the educational setting.

The token system of reinforcement has had widespread use in remedial and special education classrooms. Its main purpose appears to have been the control of disruptive behavior (Birnbrauer, Wolf, Kidder, and Tague, 1965; Broden, 1970; O'Leary and Becker, 1967; and Philipe, 1968).

In the study by O'Leary and Becker, a base rate of deviant behavior was obtained for the eight most disruptive children in a third-grade adjustment class. In a token reinforcement program, the children received teachers' ratings which were exchangeable for reinforcers such as candy and trinkets. With the introduction of the token reinforcement program, an abrupt reduction in deviant behavior occurred. The program was equally successful for all children observed, and anecdotal evidence suggested that the children's appropriate behavior generalized to other school situations. During this experiment, a return to base conditions was not carried out because of a concern that the school-wide cooperation which had been generated would be reduced. The investigators state:

> There is little doubt that a return to base conditions following three or four weeks of the token procedure would have resulted in an increase in disruptive behavior. When a reversal was used by Birnbrauer, Wolf, et

> al. (1965), a number of children showed a decline in the amount of studying to return gradually to baseline conditions during the following fall, but radical changes in pupil population prevented this reversal [O'Leary and Becker, 1967, p. 641].

The token economy has also been applied to remedial and special education classrooms to increase academic achievement (Clark, Lackowicz, and Wolf, 1968; Haring and Hauck, 1967; McKenzie, Clark, Wolf, Kothera, and Benson, 1968; Shore, 1969; Staats and Butterfield, 1965; Tyler and Brown, 1968; and Wolf, Giles, and Hall, 1968).

In the study by Wolf, Giles, and Hall, results of the first year of an after-school remedial education program for low-achieving fifth- and sixth-grade children in an urban poverty area are reported. The remedial program incorporated standard instructional materials, mastery of which was supported by token reinforcement. Experimental analysis carried out with individual students showed the token economy to function as such. The effects of the program on the academic achievement and report card grades of the children in the remedial group were found to be significant when compared with the gains of a control group who had no remedial program.

One major way in which the token economy conducted in this experiment differs from those described above is that the setting in this experiment is a regular class rather than a remedial or a special education class. Token economies have been implemented in regular classes although their use

in this type of setting is more limited.

> In classroom studies that have used reinforcement models, the main purpose appears to have been to modify some specified pupil behavior considered deviant to a particular child or group of children. The use of reinforcement to improve the academic achievement of normal children in regular classroom settings appears to have been less intensively investigated. Empirical evidence on the use of material rewards in a typical classroom is scant [Thompson and Galloway, 1970, p. 395].

There has been a limited amount of work done to increase academic achievement in the regular classroom through the token system of reinforcement. Increased achievement in spelling has been reported by Benowitz, Martin, and Busse (1970) and by Thompson and Galloway (1970); increased achievement in history and geography has been reported by Glynn (1970); and increased speed and accuracy in the reading of programmed texts by Berman (1967).

In the study reported by Thompson and Galloway, the subjects were ninety-one boys and girls in three classrooms of one elementary school. During the first three months of the school year, teachers of these three classes taught spelling by the method of their choice. Records were kept of weekly spelling tests for each child. These scores were a prereinforcement baseline. During the second three months, spelling was taught in the same manner with no extra emphasis. However, material reinforcement, paired with social reinforcement and administered through a token economy, was given to each child who equalled or bettered his test score of the

previous week. The data presented in this study indicate that for elementary school pupils in regular classrooms, academic proficiency, at least as it relates to spelling, can be increased through the use of material reinforcement paired with social reinforcement and delivered through a token economy.

Another application of the token system of reinforcement within the regular classroom has been to control disruptive behavior. In a study by O'Leary, Becker, Evans, and Saudargas (1969), a base rate of disruptive behaviors was obtained for seven second graders of a class of twenty-one. Rules, structure, and praising appropriate behavior while ignoring disruptive behavior were introduced successively. None of these procedures consistently reduced disruptive behavior. The introduction of a token reinforcement program reduced disruptive behavior. Withdrawal of the token reinforcement increased disruptive behavior, and reinstatement reduced disruptive behavior. Follow-up data indicated that the teacher was able to transfer control from the token and back-up reinforcers to the reinforcers existing within the educational setting.

Another student behavior which has been controlled by token reinforcement within a regular classroom setting has been study behavior. In a study by Bushell, Wrobel, and Michaelis (1968), a token system of reinforcement was applied

in a classroom of twelve preschoolers. Tokens were acquired by engaging in a variety of study behaviors. The tokens were used to buy admission to a special event. After a level of study behavior was established under this contingency, the special events were provided noncontingently. Study behavior declined throughout the noncontingent stage.

Although the setting of the experiment conducted by this researcher is similar to the above studies, it differs in three basic ways. First, student-initiated, content-related, higher-order questioning is a student behavior not previously controlled through a token economy. Secondly, unlike all the previous studies, this experiment was carried out without teacher knowledge of the nature of the experiment. Thus, teacher consequation of the controlled student behaviors could be observed. Finally, this is the first time that an adapted microteaching process has been combined with a token system of reinforcement to control and maintain a student behavior.

Student Questioning Behavior

The second part of this chapter will consist of a review of pertinent literature on student questioning behavior. First, studies will be cited which indicate that student-initiated questions are infrequent occurrences, and that when they do occur, their cognitive level is lower-order.

Secondly, studies which describe attempts to raise the frequency and cognitive level of these questions will be summarized.

A number of studies indicate that the frequency of student-initiated questions is low. Houston (1938) observed eleven junior high school classes and found that an average of less than one question period was student-initiated. Floyd (1960) found that student questions were 3.65, 5.14, and 3.64 percent of the total number of questions asked during a taped class session for samples of first-, second-, and third-grade classes, respectively. Dodl (1965) analyzed pupil questioning behavior in fourteen classes. He concluded that elementary school pupils do not ask questions during classroom interaction and that questions which are raised are seldom consequated other than by a direct answer. Also, the incidence of pupil-questioning behavior is related inversely to the extent of teacher domination of classroom interaction and to the incidence of teacher-questioning behavior. Johns (1968), analyzing secondary school classroom interaction, discovered that the total incidence of pupil-initiated questions was only 2 percent of total classroom interaction.

Not only are few pupil-initiated classroom questions asked, but those that are raised are generally lower-order in nature. Taba (1965), speaking of both teacher and student questions and responses, stated, "The what, who, and when

questions are the main diet of classroom instruction [p. 534]." Guszak (1966) analyzed interaction during three consecutive reading lessons in four randomly selected classes in each of Grades 2, 4, and 6. In his analysis he used an instrument containing the categories of recall, translation, conjecture, explanation, and evaluation. It was found that teacher solicitation activities were most concerned with literal comprehension responses, as evidenced by the 73 percent cluster of responses found in the combined recognition and recall categories. Gallagher (1965) studied 118 boys and 117 girls in junior and senior high schools placed in ten classes for gifted students. He analyzed classroom interaction in terms of five primary categories: (1) cognitive memory, (2) convergent thinking, (3) divergent thinking, (4) evaluative thinking, and (5) routine. The majority of both teacher questions and student questions and responses fell in the cognitive memory area. This category would be classified as lower-order. Clark (1964) recorded ninety-five social studies lessons in nine different elementary classrooms. The resulting typescripts were studied to determine the extent and nature of children's personal contributions, the manner in which they were solicited and recognized, and the extent to which they were utilized in developing children's rational powers and in fostering creativity. It was found that approximately 70 percent of teachers' reactions to children's personal contributions were

positive; 20 percent were neutral; and 10 percent were negative. Also, teachers were more apt to respond negatively to material children had placed on the agenda than to material the teachers themselves had introduced. In general, teachers did not call for, reward, or reinforce divergent contributions.

A number of studies indicate that student verbal participation, in general, and student-initiated questions, specifically, can be increased. Loree and Koch (1960) investigated the effectiveness of positive reinforcement in developing certain group discussion competencies of students. The technique of stimulated recall, described by Bloom in 1953 as a means through which immediate reinforcement conditions may be simulated, was used. Results support the hypothesis that group discussion by students can be improved by simulating immediate reward conditions through the use of stimulated recall techniques. Johnson (1964) attempted to determine the effect on classroom participation of a social-verbal reinforcement treatment applied to intermediate-grade children selected as low-verbal participating pupils. Ninety-six pupils were selected and classified as high- or low-verbal participators by teacher ranking. Social verbal reinforcement of verbal behavior was provided to low participators assigned to experimental groups. Comparisons were made between experimental and control group subjects' verbal

participation in their classrooms following treatment as indicated by three criterion tests: (1) teacher rating of pupil change in verbal behavior, (2) counting of subjects' verbal responses during a thirty-minute experimenter-led classroom discussion, and (3) counting subjects' verbal responses during a half-day classroom observation. Low participating subjects receiving social-verbal reinforcement did display a greater frequency of verbal participation than subjects not receiving social-verbal reinforcement as measured by each of the three criterion tests.

Concentrating explicitly on questioning behavior rather than on increased participation in general, Bland and Covington (1965) induced question-asking behavior in fifty-four sixth-grade pupils through an autoinstructional program employed under three experimental conditions. The autoinstructional program was designed to guide the individual through a series of problem solutions to demonstrate to him the value and necessity of asking questions in solving the problems and to elicit his own questions. One group received instruction in the complete program; the second group received a shortened version containing all the problems given to the first group but which afforded no training in question asking; and a third group received no material. All subjects were given criterion tests before and after the instructional period. The results indicated that the pupils

given the complete program asked significantly more questions on the criterion posttests, received higher scores on the science achievement test, and were rated superior to the other two groups in terms of participation in class discussion.

Some data indicate that the cognitive level of classroom interaction can be raised. Farley (1968) attempted to determine if student teachers who had received instruction in the use of Bloom's taxonomy would operate within the classroom at a higher cognitive level than student teachers who had not received such instruction. The subjects were two groups of student teachers. One group was given instruction in the use of the taxonomy as a teaching tool for raising the classroom level of intellectual behavior. A second group (placebo) was not instructed in the use of taxonomy but was given equal time and instruction in other elements of pedagogy. Tape recordings were made of lessons taught by student teachers of both groups. Analysis of the tapes showed a significant difference in cognitive level favoring the experimental group of student teachers. It was concluded that student teachers who employ the taxonomy as a teaching tool will achieve higher cognitive behavior in the classroom. Johns (1968) hypothesized that indirect teacher influence is related to a greater incidence of thought-provoking questions. A nonthought-provoking question was characterized by the simple recall of information. Thought-provoking questions were

concerned with comparative relationships, classifications, verifications, applications, cause-and-effect relationships, explanations, and judgments. There appears to be a strong similarity between thought-provoking questions and higher-order questions. Using Flanders system of interaction analysis, Johns analyzed interaction in matched high school English classes representing two groups of teacher behaviors. Group I represented teacher behaviors that were more indirect. Group II represented teacher behaviors that were more direct. An analysis of the data showed that there was a greater incidence of thought-provoking questions by students of teachers in Group I compared with students of teachers in Group II. It was concluded that students exhibit more thought-provoking questioning behavior in indirect classrooms. Scovel (1968) attempted to determine whether secondary school students could raise the cognitive level of their questioning behavior as the result of instruction in questioning. An instructional program was prepared which directed student attention to general rules for asking good questions and to a classification schema based on Bloom's taxonomy. The classification system consisted of five categories: memory, translation, comprehension, application, and evaluation. The research was implemented in eighteen experimental classes and thirteen control-group classes of senior high school American history. In both experimental and control groups,

students formulated questions based on four items of historical information. The experimental groups received instruction on ways to improve their questions and classify them while the control groups did not. After studying the Depression, both the experimental and the control groups asked questions on the same items of historical information as used in the pretest situation. It was found that students in the experimental groups asked significantly more translation, comprehension, application, and evaluation questions. It was concluded that with proper instruction high school students may be expected to increase the cognitive level of their questions.

In summary, the work of Dodl and of Johns indicates that the incidence of student-initiated classroom questions is low. Moreover, studies by Taba, by Guszak, by Gallagher, and by Clark show that the level of classroom interaction is of a low cognitive nature. The research of Loree and Koch, of Johnson, and of Bland and Covington suggests that the frequency of student verbal participation and, more specifically, of student-initiated questions can be increased. Finally, work by Farley and by Johns indicates that the cognitive level of classroom interaction and of student questions can be raised by modifying teacher behavior, and the work of Scovel suggests that cognitive level can be raised by training students in question-asking behavior.

The major focus of this experiment is similar to

that of Farley, Johns, and Scovel in that it is concerned with increasing the cognitive level of student-initiated questions. The approach differs from that of Farley and Johns in that students rather than teachers are trained in order to raise the cognitive level of student questions. It is similar to Scovel's experiment in that both train students directly in question-asking behavior.

However, this experiment differs from the work of Scovel in a number of major ways. Most obviously, a token reinforcement procedure was implemented in this experiment and not in Scovel's. Moreover, in Scovel's experiment, high school students were taught to ask questions of a higher cognitive level through programmed instruction. In this experiment, elementary school students were taught to ask questions of a higher cognitive level through a microteaching process adapted for students. Also, in Scovel's experiment, student questions were primarily written, were asked over a time span of a few days, and were asked about four specified items of historical interest. In this experiment, student questions were verbal, were asked over the time span of three months, and were asked about any topic being discussed in the social studies class. In summary, the emphasis in Scovel's work appears to be on student comprehension of and ability to write questions of a high cognitive level over a few specified topics for a brief time period. In contrast, emphasis in this experiment is on student verbal behavior maintained

over a long period of time and concerned with a wide variety of topics.

Thus, this study differs from related work in a number of ways. Review of the literature indicates that this experiment is the first use of a token system of reinforcement to control student-initiated, content-related, higher-order questioning behavior. Moreover, this is the first application of microteaching to train a student population and the first attempt to maintain verbal higher-order questioning behavior over an extended period of time.

C H A P T E R I I I

METHODOLOGY

Included in this chapter are descriptions of the subjects involved in this experiment, the microteaching curriculum developed, the token economy put into effect, and the five phases of the procedure.

Subjects and Setting

The school in which the experiment took place was the Mark's Meadow Laboratory School, an elementary school in the Amherst School System which houses Grades Kindergarten through 6. This school has a total enrollment of 359 students taught by ten teachers. Mark's Meadow is connected physically to the University of Massachusetts School of Education. It is, at least to some extent, committed to a policy of experimentation and innovation.

A fifth-grade social studies class in Mark's Meadow was chosen as the site of the experiment. The topic being studied by this class was prehistoric man. During the initial phases of the experiment, meeting days for the class were every Tuesday, Thursday, and Friday and every other Wednesday from 1:00 P.M. to 1:35 P.M. As the experiment progressed, the Friday sessions were dropped; the Wednesday class was held

daily; and all class sessions were extended approximately five minutes every day. At this point, it is pertinent to explain in some detail the grouping patterns set up to facilitate verbal interaction within this classroom.

Occasionally, the students in this class convened as a total group of twenty-four, taught by the classroom teacher with two interns observing. More frequently, however, the students met in three smaller groups of eight each. One group was taught by the classroom teacher, while each of the other two was taught by an intern teacher.

Originally, the three small groups had been grouped homogeneously, according to reading ability level. However, it was the decision of the teacher and the two interns that a more beneficial learning situation would be provided by heterogeneous grouping. The day before the experiment began, the groups were reconstructed so that each group contained representatives of all reading ability levels.

The eight students in the small group taught by the teacher were chosen as the subjects of the experiment. This group was composed of five boys and three girls. Reading scores of these students on the Gates MacGinitie Reading Test are as follows. Alane scored in Grade 9.2 in vocabulary and in Grade 11.9 in reading comprehension; Beth's scores were 7.6 in vocabulary and 11.9 in reading comprehension; Paul P's scores were 3.5 and 3.8; Amy's, 5.0 and 5.6; Billy's, 11.8 and 11.9; Matthew's, 10.8 and 11.9; Arthur's, 11.8 and 8.1;

and Paul W's, 6.0 and 4.0. In terms of classroom verbal participation, the teacher, during an informal interview, classified the students as follows. Matthew and Alane were considered "very talkative"; Billy and Beth, as "fairly talkative"; and Arthur, Amy, Paul P., and Paul W., as "quiet." After ten days of observation, for one-half hour a day, two raters participating in the experiment concurred with the categorization made by the teacher. Classifications made according to reading ability level and verbal participation are summarized in Table 1.

Four of these eight students, Alane, Beth, Paul P., and Amy, were selected for training in the asking of higher-order questions. The choice of these four students insured that all reading ability levels and all verbal participation levels would be represented. Parents of these four students were contacted and written permissions were obtained for the children's participation. The children were instructed that their participation was to remain confidential, and other students were not aware that an experiment was being conducted.

The classroom teacher was aware that an experiment was being conducted, but she was not cognizant of the nature of the experiment. It is pertinent to note that, during an informal interview situation, it had been stated by this teacher that one of her goals as a teacher was to "increase the participation of the quiet children in the class."

TABLE 1

BACKGROUND DATA OF THE EIGHT SUBJECTS

Name	Age	Score on Gates MacGinitie Reading Test Survey D Form 1		Verbal Participation as Categorized by Teacher and Raters
		Vocabulary	Comprehension	
		Trained Students		
Alane	11	9.2	11.9	Active
Beth	11	7.6	11.9	Moderate
Paul P.	11	3.5	4.8	Low
Amy	11	5.0	5.6	Low
		Untrained Students		
Matthew	11	10.8	11.9	Active
Arthur	11	11.8	8.1	Moderate
Billy	12	11.8	11.9	Moderate
Paul W.	11	6.0	4.0	Low

Equipment

A curriculum to generate question-asking skills was developed for the purpose of training the four selected students. The curriculum was based on the microteaching procedure of presentation of symbolic and perceptual models, followed by brief sessions in which the skill to be acquired is practiced. As defined by McDonald and Allen (1967), a

symbolic model is one that is written. A perceptual model is one which enables the observer to view another person or persons displaying the skill to be acquired. The curriculum was composed of the following two skills: (1) student-initiated, content-related question asking; and (2) student-initiated, content-related, higher-order question asking.

The first symbolic model presented to the four students was concerned with student-initiated, content-related questions. It consisted of the following topics: (1) a discussion of the importance of student question asking in school, (2) definitions of content-related questions as those related to the subject matter under discussion and of procedural questions as those related to classroom organization and management, (3) examples of content-related and of procedural questions, and (4) a brief quiz for the purpose of assessing ability to discriminate between the two types of questions.

A four-minute videotape of students asking content-related questions of a teacher who is presenting material to them was developed as the perceptual model. Following is a brief description of the procedure used in the development of this model.

Six students, two male and four female, varying in grade placement from Grade 4 to Grade 7, participated in the development of the perceptual model. Before taking part in the short videotaped lesson, the students were presented with

the symbolic model described above. They were then instructed to ask content-related questions of the teacher who was presenting material to them. There was no script, and all questions asked were spontaneous and impromptu. The students appeared to enjoy the instructions to ask questions and raised their hands for this purpose as soon as the lesson began. It is of interest to note that, even though the teacher had been instructed to encourage student questions, fifteen seconds elapsed between the first raised hand and the teacher's verbal recognition allowing the student to speak. This time lapse was attributed by the teacher to his being unaccustomed to students' asking questions. Within the four-minute videotaped segment, the six students asked a total of five content-related questions. A typescript of this perceptual model was prepared. For purposes of further clarification, all student-initiated, content-related questions were underlined on this typescript.

The second symbolic model to be presented, student-initiated, content-related, higher-order question asking, consisted of the following topics: (1) a definition of higher-order and of lower-order questions (called thought and memory questions for vocabulary purposes), (2) examples of these two types of questions, and (3) a short quiz for the purpose of assessing ability to discriminate between the two types.

A seven-minute videotape of students asking

content-related, higher-order questions was developed as the second perceptual model. The same teacher and students were used in the construction of perceptual models 1 and 2. Before participating in the second perceptual model, these six students were instructed in the difference between higher-order and lower-order questions. Some inability to discriminate between the two types was exhibited by these six students and, as a result, the original symbolic model was revised and clarified. During the seven-minute video-taped segment used as the model, the students asked a total of twenty content-related questions. Sixteen of these were higher-order questions. A typescript of this perceptual model was prepared. On the typescript, all content-related, student-initiated questions were underlined, and lower-order and higher-order questions were identified with a brief explanation of each categorization.

The Fry Readability Formula (1968) was applied to both symbolic models to ascertain the reading level of the material. In accordance with this formula, the following four-step process was used: (1) three 100-word passages from near the beginning, the end, and the middle of the material were selected; (2) the total number of sentences in each 100-word passage was counted, and these three numbers were averaged; (3) the total number of syllables in each 100-word sample was counted; and (4) the average number of sentences per 100 words and the average number of syllables per

100 words were plotted on a readability graph developed by Fry.

Initial assessment of the symbolic materials by the readability formula indicated that they were at the seventh-grade level. The materials were revised, and a second analysis indicated that the first model was at the fourth-grade level and the second model was at the fifth-grade level.

Fry indicates that his formula is accurate within a grade level. He also indicates that the Fry readability method has an intercorrelation of .98 with SRA, .78 with Botel, .94 with Dale-Chall, and .96 with the Flesch method, a rank order correlation of .56 being significant at the .05 level and .75 significant at the .01 level. For further insurance of accuracy, the symbolic materials were field tested by a number of fifth graders in Amherst elementary schools other than Mark's Meadow. It was also indicated by the field-testing procedure that the reading material was at the fifth-grade level or below.

Appendix A is composed of the symbolic model and a typescript of the perceptual model of student-initiated, content-related question asking. Appendix B is composed of the symbolic model and a typescript of the perceptual model of student-initiated, content-related, higher-order question asking.

A second aspect of this experiment consisted of a token reinforcement procedure. Points were used as token

reinforcers. The reinforcers for which points could be exchanged were determined by asking the four selected students to name the toys and games and activities they wished to have available. A list of the items was compiled, and the necessary materials were purchased. Since the Mark's Meadow Laboratory School is connected to the University of Massachusetts School of Education, attempts were made to include educationally relevant items at the store. For example, the opportunity to attend a college class was offered. These items were assembled in a School of Education room set aside as a "store." Every day on which a social studies lesson was presented, the four selected students were brought to the store at 2:30 P.M., the close of the school day. During the reinforcement phase of the experiment, social studies classes were held every Tuesday, Wednesday, and Thursday from 1:00 P.M. to 1:40 P.M. The items named varied in expense from candy bars to elaborate games. The actual items used as reinforcers are listed in Table 2. The point values of the various items used as reinforcers ranged from 1 to 25.

Personnel

One master's candidate and one doctoral candidate at the University of Massachusetts School of Education were trained as raters for this project. Training consisted of presentation of the symbolic and perceptual models to the two raters, and of verbal instruction in ways to discriminate

TABLE 2

ITEMS AVAILABLE FOR REINFORCEMENT OF HIGHER-ORDER QUESTION ASKING

Necklaces	Magic Markers
Life (game)	Felt-tipped Pen
Conflict (game)	Unstrung Beads
Peace Pendants	Yahtzee (game)
Candles	Model Planes
Peanuts (game)	Earrings
Peanuts Posters	Pins
Psychedelic Posters	Mechanical Pencil
Peanuts Pennants	Plastic Erasers with Brushes
Stuffed Animals	Leather Barrette
Candy Bars	Psychedelic Paper Lampshade
Bird Mobile	Spirograph
Animal Mobile	Skill-It (game)
Eye Mobile	Attend a College Class
Playing Cards	Have a discussion with a "real" poet or artist

between content-related and procedural questions, and between higher-order and lower-order questions. A variety of videotaped classroom lessons were viewed by the raters. Also, live classrooms were observed from the Mark's Meadow observation corridor which is equipped with headphones and one-way mirrors. While observing the videotaped and live lessons, questions were categorized by the raters as procedural,

content-related, higher-order, and lower-order. The following information was also noted by the raters: (1) the time at which the question was asked, (2) the student who asked the question, and (3) whether or not the question was consequated by the teacher. The raters considered teacher consequation to have occurred when the teacher responded to a student-initiated question.

Anecdotal comments were made concerning behaviors exhibited by teachers when consequating student-initiated questions. During their two weeks of observation, it was found by the raters that few student-initiated questions occurred. Consequently, teacher questions were often used in practicing for discrimination between various question categories. Table 3 consists of the rating sheet used by the raters during the experiment.

The rating sheet of the final day of Reinforcement 1 is shown. The reason for this choice is that a high rate of higher-order question asking had been attained, and an indication can be given not only of the nature of the rating sheet but also of the types of higher-order question asked and of teacher behaviors manifested in consequating questions.

In order to ascertain the extent of stability in the findings, interrater reliability was determined. Observational findings in two areas were investigated. One area was concerned with the frequency of higher-order questions,

TABLE 3

RATER'S SHEET--SESSION 21

Time	Student	Higher-order Question		Consequation*
1:07	Alane	How did they go about distributing the food fairly?	v	We'll answer that later.
1:08	Paul W.	How did they learn to write?	v	
1:09	Paul P.	Why would writing be so important?	v	
1:11	Alane	How did they trade? Wouldn't the Persians speak another language?	v	
1:11	Amy	How did they know how to write?	v	Let's answer Alane's question first. It's a good question.
1:12	Alane	How did languages begin?	v	
1:13	Arthur	How come they didn't use our language?	v	
1:13	Arthur	How did our language develop?	v	
1:14	Paul P.	What would happen if there were no languages?	v	
1:15	Beth	What caused them to think of speaking?	v	
1:15	Paul P.	What would happen if writing was never invented?	v	

TABLE 3--Continued

Time	Student	Higher-order Question		Consequation*
1:16	Paul P.	What would happen if they couldn't draw animals?	v	
1:17	Alane	How would they indicate adjectives?	v	You expect me to give you all the answers. You should look them up.
1:18	Beth	What would happen if someone couldn't read the writing?	v	
1:19	Alane	How would they draw pictures of verbs?	v	
1:22	Paul P.	What would happen if one man was communicating with another man and the other man didn't understand the rule?	v	
1:26	Paul P.	What would happen if the acolyte didn't write well?	v	
1:30	Alane	How would a language change?	v	
1:33	Amy	If everybody signed their name X, how would they know which was which?	v	
1:34	Alane	How would they know both witnesses was telling the truth?	v	

TABLE 3--Continued

Time	Student	Higher-order Question	Consequation*
1:35	Beth	(Shouts out without raising her hand.) How would the imprint get into it?	v "It's very rude to talk when I'm talking. Your mother doesn't let you do that at home, does she?" Beth: "Sometimes." Teacher: "I'll speak to your mother and see."

*v indicates consequation.

and the second area with the frequency of teacher consequation. Teacher behaviors while consequating were noted by the raters, but no reliability was determined on these.

In determining interrater reliability, ten days of observational data, selected randomly and concerning each of these two areas, were utilized. A Pearson product moment correlation was used to determine the interrater reliability. This reliability for higher-order questions was .97, and the reliability for teacher consequation was .95.

During the experiment, the observation corridor was not used by the raters because of auditory difficulties. Instead, the raters were stationed inside the social studies classroom near the group of eight students taught by the classroom teacher. They were introduced to the students as participants in a microteaching project. The students recognized the raters as directors of the School of Education microteaching clinic, a pre-practicum program for University of Massachusetts student teachers. Therefore, they did not associate the raters with this experiment.

The after-school microteaching sessions in which the selected students practiced question asking were conducted by a School of Education doctoral student who had had four years of classroom teaching experience. Instruction in the various question types had been presented to this teacher prior to the after-school training sessions. During these microteaching sessions, a supervisor was present to make frequency

counts of questions asked, to videotape the microteaching sessions, and to give feedback to the students on their question-asking performances. The supervisor was a University of Massachusetts undergraduate who had received instruction in the various categories of questions and in the use of the one-half-inch videotape recorder.

Procedure

The dependent variable measure is the number of student-initiated, content-related, higher-order questions asked by the four trained students in their regular classroom. Records were also kept of the number of student-initiated, content-related, higher-order questions asked by the four students not trained in questioning behavior; and of teacher consequation of student-initiated, content-related, higher-order questions. Consequation was considered to have occurred when the teacher responded to the higher-order question asked. Rate of higher-order question asking by the trained and untrained students was plotted as a frequency distribution over time in terms of the number of higher-order questions asked during each session. Teacher consequation was recorded for each higher-order question asked. Anecdotal records were kept of teacher behaviors exhibited during consequation.

The basic procedure used in this experiment was to present the four selected students with instruction and

training in higher-order question asking through the micro-teaching procedure adapted for students. The higher-order question-asking behavior of these four students was then reinforced in their social studies classroom through a token economy. The five phases of the experiment are described below.

I. Baseline

The two raters analyzed classroom interaction during the social studies class. They kept records of the number of content-related, higher-order questions asked by the trained and untrained students and of teacher consequation of these questions. Baseline data were gathered in Sessions 1 through 8. No reinforcement for student-initiated, content-related, higher-order questions was administered in this phase.

II. Microteaching

Four microteaching training sessions took place after school. They lasted from 2:30 P.M. to 4:00 P.M. The first microteaching session was conducted on October 13. During this session, the four students read Symbolic Model 1, Content-related Questions (referred to as subject questions for vocabulary purposes), viewed the four-minute perceptual model, and read the videotape typescript. A ten-minute lesson was taught to the four students. The students were instructed to ask content-related questions during the period of instruction. This short lesson was videotaped, and the number of content-related questions asked was tallied by the

supervisor. During this first instructional segment, nine questions were asked by Beth, four by Alane, none by Paul, and none by Amy. The students' performances were discussed with them by the supervisor and the videotape of the lesson was reviewed. Paul and Amy were encouraged to ask more questions. A second ten-minute lesson was taught to the students and the number of questions asked was tallied by the supervisor. During this lesson, nine questions were asked by Alane, six by Beth, two by Paul, and none by Amy. According to the instructor and the supervisor, Beth's decrease in question asking appeared to be caused by the instructor's refusal to recognize her unless she raised her hand.

The second microteaching session was held on October 15. Again, the lessons were videotaped; questions were tallied; and feedback was given by the supervisor. The lessons taught were remedial, and only Paul and Amy were instructed to ask content-related questions. During the first lesson taught, one question was asked by Paul and none by Amy. During the second lesson, eight questions were asked by Paul, and Amy asked her first question. During the third and fourth sessions, only Amy was instructed to ask questions. She asked two during the third session and three during the fourth. After these four remedial lessons, the four students were presented with Symbolic Model 2, Higher-order Questions. The remainder of this training session was spent in discussion of higher-order and lower-order questions. Confusion

was exhibited by all four students on ways to discriminate between the two question types.

The third training session took place on October 20. The higher-order questioning perceptual model was viewed, and the typescript of the model was read. Further discussion of ways to distinguish between the two types of questions took place. The students were presented with the following key phrases to aid them in the formulation of higher-order questions: (1) Why? (2) What would happen if . . .? (3) How can you solve the problem of . . .? (4) How would you compare . . .? (5) What was the cause of . . .? (6) Which do you think is better . . .? and (7) What is your opinion of . . .? It was explained to the students that these were only a few of the many possible phrases with which to begin higher-order questions. It was also explained that it was possible, on occasion, to begin a question with one of these phrases and for a lower-order question to result. After this discussion, the students visited the store where they examined the displayed items with their attached point values. This session ended with a five-minute lesson in which the asking of higher-order questions was practiced by the students. All four students participated in the ten-minute lesson. Eleven questions were asked by Beth, ten by Alane, eight by Paul, and seven by Amy.

The last training session took place on October 22. During a ten-minute practice lesson, ten higher-order questions

were asked by Paul, nine by Alane, eight by Beth, and seven by Amy. It was noted that questioning behavior had increased markedly from the first to the fourth session for all students except Beth who had begun at a high rate of question asking. Frequency of question-asking behavior during the microteaching sessions is summarized in Table 4.

It was determined that rate of higher-order question asking was sufficiently high for reinforcement to begin. This last microteaching session concluded with the following instructions to the students.

> You have spent quite a bit of time studying different kinds of questions. Now you will try to ask as many thought questions as you can in your Mark's Meadow social studies class.
>
> During your social studies class, you will receive one point every time you ask a thought question about the subject the class is discussing. Raters will watch you from the observation corridor. They will count the number of questions each of you asks. The raters will tell me how many points each of you has earned.
>
> At 2:30 P.M. every day you have social studies, I will tell you how many points you have earned. Then, if you wish, you can go to the store and trade in your points for one of the toys and games. If you like, you can save your points and then exchange them for something that costs more points than you can earn in one day.

During the microteaching phase, data were gathered in Sessions 9 through 12. It was of interest to the experimenter to interview the instructor and the supervisor of the microteaching sessions after the first and after the last session regarding the ability of the four students to ask higher-order questions. Both agreed to a large extent on their opinions about the students. After the first session, it was

TABLE 4

QUESTION ASKING DURING MICROTEACHING TRAINING

Microteaching Lessons	Alane	Paul	Beth	Amy
Frequency Count by Lesson of Student-Initiated Content-related Questions				
Lesson 1	4	0	9	0
Lesson 2	9	2	6	0
Lesson 3	*	1	*	0
Lesson 4	*	8	*	1
Lesson 5	*	*	*	2
Lesson 6	*	*	*	3
Frequency Count by Lesson of Student-Initiated, Content-related, Higher-order Questions				
Lesson 7	10	8	11	7
Lesson 8	9	10	8	7

*Indicates request to student not to ask questions.

indicated by both that Alane and Beth would have little trouble asking higher-order questions. Reservations were expressed about Amy who appeared quiet and shy and unable to speak in front of others, and about Paul who seemed to think too slowly to formulate higher-order questions during the fast pace of classroom verbal interaction. After the final microteaching session, the supervisor and the instructor were asked if their opinions had altered in any way. Opinions

concerning Alane and Beth remained the same. It was thought that Paul and Amy would never attain high rates of higher-order question asking, but would be able to ask some higher-order questions during their Mark's Meadow social studies class.

III. Reinforcement

In this phase, a point was awarded for every content-related, higher-order question asked by a subject. Judgments of the cognitive level of questions were made by the two raters. Number of points earned was presented to the students at 2:30 P.M. on each day that a social studies lesson occurred. Points could be accumulated over a period of sessions and thus be exchanged for items with a point value higher than that which could be earned in a single session. A point chart was set up next to the store, and on this chart records were kept of the number of points each of the four students earned and exchanged.

Occasionally material reinforcement was paired with social reinforcement, for students were often praised when they asked many higher-order questions and were prompted to do more question asking when they asked few higher-order questions. Reinforcement data were gathered on Sessions 13 through 21.

IV. No Consequation

Reinforcement was terminated in this phase. This phase was an attempt to reverse the effects of the

independent variable manipulations made in Phases II and III.

Before this phase was initiated, the following explanation was given to the students:

> It is almost time for Thanksgiving vacation, and the two raters and I will be going out-of-town to celebrate this holiday. We are not sure exactly when we will come back. We will probably come back sometime shortly after Thanksgiving. While we are gone, you will not get any points for thought questions that you ask. We will take the toys and games in the store with us so that nothing will happen to them while we are gone.
>
> As soon as we get back from our vacation, we will get in touch with you. Then you will get points again for the higher-order questions that you ask during your social studies class. You will be able to trade these points in for toys and games at the store, just as you have been doing.
>
> You may exchange the points you have earned so far, or you may save them and add to them when you start earning points again.

During the No Consequation phase, data were gathered in Sessions 22 through 27.

V. Reinforcement II

Experimental Phase III was reinstated. This experimental phase was included to complete the attempted demonstration of reversal of the effects of consequation.

During the Reinforcement II phase, data were gathered in Sessions 28 through 32. The period during which the experiment was conducted included one school holiday, three canceled classes, and Thanksgiving vacation.

for verbal interaction throughout the experiment was 74 percent. The percentage of classroom interaction time available during each session is indicated in Table 5.

It was noted in the previous chapter that the students in the social studies class met occasionally as a total group and, more frequently, in three small groups of eight each. The classroom organizational structure in which the twenty-four students met as one group was considered to be large-group instruction. The classroom organizational structure in which the twenty-four students met in three groups of eight each was considered to be small-group instruction.

It was of interest to compare the amount of verbal interaction time spent in large-group instruction and the amount of verbal interaction time spent in small-group instruction. It was found that a total of fifteen hours was available for verbal interaction and question asking. Of this amount, ten hours and ten minutes were spent in small-group instruction and four hours and fifty minutes in large-group instruction. Only in Phase IV of the experiment did interaction time in large-group instruction exceed that in small-group instruction. The amount of verbal interaction time in large and in small groups is summarized by phase in Table 6.

The frequency of student-initiated, higher-order question asking for small-group and large-group instruction was compared. It was found that the mean number of higher-order questions asked by the eight students per five-minute interval

TABLE 5

PERCENTAGE OF CLASSROOM TIME AVAILABLE FOR VERBAL INTERACTION

Phase	Session	Percentage of Classroom Time Available for Verbal Interaction
Baseline	1	100
	2	100
	3	100
	4	100
	5	100
	6	100
	7	29
	8	100
Microteaching	9	100
	10	100
	11	67
	12	88
Reinforcement	13	78
	14	75
	15	75
	16	25
	17	50
	18	38
	19	25
	20	25
	21	100
No Consequation	22	68
	23	100
	24	38
	25	38
	26	100
	27	75
Reinforcement 2	28	100
	29	25
	30	63
	31	100
	32	100

*Mean percentage of classroom time available for verbal interaction = 74 percent.

TABLE 6

AMOUNT OF VERBAL INTERACTION TIME IN SMALL- AND IN LARGE-GROUP INSTRUCTION

Phase	Number of Minutes of Verbal-interaction Time	
	Small-group Instruction[a]	Large-group Instruction[b]
Baseline	175	80
Training	115	20
Reinforcement	160	40
No Consequation	65	110
Reinforcement II	95	40
Total	610	290

[a]The classroom organizational structure in which the twenty-four students met in three groups of eight each.

[b]The classroom organizational structure in which the twenty-four students met as one group.

in small-group instruction was higher than the mean number asked during large-group instruction in all phases of the experiment. During Phase I, there were five times as many questions asked per five-minute interval in small-group instruction as in large-group instruction. During Phase II, no questions were asked in the large group, while .71 questions were asked per five-minute interval in the small group. During Phase III, 50 percent more questions were asked in small-group instruction than in large-group instruction.

During Phases IV and V, the mean number of questions asked per five-minute interval was approximately twice as high in small-group instruction as in large-group instruction. Frequency of student-initiated, higher-order questions per five-minute interval by phase is indicated in Table 7.

Rate of Response

The data on rate of response are presented in Figures 1 through 10. In each of these ten figures, special notations occur on four different sessions: (a) in Phase II, immediately preceding Session 11, the trained students were encouraged in their microteaching lesson to ask higher-order questions in their Mark's Meadow social studies class, even though they would not yet receive points for doing so; (b) in Phase III, Session 17, Alane was appointed class secretary for the period, and much of her time was occupied in note taking; (c) in Phase V immediately preceding Session 31, three of the trained students, Alane, Paul, and Amy, received an extra microteaching session, and the cost of a number of the store's high-value items was reduced; (d) immediately preceding Session 32, Beth, the remaining trained student, received an extra microteaching lesson.

The data presented in Figure 1 are based on the mean number of higher-order questions asked per five-minute interval by session for the four students trained in question-asking behavior. The data presented in Figure 2 are based on

TABLE 7

FREQUENCY OF HIGHER-ORDER QUESTIONS ASKED PER FIVE-MINUTE INTERVAL IN SMALL AND IN LARGE GROUPS FOR TRAINED AND UNTRAINED STUDENTS

Phase	Number of Minutes of Verbal Interaction Time during Small-group Instruction	Mean Number of Questions Asked during Small-group Instruction per Five-Minute Interval	Number of Minutes of Verbal Interaction Time during Large-group Instruction	Mean Number of Questions Asked during Large-group Instruction per Five-Minute Interval
Baseline	175	.71	80	.13
Training	115	.70	20	0
Reinforcement I	160	2.91	40	1.97
No Consequation	65	.69	110	.36
Reinforcement II	95	2.79	40	1.63

the mean number of higher-order questions asked per five-minute interval by session for the four students not trained in question-asking behavior. In Figures 3 through 10, each subject is represented by a figure which indicates the mean number of higher-order questions asked per five-minute interval by session for that individual. Higher-order question-asking frequency is expressed through mean number per five-minute interval because the amount of verbal interaction time varied from session to session. For the purpose of facilitating the presentation of the data in the remaining portion of this chapter, each reference to the mean number of higher-order questions asked refers to this rate per five-minute interval.

Phase I. Baseline

This phase was in effect for Sessions 1 through 8. For the four selected students, Alane, Beth, Paul, and Amy, higher-order question-asking rate stabilized at a group mean of no questions asked during large-group instruction, and at .08 questions asked during small-group instruction. During this phase, no questions were asked by Paul and Amy; one question was asked by Beth; and eleven questions were asked by Alane.

For the four students not selected, Matthew, Arthur, Billy, and Paul W., higher-order question-asking rate stabilized at a group mean of .06 higher-order questions asked in

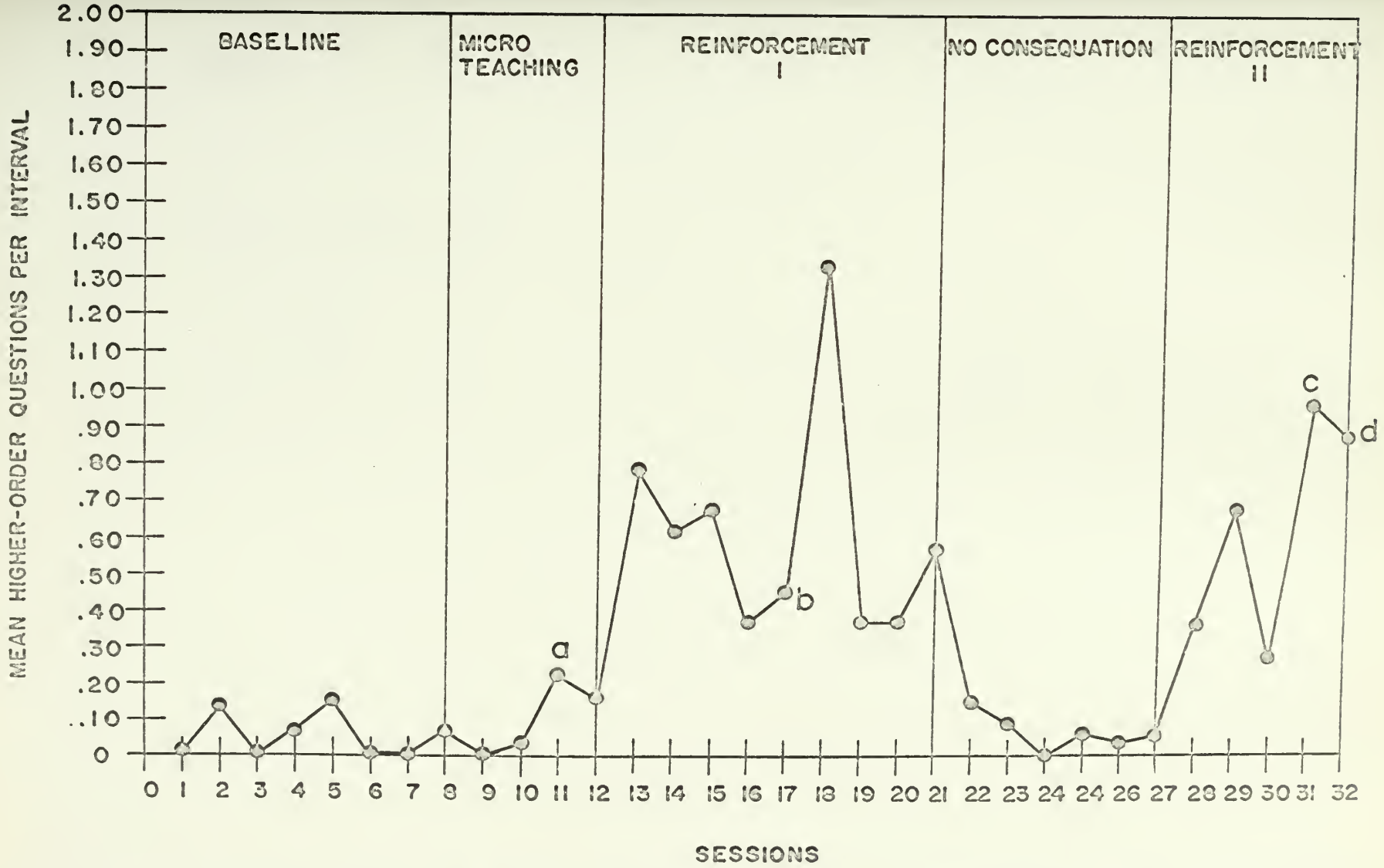

FIGURE 1. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR TRAINED STUDENTS.

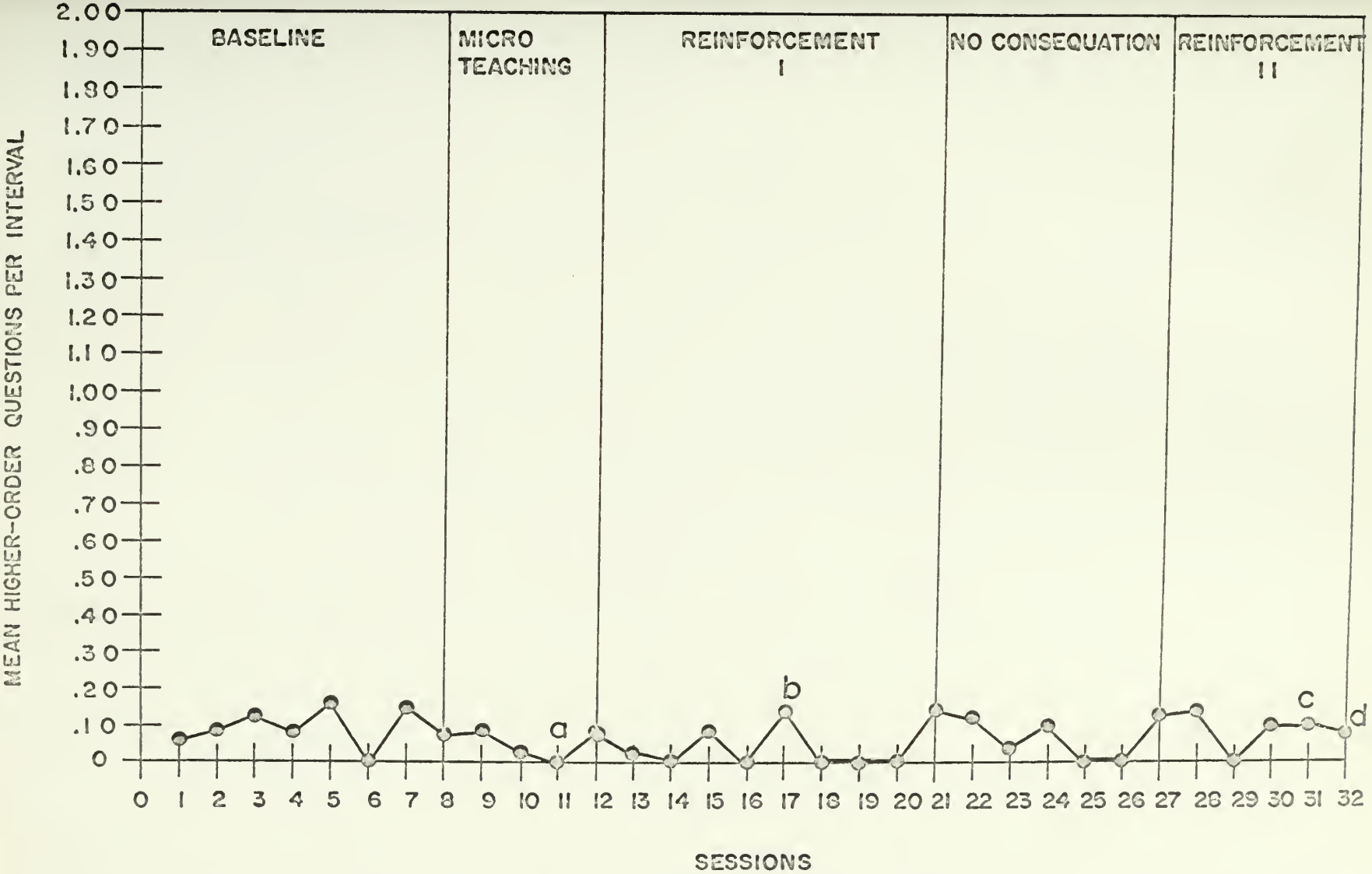

FIGURE 2. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR UNTRAINED STUDENTS.

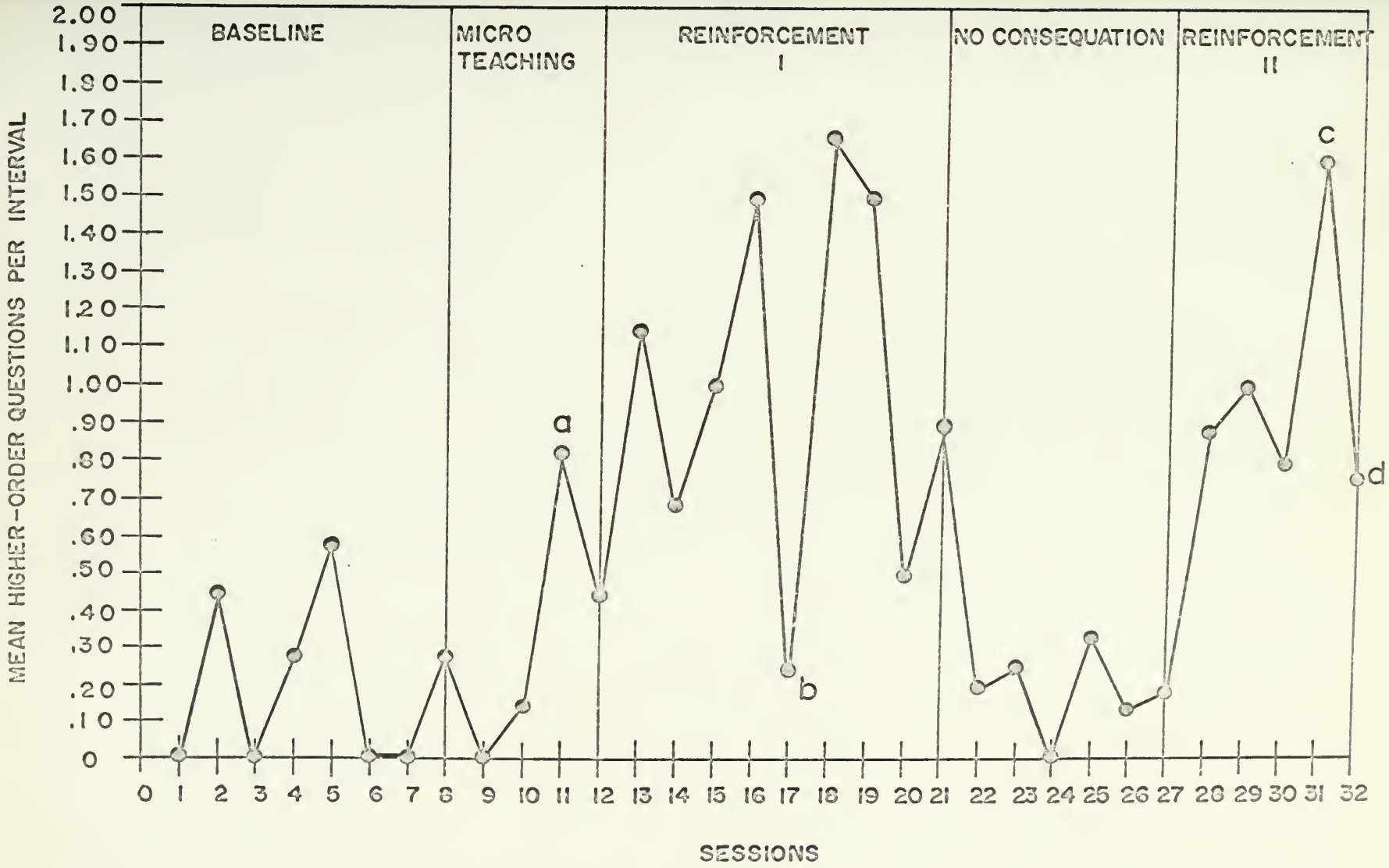

FIGURE 3. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR ALANE.

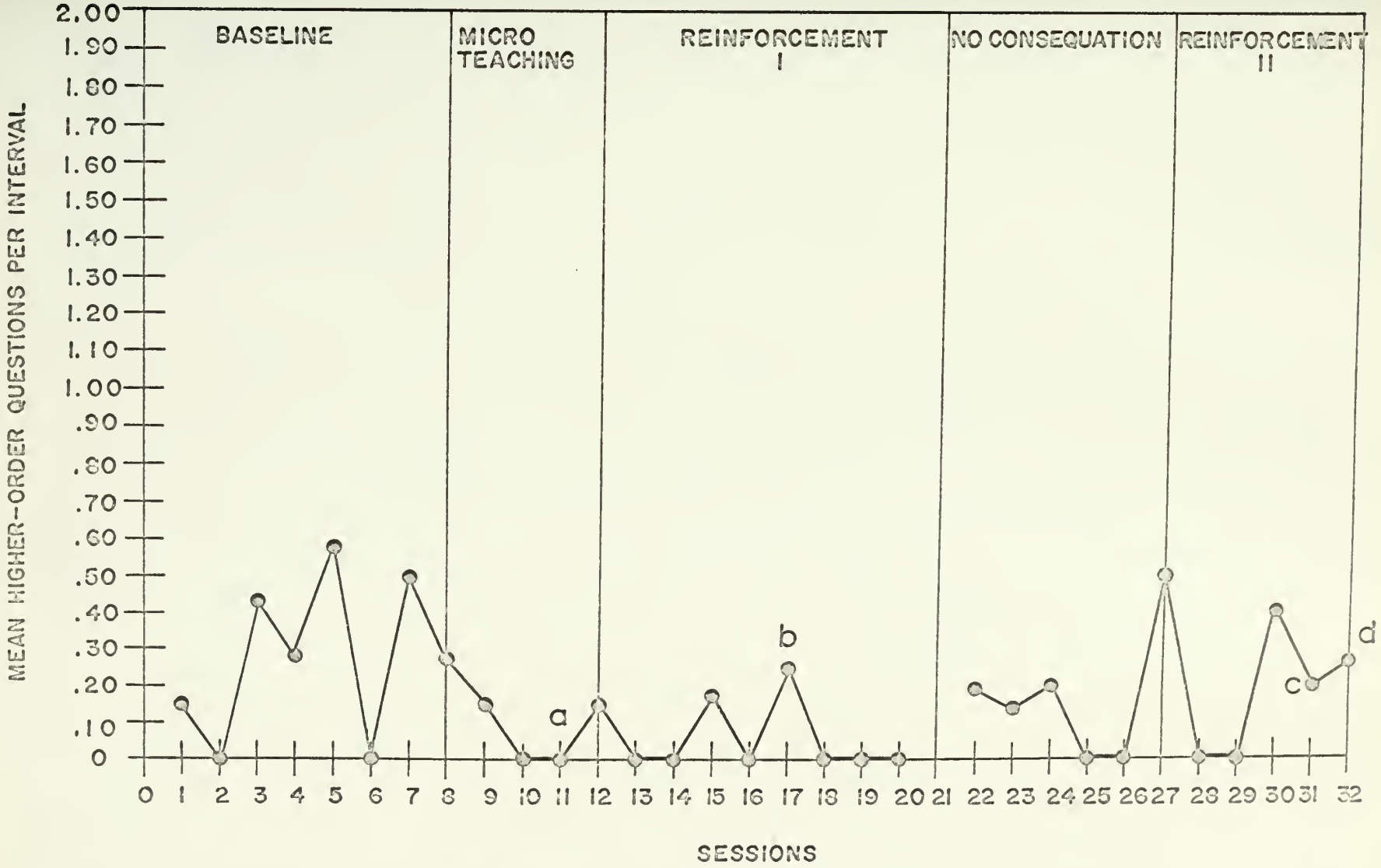

FIGURE 4. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR MATTHEW.

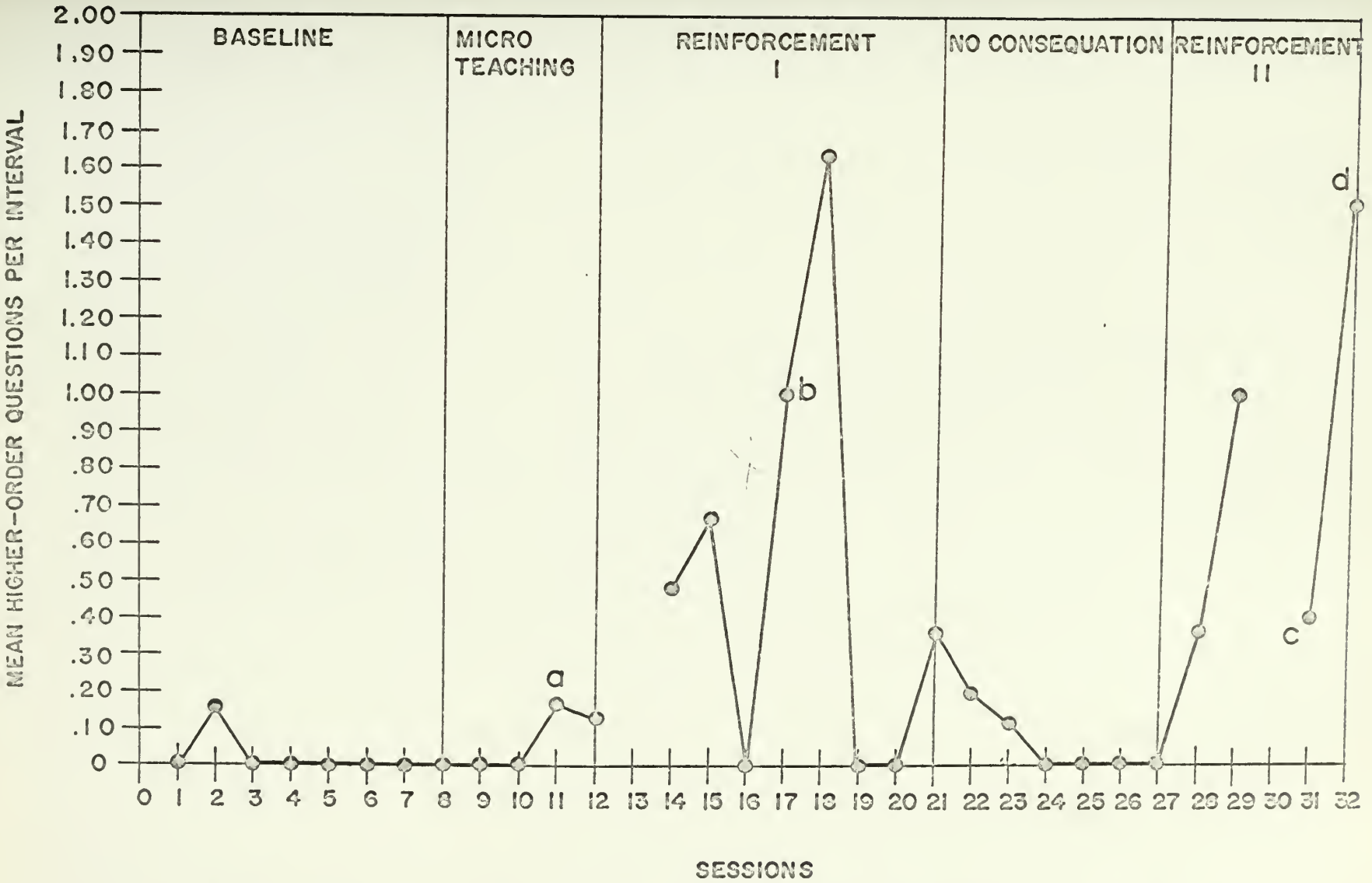

FIGURE 5. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR BETH.

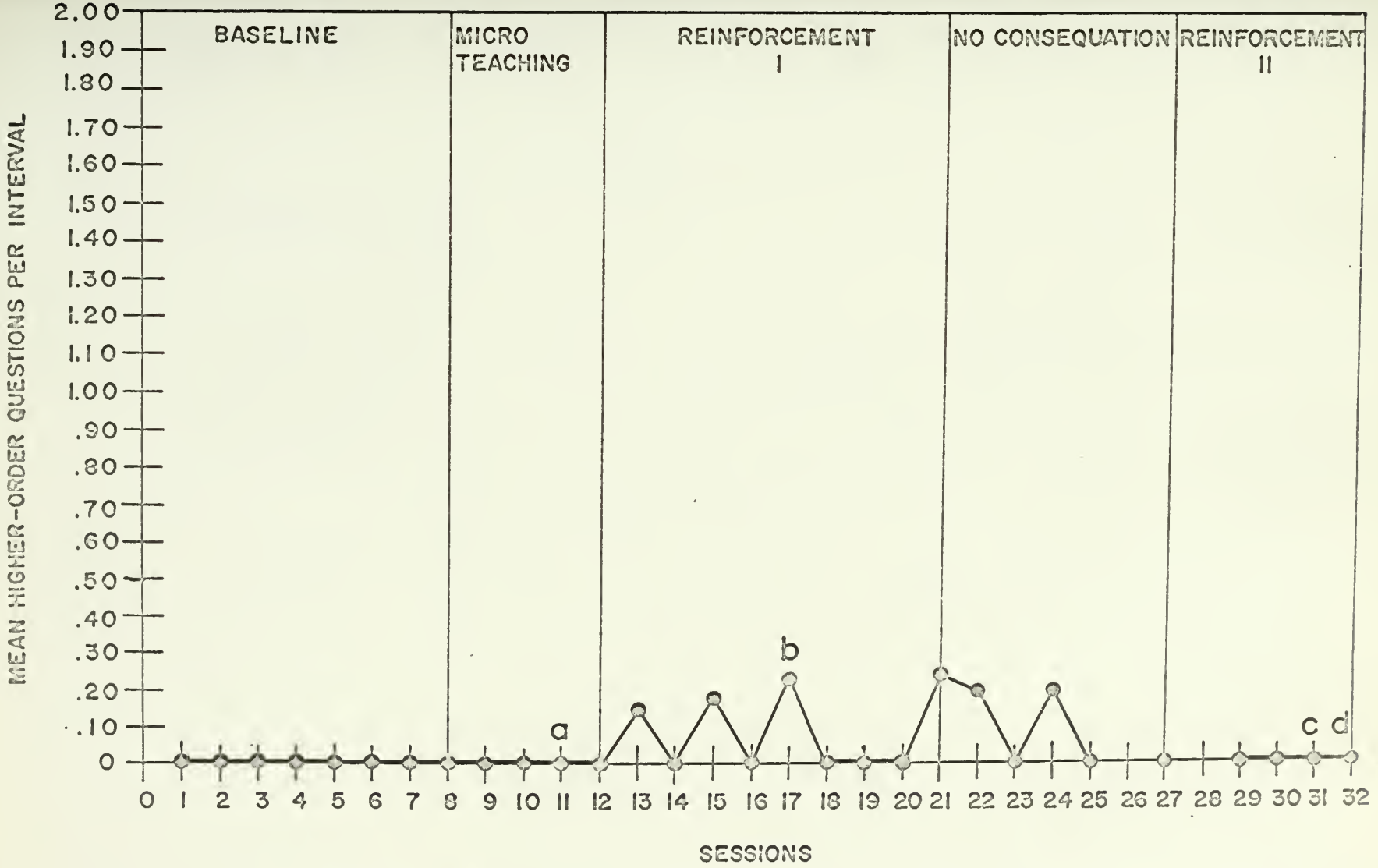

FIGURE 6. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR ARTHUR.

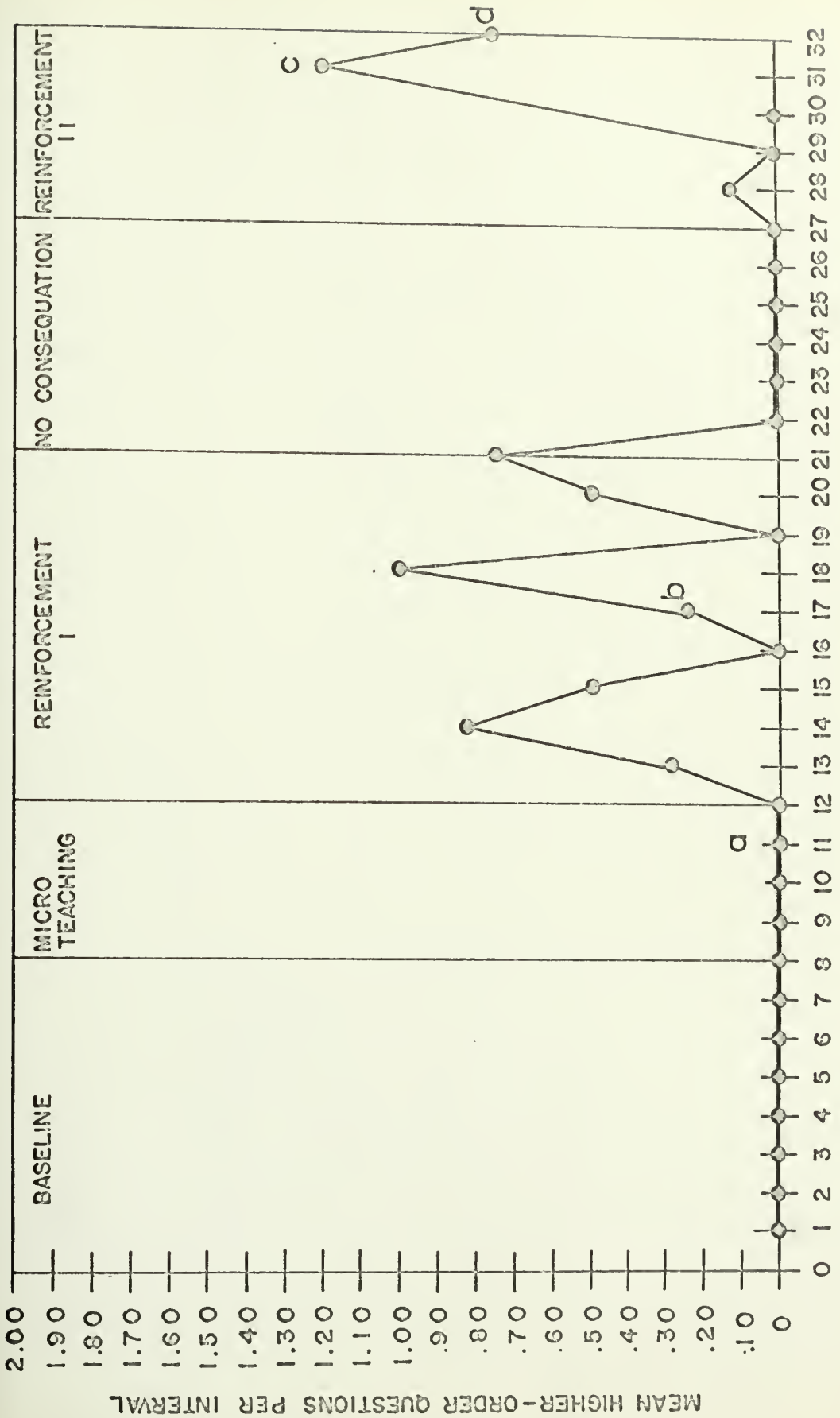

FIGURE 7. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR PAUL P.

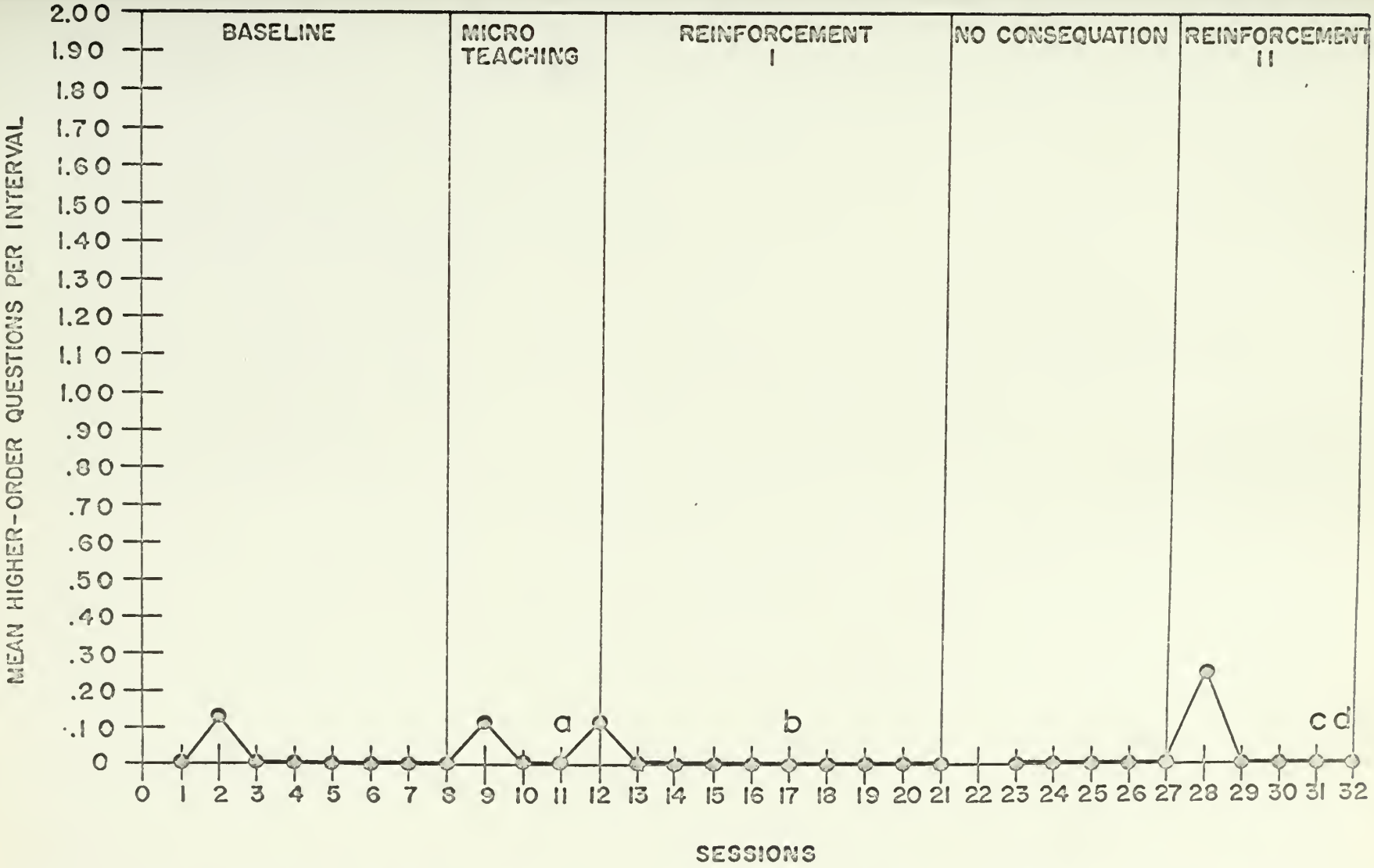

FIGURE 8. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR BILLY.

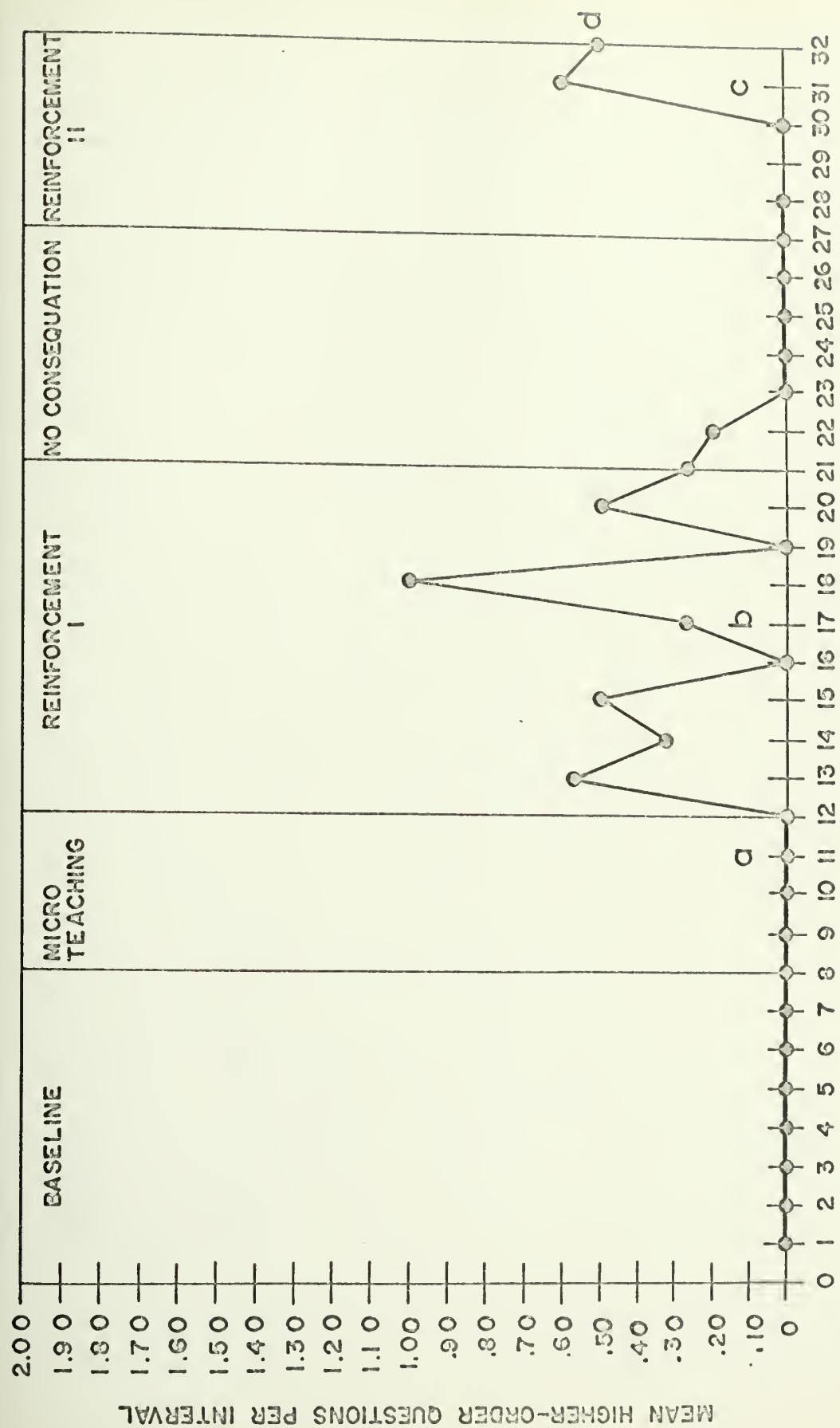

FIGURE 9. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR AMY.

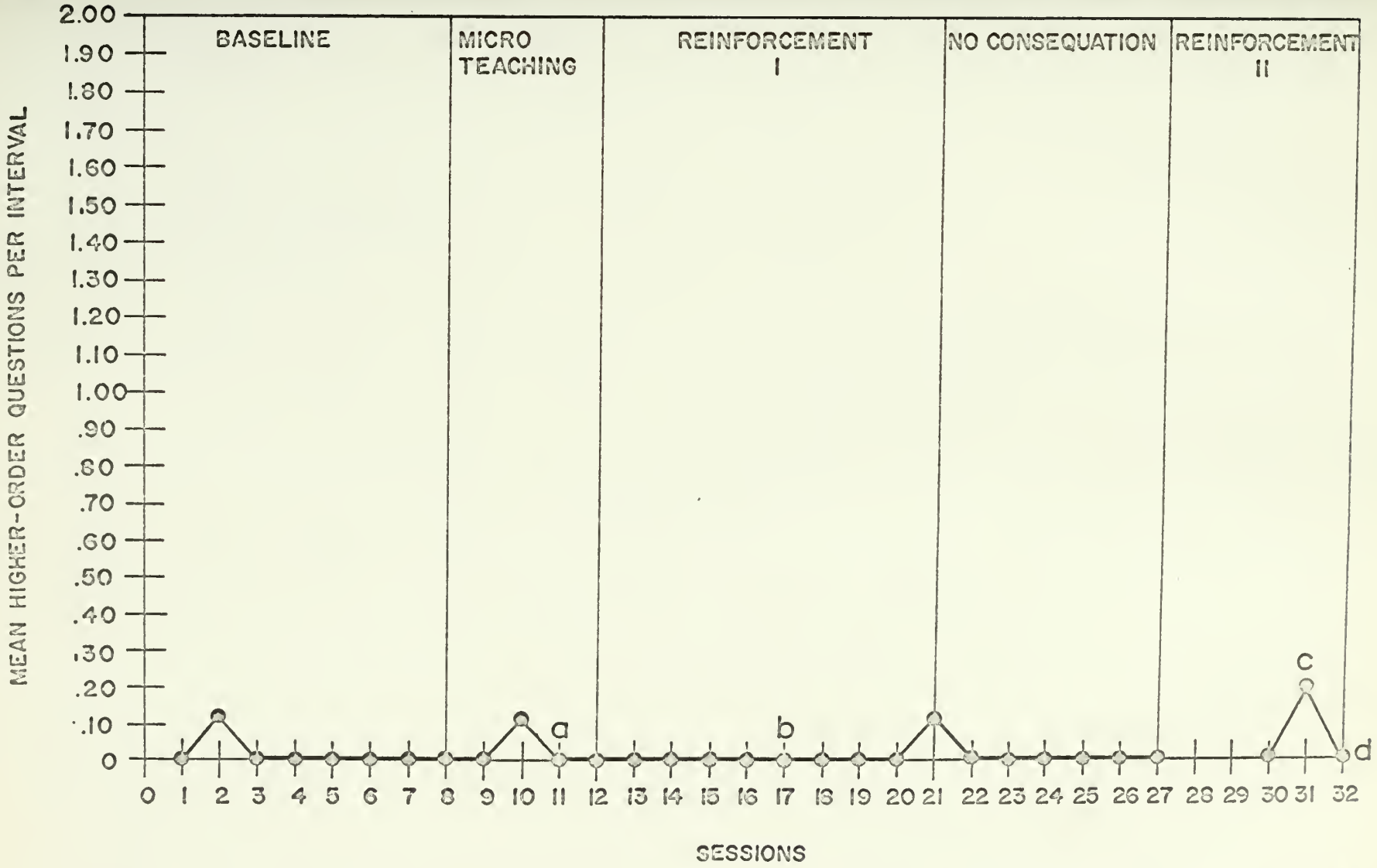

FIGURE 10. MEAN HIGHER-ORDER QUESTIONS PER INTERVAL FOR PAUL W.

large-group instruction and .09 asked in small-group instruction. No questions were asked by Arthur; one was asked by Billy; one, by Paul W.; and thirteen, by Matthew.

Phase II. Microteaching

This phase began with Session 9 and ended with Session 12. During this phase, the selected students were receiving training in question-asking behavior in their microteaching lessons. During the ninth and tenth sessions of this phase, the rate of higher-order question-asking behavior remained low for the trained students, averaging .02. However, in the microteaching lesson which preceded the eleventh classroom session, these four students were encouraged to practice asking higher-order questions in their social studies class. During the eleventh and twelfth sessions, the higher-order question-asking rate of these four students increased to a mean of .20.

The higher-order questioning rate for each trained student during Phase II is reported below. No questions were asked throughout this phase by Amy and Paul. Alane's rate of higher-order questioning for the ninth and tenth sessions averaged .07. This rate increased to .63 for the eleventh and twelfth sessions. Beth asked no questions during the ninth and tenth sessions. Her rate increased to .16 for the eleventh and twelfth sessions.

During this phase, the mean rate of higher-order

question asking for the group of untrained students averaged .06 for Sessions 9 and 10, and .04 for Sessions 11 and 12. No questions were asked by Arthur; one was asked by Paul W.; and one, by Billy. Matthew's mean rate of higher-order questioning decreased to .07 for this phase.

Phase III. Reinforcement I

This phase began with Session 13 and ended with Session 21. Subjects accumulated points beginning with Session 13. The group of four trained students began this phase asking higher-order questions at the mean rate of .79 per five-minute interval. This rate decreased slightly during the next four sessions and then reached a peak of 1.33 during Session 18. The rate decreased during the next two sessions to .38 for each session and then increased for the last session to .57. The mean rate for the group of four trained students was .62 higher-order questions. A description of questioning behavior for each trained student treated individually follows.

During the first session of this phase, Alane's rate was 1.14. A high rate of higher-order questioning was maintained until Session 17 when frequency dropped to .25, her lowest rate of the phase. During this session, Alane had been appointed class secretary for the period, and the task of recording classmates' comments kept her occupied. Alane's rate reached a peak of 1.67 during Session 18. After this

session, Alane exchanged her points for a high-value item. No further points were exchanged by Alane during this phase. Alane's mean rate of higher-order question asking for Phase III was 1.01.

Beth began Phase III at the rate of 1.14 higher-order questions for Session 13. At the end of the first reinforcement session, Beth exchanged her points for a few low-value items. After this initial exchange, she expressed interest in a number of high-value items. Beth's higher-order questioning rate reached a peak of 1.16 in Session 18, after which she exchanged her points. Beth's higher-order questioning decreased after this point, and when the phase ended she was left with only a few points. During the final reinforcement session, an altercation occurred between Beth and the teacher. After this, Beth appeared depressed and commented, "I can't get the teacher to call on me any more, and now she's really mad at me." (See section on teacher consequation.) Beth's mean rate of higher-order question asking for Phase III was .61.

Paul began this phase at the rate of .29 higher-order questions asked per five-minute interval for Session 13. After this first session, there was an initial exchange of points for low-value items. Following this exchange, Paul expressed a desire for one of the highest-value items in the store. He maintained a relatively high rate of higher-order questioning throughout the phase, and no further transactions

were made until the final session of the phase. At this time, Paul had the necessary number of points to purchase the desired high-value item. Consequently, he completed Phase III with no points saved. For Phase III, Paul's average rate was .46 higher-order questions asked. His highest rate was 1.00, a level he reached during Session 18.

Amy's rate for the beginning session of the phase was .57 higher-order questions asked. At the end of this first session, Amy exchanged her points for a few candy bars, items which were low in point value. At this transaction she commented, "I'm not really hungry, but I feel as though I have to get something right away." This pattern of exchange of points for low-cost items was continued throughout Phase III for Amy. Amy's highest rate of higher-order question asking, 1.00, occurred during Session 18. Her mean rate throughout the phase was .38.

The number of higher-order questions asked by the group of four students not trained in question-asking behavior averaged .04 per five-minute interval. During this phase, no questions were asked by Billy, and one question was asked by Paul W. Arthur, who had not asked any higher-order questions since the experiment began, reached an average rate of .09 during this phase. In contrast, Matthew's rate decreased to a mean of .05 higher-order questions asked, his lowest rate since the experiment's beginning.

Phase IV. No Consequation

This phase ran from Session 22 to Session 27. The trained students were informed that no points would be awarded for higher-order question asking. Higher-order question asking decreased to an average of .07 per five-minute interval for the group of trained students. No questions were asked by Paul; one was asked by Amy; two, by Beth; and five, by Alane during this phase.

The mean number of higher-order questions averaged .05 for the group of four students not trained in question-asking behavior. No questions were asked by Billy and Paul W. during this phase. Higher-order question-asking rate averaged .08 for Arthur and increased to .17 for Matthew.

Phase V. Reinforcement II

This phase was in effect for Sessions 28 through 32. In this phase, the trained students were informed that points would again be awarded for higher-order question asking. Three of the trained students received extra microteaching training between the thirtieth and thirty-first sessions. The fourth trained student received an extra microteaching session before the thirty-second classroom session. The average rate of higher-order questioning for the group of trained students was .43 before the first extra microteaching session. A discussion of the questioning pattern of each trained student follows.

Alane's rate of higher-order question asking averaged .89 for Sessions 28 through 30. Following the extra microteaching session, her rate increased to an average of 1.18 for Sessions 31 and 32. Her consistently high rate of higher-order question asking enabled her to make a number of transactions for high-value items throughout this phase.

Beth's average rate of higher-order question asking per five-minute interval was .59 for Sessions 28, 29, and 31. Since Beth was absent during Session 30, she did not receive the extra microteaching training until after Session 31. Following this training, her rate on Session 32 increased to 1.50.

Paul began this phase at a low rate of higher-order question asking. His average rate for Sessions 28, 29, and 30 was .04 per five-minute interval. After Session 28, he explained that he had forgotten how "thought" questions differed from "memory" questions. He also indicated that he had been interested in purchasing store items to give as Christmas presents, but he felt that five sessions of reinforcement before Christmas vacation were not enough for him to earn the high-cost items in which he was interested. Following Paul's explanation, another microteaching lesson was held, and several high-cost items were reduced so as to make them obtainable before the Christmas vacation. Following these changes, Paul's higher-order question asking increased to a mean rate of .98 for Sessions 31 and 32.

During Sessions 28, 29, and 30, Amy was absent for one session and asked no questions during the other two. Her explanation was similar to Paul's. A desire was expressed for an extra microteaching lesson and for a reduction in the cost of several high-value items so that they would be obtainable before Christmas vacation. After these changes, Amy's higher-order question asking increased to a mean rate of .55 for Sessions 31 and 32.

The mean number of higher-order questions asked for the group not trained in questioning behavior was .08 during this phase. No questions were asked by Arthur; one was asked by Billy; and one, by Paul W. Matthew asked an average of .17 higher-order questions during this phase. Arthur was absent from Session 28, and Paul W. was absent from Sessions 27 and 29.

Thus, it is indicated by the data that all four trained students increased, to varying degrees, their frequency of higher-order question asking during Phases III and V. Alane, who had been designated as high in verbal participation, asked a total of ninety-two higher-order questions over the course of the experiment. Beth, described as average in verbal participation, asked a total of forty-eight. Paul and Amy had been considered low in their participation. Paul asked a total of thirty-four higher-order questions, and Amy asked a total of twenty-four higher-order questions.

The question-asking behavior of the four untrained

students remained relatively consistent over the five phases. The only changes of note were a slight decrease in higher-order question asking during Phase III for Matthew and an increase in higher-order question asking during Phases III and IV for Arthur. Matthew, who had been considered high in verbal participation, asked a total of twenty-eight higher-order questions over the course of the experiment. Arthur, described as average in verbal participation, asked seven higher-order questions. Billy, average in participation, asked five. Paul, low in participation, asked a total of four higher-order questions. The mean number of higher-order questions per phase for each of the eight students is summarized in Table 8.

Rate of Response by Category

The data on rate of response in each component category are presented in Figures 11 through 22. The five component categories which compose higher-order questions are (1) evaluation, (2) comparison, (3) problem solving, (4) cause and effect, and (5) divergent.

The data presented in Figures 11 and 12 are based on the mean number of higher-order questions asked in each of the categories by the trained group and by the group not trained, respectively. The category of higher-order questions used most frequently by both groups of students was that of cause and effect. Divergent questions were least

TABLE 8

MEAN HIGHER-ORDER QUESTIONS PER FIVE-MINUTE INTERVAL PER PHASE FOR TRAINED AND UNTRAINED STUDENTS

Students	Base-line	Micro-teaching	Reinforce-ment I	No Conse-quation	Reinforce-ment II
			Trained Students		
Alane	.20	.35	1.02	.18	1.01
Beth	.02	.08	.61	.06	.82
Paul P.	0	0	.46	0	.42
Amy	0	0	.38	.03	.28
			Untrained Students		
Matthew	.28	.07	.05	.17	.17
Arthur	0	0	.09	.08	0
Billy	.02	.07	0	0	.05
Paul W.	.02	.04	.01	0	.07

often asked by the four trained students; evaluation and divergent questions were asked least often by the four students who did not receive training.

In Figures 13 through 20, each subject is represented by a figure which indicates the mean number of higher-order questions asked in each of the five component categories per five-minute interval by session for that individual. Following is a discussion of each subject's higher-order question-asking behavior in terms of frequency by category. First,

the trained students will be considered.

The category in which Alane asked the most higher-order questions was problem solving. Cause-and-effect questions ranked second in frequency. During Phases I and II, no evaluation, comparison, and divergent questions were asked by Alane. However, questioning in these three categories increased in frequency over time. Throughout the experiment, two evaluation, four comparison, four problem-solving, twenty-four cause-and-effect, and one divergent questions were asked by Alane.

In all five phases, Beth asked cause-and-effect questions most frequently. During Phases I and II, only cause-and-effect questions were asked. During Phase III, Beth asked her first problem-solving questions. The first evaluation question was asked during Phase IV, and the first divergent questions were asked during the final phase. Throughout the course of the experiment, two evaluation, no comparison, four problem-solving, thirty-nine cause-and-effect, and two divergent questions were asked by Beth.

During Phases I, II, and IV, no questions were asked by Paul. The category used most frequently by Paul during Phases III and V was that of cause and effect. There was some attempt at use of evaluation, comparison, and problem-solving questions in Phase III. This attempt decreased to zero during Phase V. Throughout the experiment, one evaluation, one comparison, four problem-solving, twenty-eight

cause-and-effect, and no divergent questions were asked by Paul.

The cause-and-effect category was also the one used most frequently by Amy. Throughout the experiment, a few attempts were made at the asking of evaluation and comparison questions. Two evaluation, four comparison, no problem-solving, eighteen cause-and-effect, and no divergent questions were asked by Amy.

For Matthew, an untrained student, the most frequent higher-order question asking was done in the cause-and-effect category. Problem-solving questions were asked almost as frequently. There was also some attempt at the asking of evaluation and comparison questions. Throughout the experiment, Matthew asked one evaluation, three comparison, five problem-solving, six cause-and-effect, and no divergent questions.

The higher-order questioning rates of the three remaining untrained students were low. Of the seven questions asked by Arthur, six were cause and effect and one was problem solving. Of the five questions asked by Billy, four were problem solving and one was cause and effect. Paul W. asked two problem-solving, one cause-and-effect, and one divergent questions.

Thus, three of the trained students and two of the students who were not trained used the cause-and-effect category most often. One trained student and two untrained

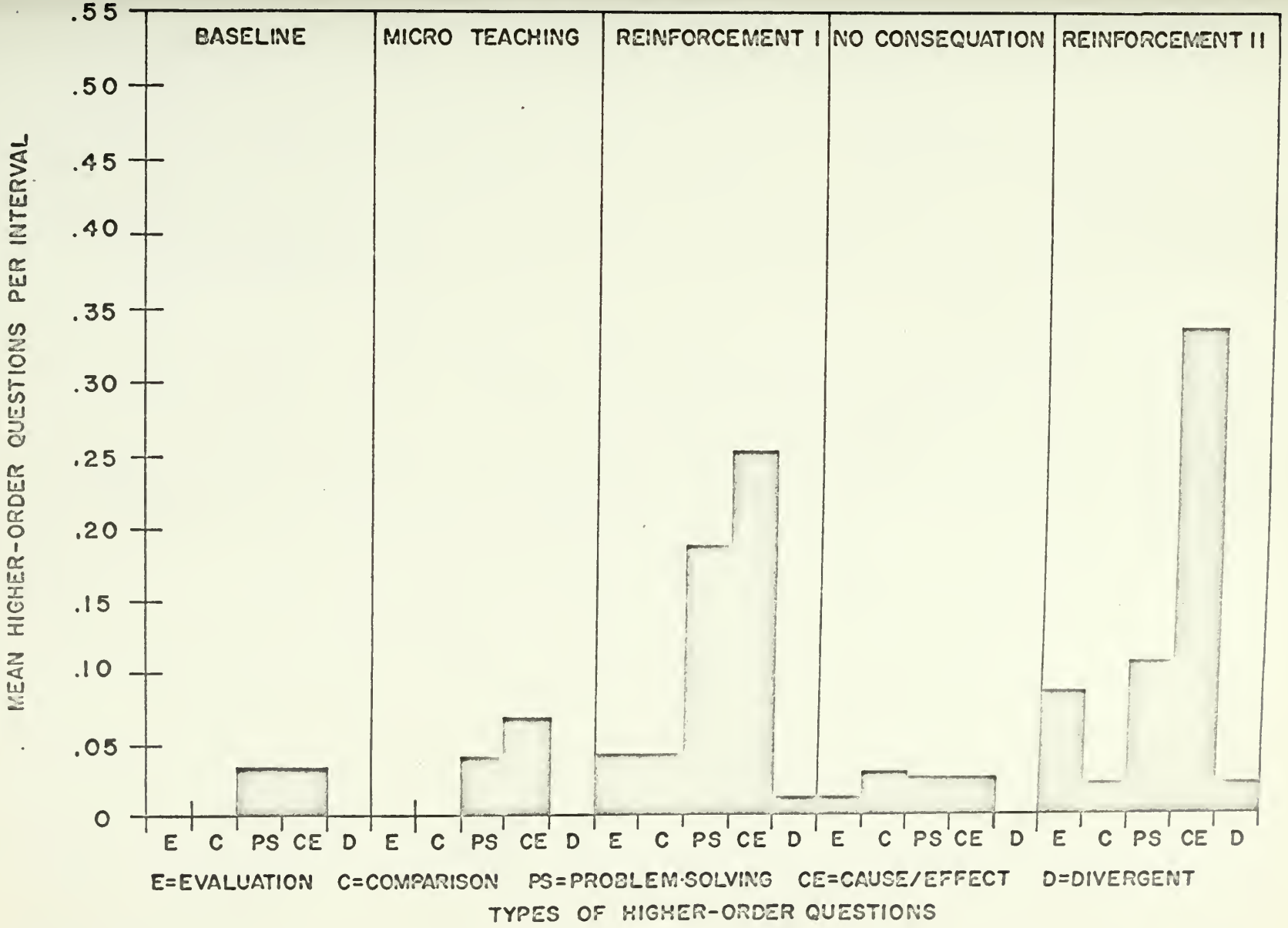

FIGURE 11. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR TRAINED STUDENTS.

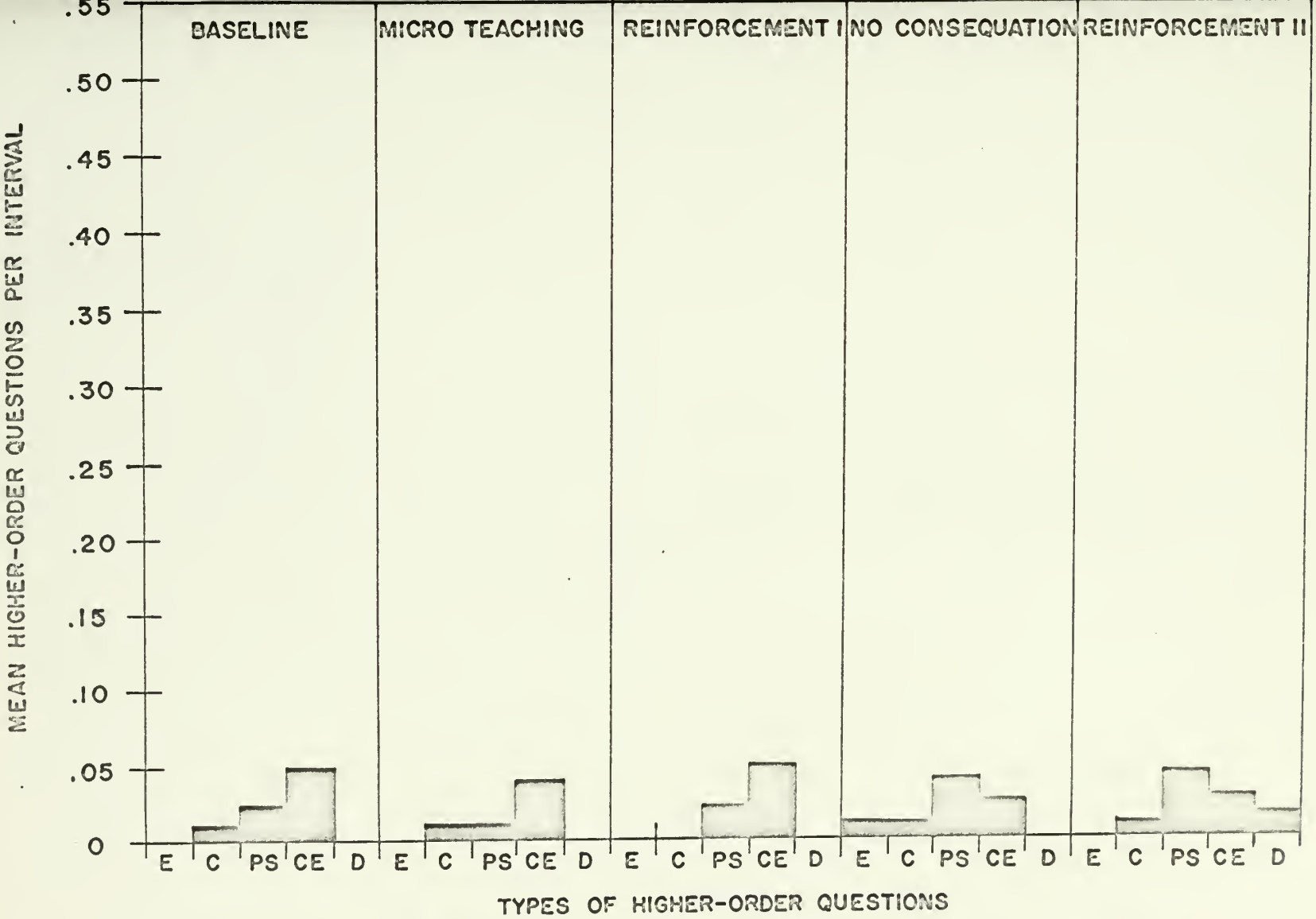

FIGURE 12. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR UNTRAINED STUDENTS.

E=EVALUATION C=COMPARISON PS=PROBLEM SOLVING CE=CAUSE/EFFECT D=DIVERGENT

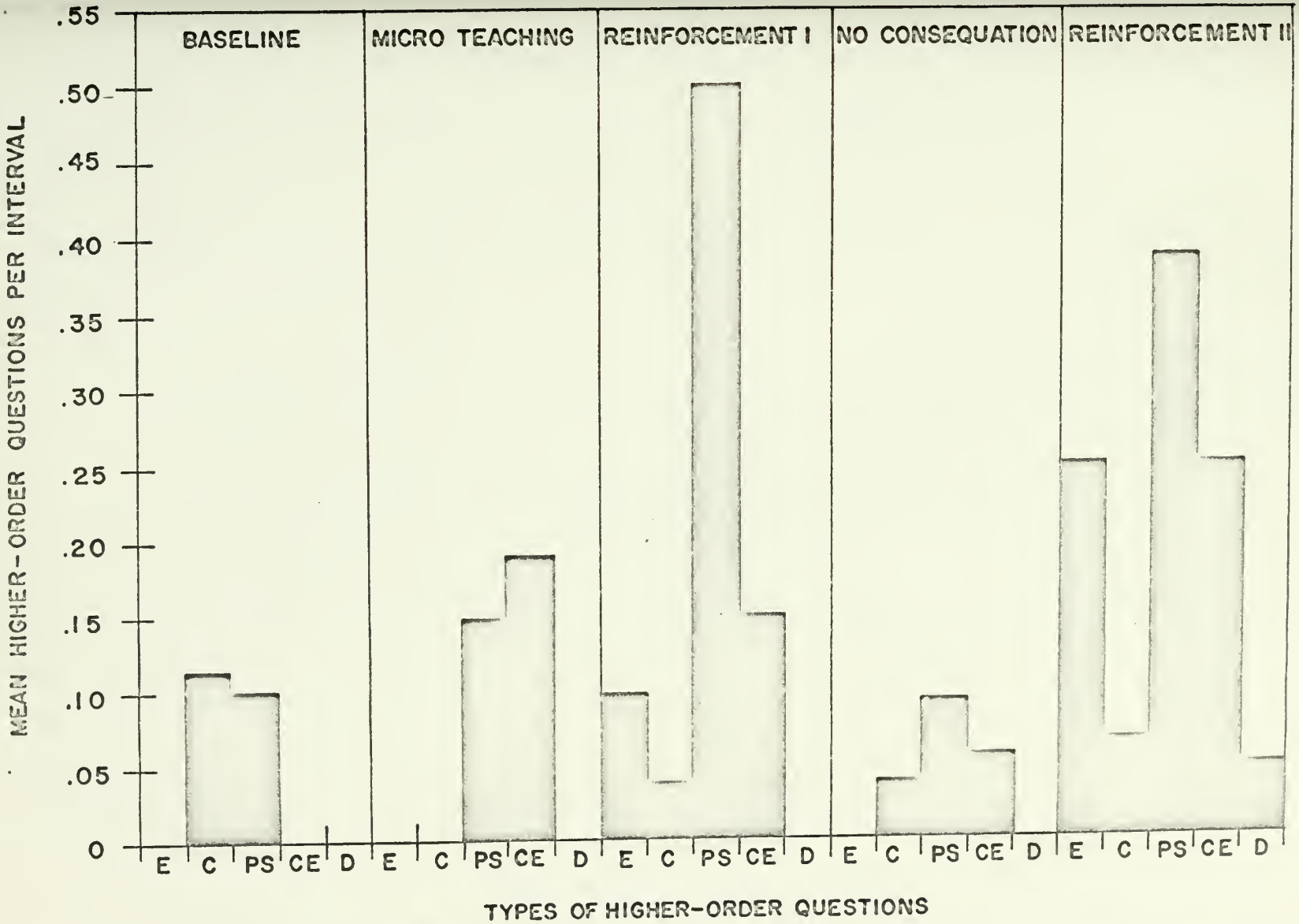

FIGURE 13. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR ALANE.

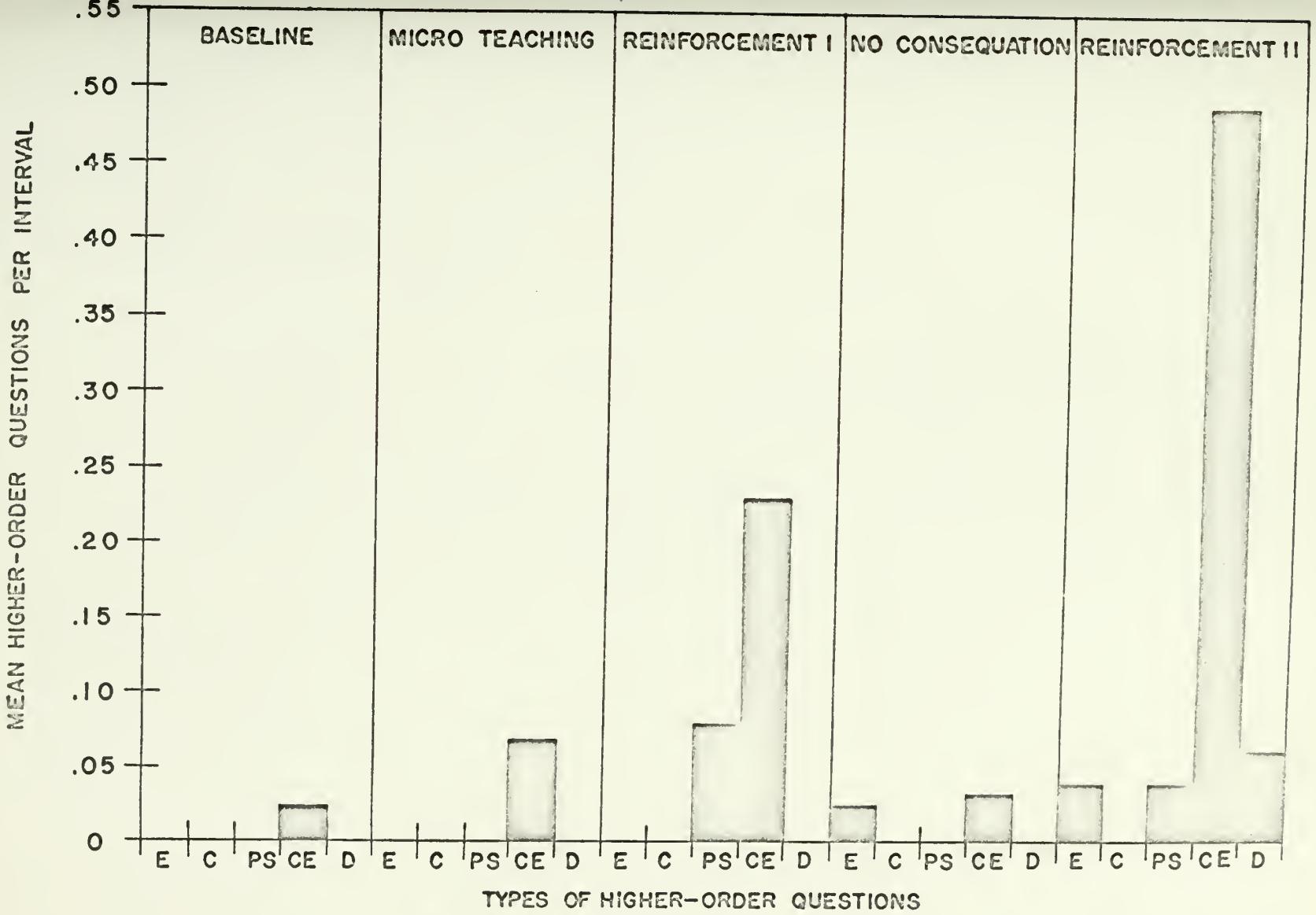

FIGURE 14. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR BETH.

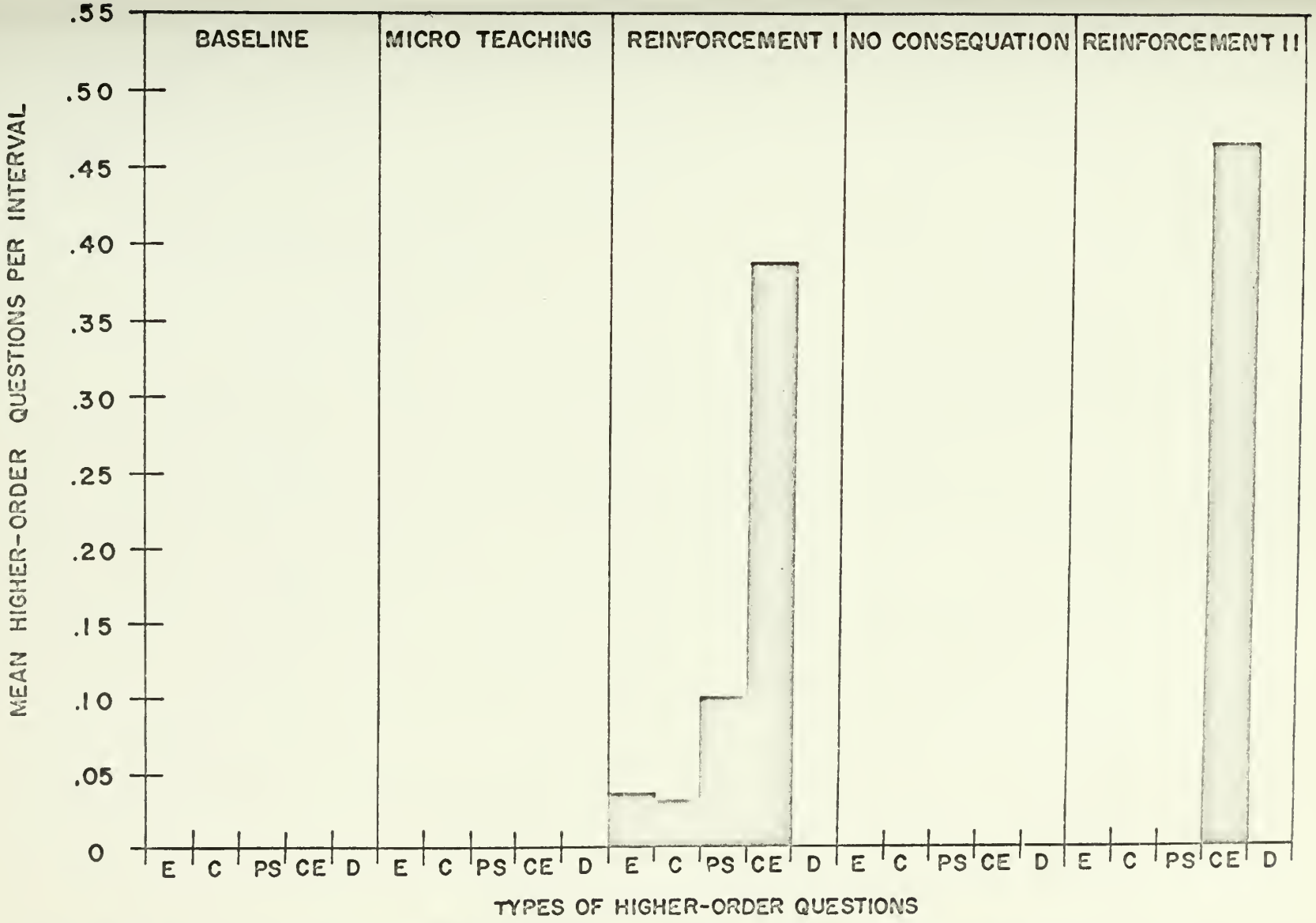

FIGURE 15. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR PAUL P.

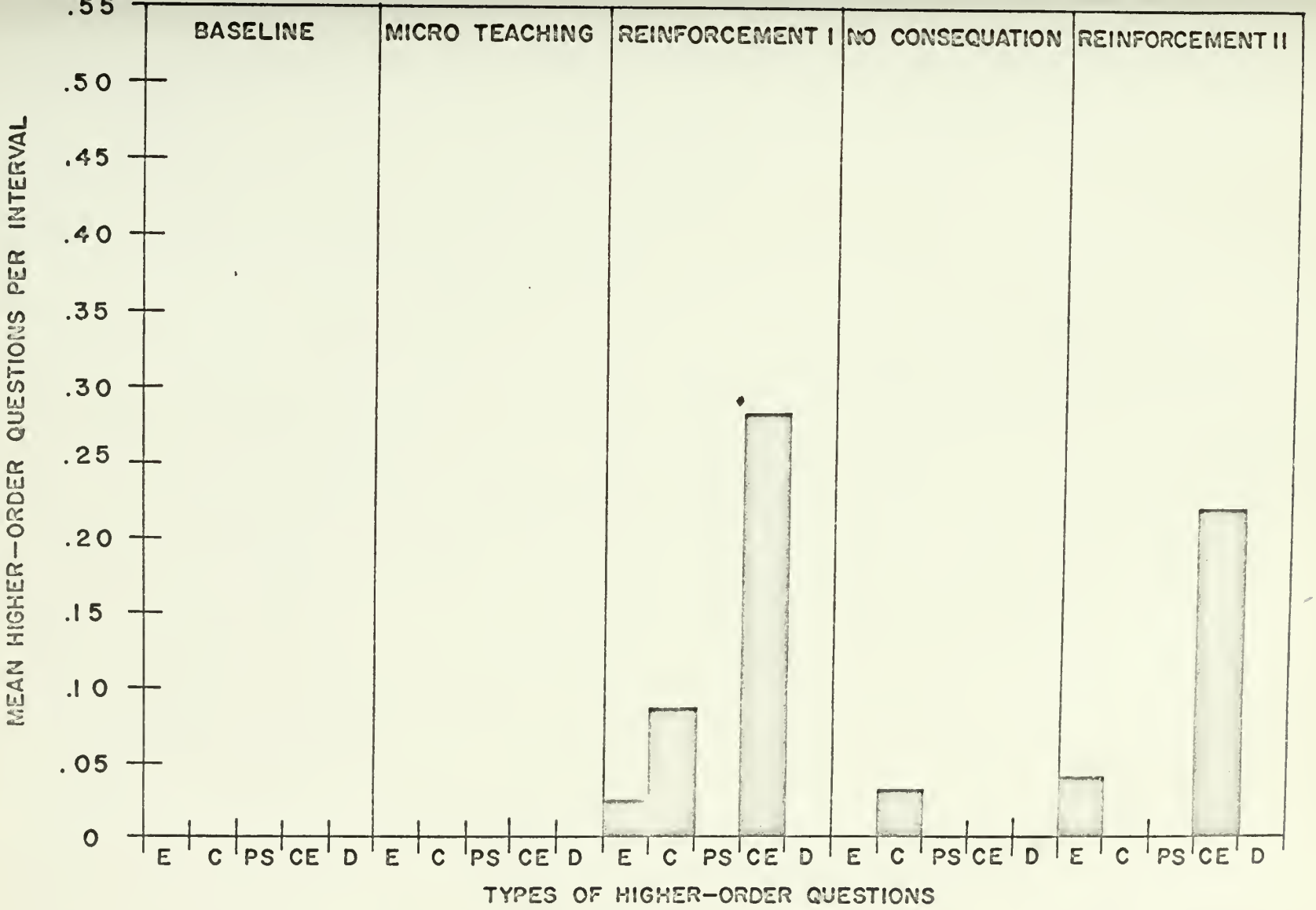

FIGURE 16. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR AMY.

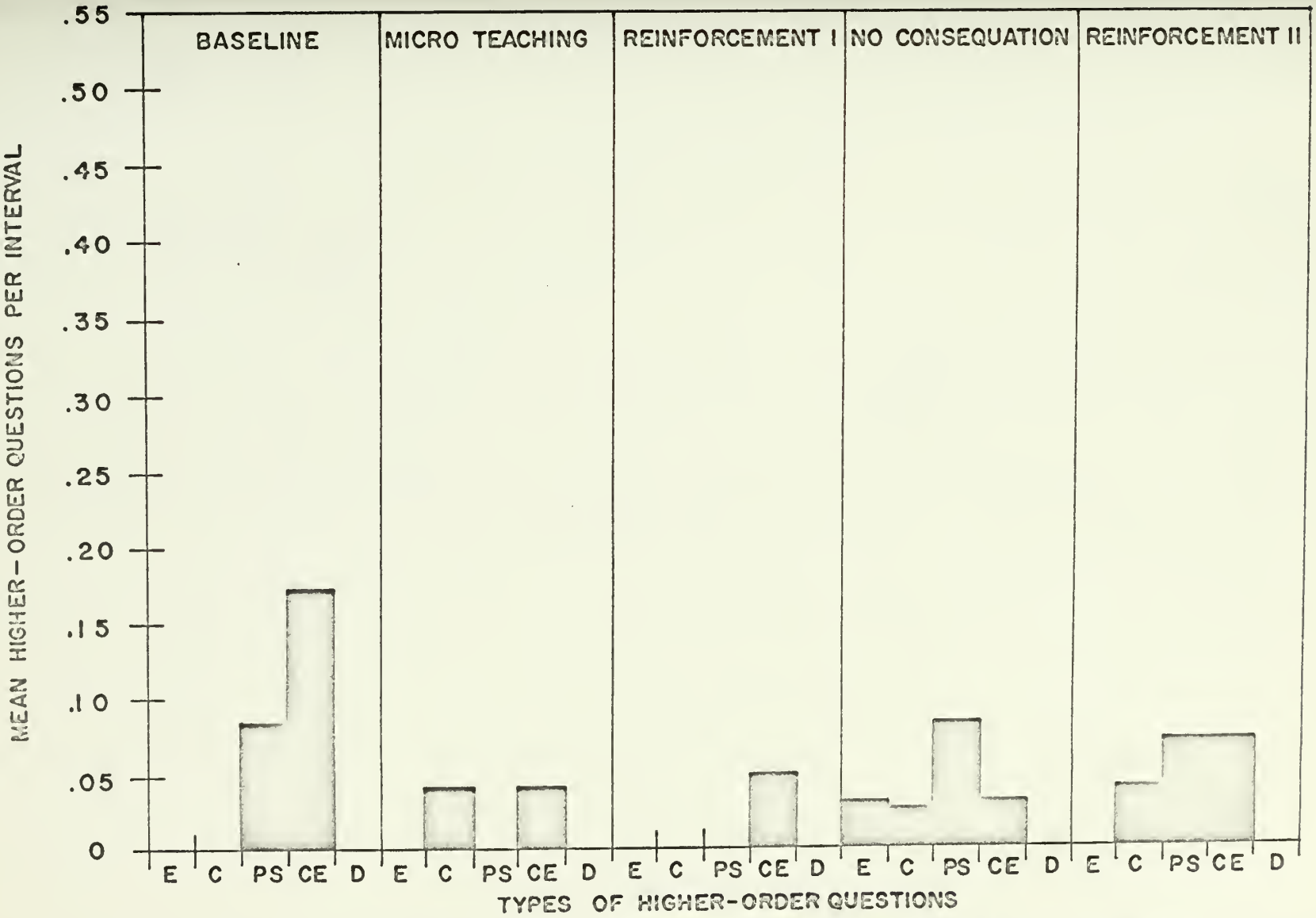

FIGURE 17. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR MATTHEW.

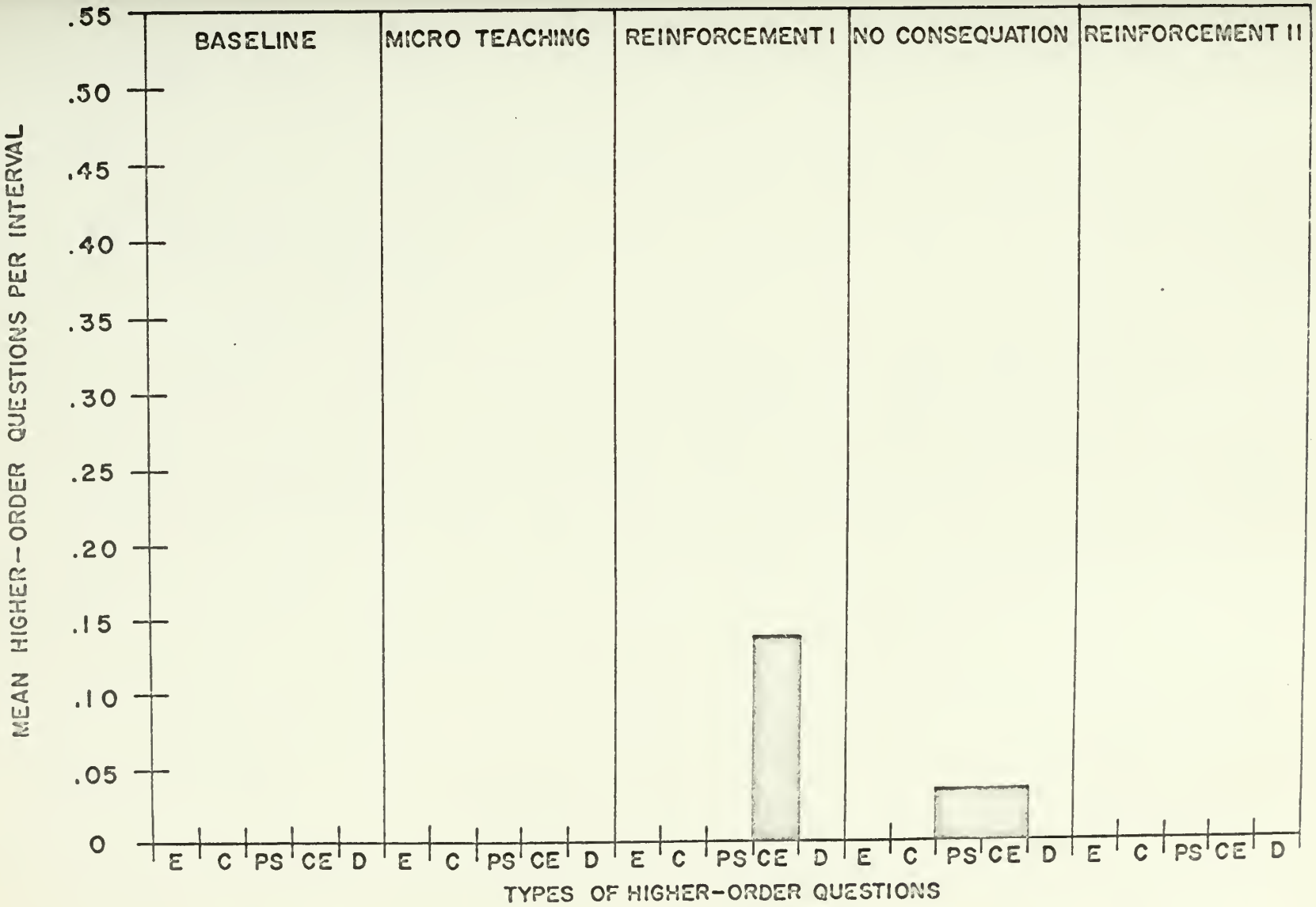

FIGURE 18. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR ARTHUR.

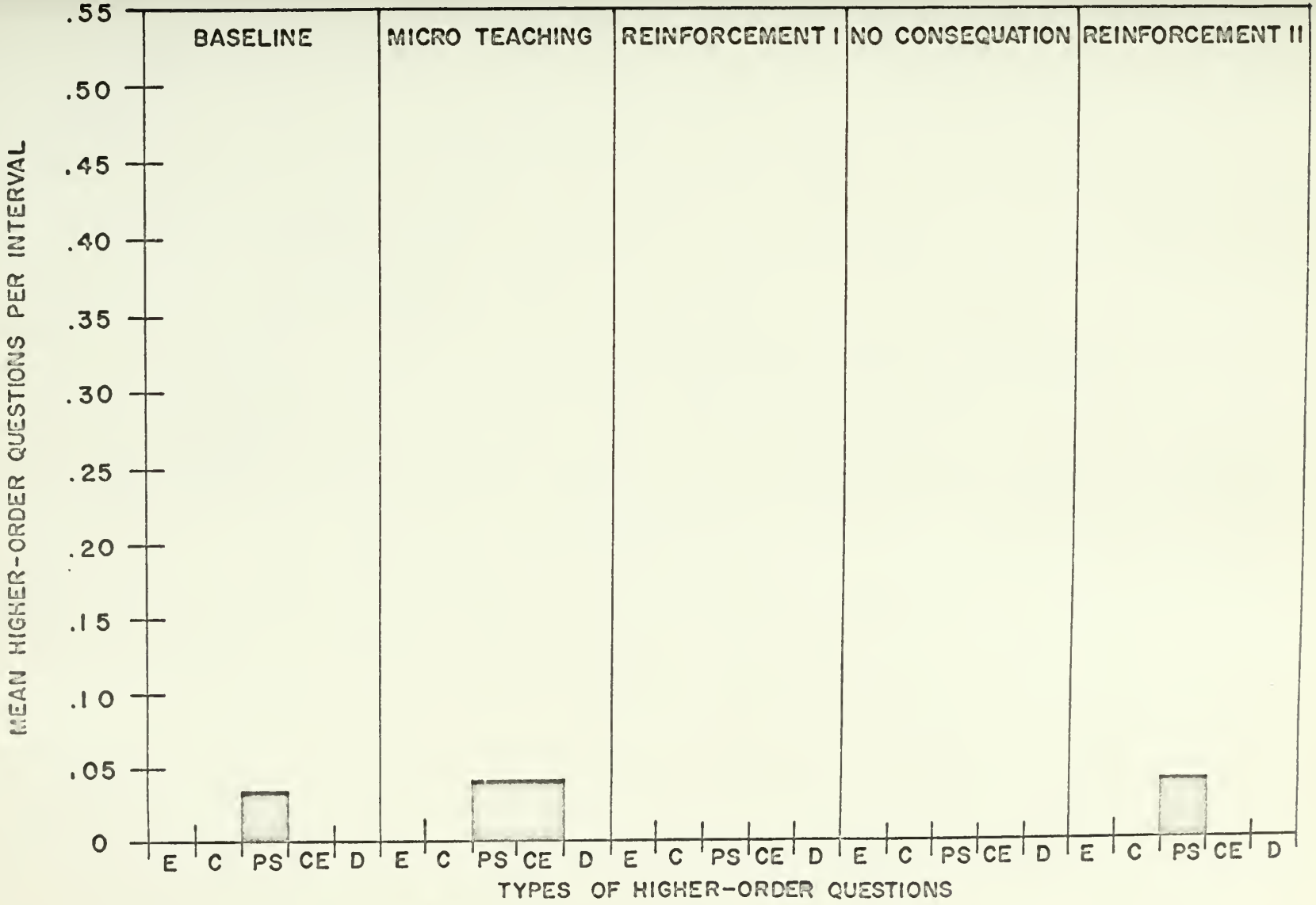

FIGURE 19. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR BILLY

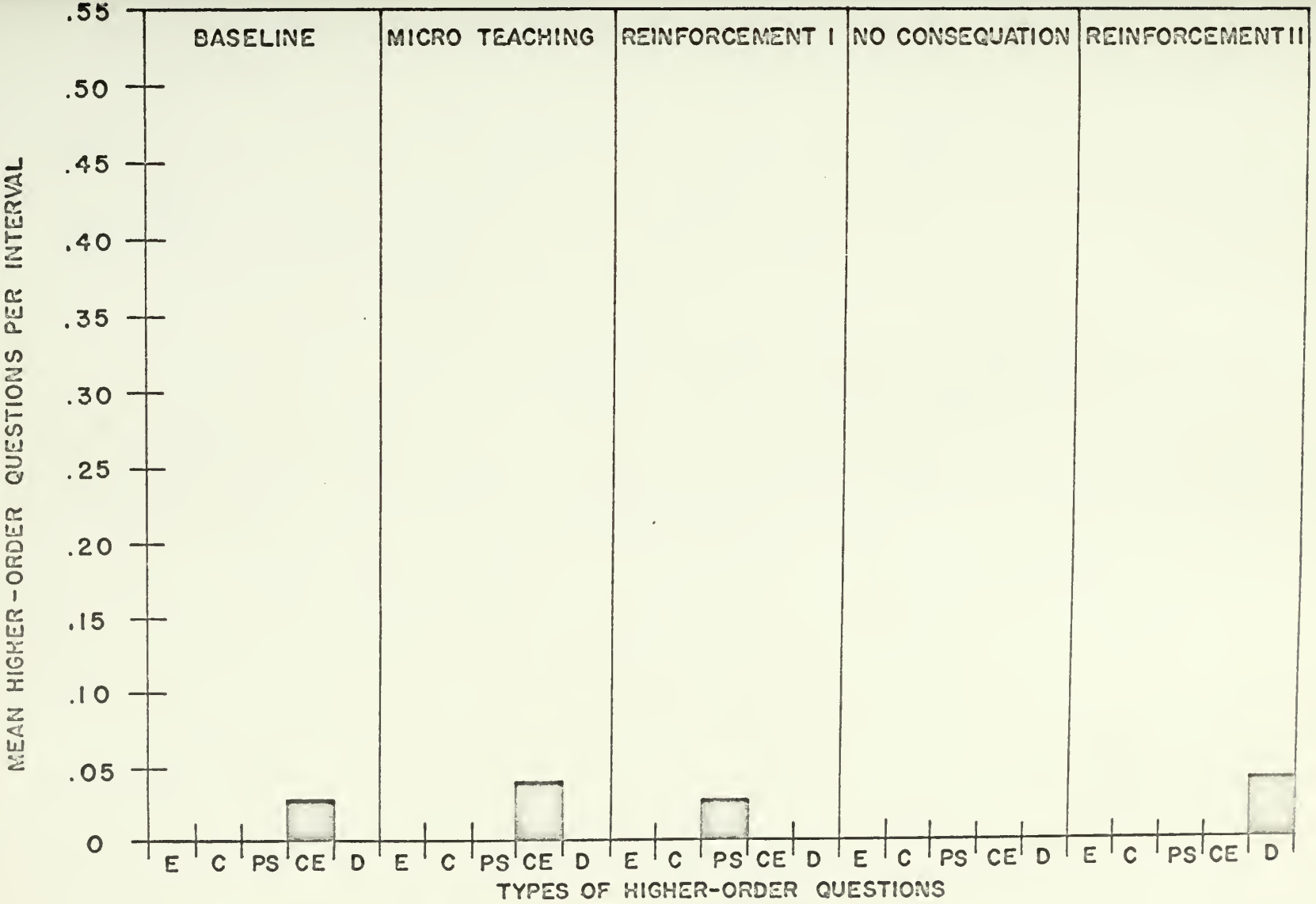

FIGURE 20. TYPES OF HIGHER-ORDER QUESTIONS BY CATEGORY FOR PAUL W.

students asked problem-solving questions most frequently. The total breakdown of higher-order questioning by category for each group of students is as follows. There were sixteen evaluation, nine comparison, forty-nine problem-solving, 109 cause-and-effect, and three divergent questions asked by the trained students. There were one evaluation, three comparison, ten problem-solving, fourteen cause-and-effect, and one divergent questions asked by the students who were not trained in question-asking behavior.

Appendix C consists of samples drawn from the raw data of evaluation, comparison, problem-solving, cause-and-effect, and divergent questions asked by each of the eight students.

Teacher Consequation

This section consists of a discussion of the frequency of teacher consequation of student-initiated, higher-order questions and of the nature of teacher verbal behaviors during consequation. Teacher consequation was considered to have occurred each time the teacher responded to a student-initiated, higher-order question.

During this experiment, 242 higher-order questions were asked by the eight students. Two hundred and forty of these were consequated by the teacher. One failure to consequate occurred during Phase III, and the second failure to consequate occurred during Phase IV. Both were caused by

behavior disruptions which diverted the teacher's attention away from the questioning students. Frequency of teacher consequation of student-initiated, higher-order questions in each phase is summarized in Table 9.

At times, the teacher's response to student-initiated, higher-order questions went beyond direct response to these questions. These verbal comments appeared to fall into four categories. They are as follows: (1) praise, (2) evasion, (3) mild reprimand, and (4) severe reprimand. Praise most frequently consisted of the phrase, "Good question." Seven statements of praise were made by the teacher during the experiment. Evasion generally consisted of responses such as "You're getting ahead," "We'll find out later," "We don't have time to answer questions now--we have to go on." The teacher evaded higher-order questions eight times over the course of the experiment. Teacher reprimands when consequating questions are described in greater detail below.

Rebukes which did not create a definite pause within the pace of classroom interaction and which did not appear to have a noticeably negative effect upon the student to whom they were directed were considered as mild reprimands. Six mild reprimands occurred over the course of the experiment. Rebukes in which the teacher appeared angry, the student seemed frightened or unhappy, and in which a tense pause was created were considered to be severe reprimands. During the experiment, one severe reprimand occurred. First, the nature

TABLE 9

TEACHER-CONSEQUATION OF HIGHER-ORDER QUESTIONS ASKED BY TRAINED AND UNTRAINED STUDENTS

Phase	Number of Higher-order Questions	
	Asked	Consequated by Teacher
Baseline	27	27
Training	16	16
Reinforcement I	108	107
No Consequation	17	16
Reinforcement II	74	74
Total	242	240

of each of the mild reprimands will be described.

Alane received two mild reprimands. The first took place during Phase II, Session 11. At this time, Alane had been encouraged, during her microteaching lessons, to ask higher-order questions in the social studies class. Alane's questioning rate increased, and the teacher appeared to become progressively more annoyed at Alane's high rate of question asking. Finally, twenty-eight minutes into the session, the teacher exclaimed, in response to Alane's raised hand, "Stay with us, for a change, Alane. Are you finally going to answer one of my questions or just ask another one of your own?" The second reprimand took place during

Session 27 in Phase IV. Alane had asked a question the answer to which had been discussed previously. In response, the teacher commented in an annoyed tone, "Weren't you here when we studied this?"

Beth received one mild reprimand during consequation of her question. This occurred during Session 18 in Phase III. Beth asked a question before the teacher had received an answer to one of her own. The teacher responded to Beth's question in an annoyed tone saying, "I won't answer your question until you answer mine."

Two mild reprimands were directed at Paul. Both seemed to be caused by his inability to understand the subject matter under discussion. During Session 21 in Phase III, Paul asked, "What <u>is</u> Sumer?" It appeared to the raters that this question was prompted by Paul's inability to grasp concepts of time and space. However, if one interpreted the question superficially, it was inappropriate because the class had been studying the ancient city of Sumer since the beginning of the semester. The teacher responded in a surprised and angry manner: "Paul, how can you ask that? We've been studying Sumer for over a month now." The class laughed at this exchange, and Paul looked down at his desk and laughed. Paul received his second reprimand during Session 28 in Phase V. The teacher had been discussing the hundreds of thousands of slaves who had worked to build the pyramids. Paul asked, "What would happen if one of those guys [slaves] got sick?"

The class laughed, and the teacher responded in a manner that appeared to be both annoyed and amused, "What are you talking about? Don't you know anything about history?" Paul shrugged and grinned.

Amy received a mild reprimand during Session 32 in Phase V. She asked a question concerning a topic which had been under discussion previously. The teacher answered in a tone of mild annoyance, "You should know that. We have talked about it before."

Beth was the only student to be severely reprimanded as the teacher consequated one of her higher-order questions. This incident occurred during Session 21 of Phase III. It was the teacher's rule that students should raise their hands before asking or answering questions. During the last five minutes of this class, Beth shouted out a question without raising her hand. The teacher responded angrily, "It's very rude to talk when I'm talking. Your mother doesn't let you do that at home, does she?" Beth responded, "Sometimes." This answer appeared to further anger the teacher. She retorted, "I'll speak to your mother and see." Beth looked down at her desk, and the atmosphere seemed tense. That this exchange disturbed Beth is suggested by her subsequent comments; she later expressed anxiety concerning the teacher's anger and formulated a plan always to answer one of the teacher's questions before asking one of her own.

It was of interest to note which students most

frequently received the teacher's praises, her evasions, and her reprimands, and to attempt to assess the net effect of these comments on each trained student. Of the ninety-two higher-order questions asked by Alane, six received statements of praise; one, an evasion; and one, a mild reprimand. Beth's forty-eight higher-order questions received one statement of praise, one evasion, one mild reprimand, and one severe reprimand. Paul's thirty-four higher-order questions received two mild reprimands, and for her twenty-four higher-order questions Amy received one evasion and one mild reprimand. Thus, the only student to receive more positive than negative comments was Alane. These data are summarized in Table 10.

The relationship of teacher comments to each higher-order question category was also investigated. The seventeen evaluation questions asked received no statements of praise, evasion, or reprimand by the teacher. The thirteen comparison questions received one statement of praise, one evasion, and one mild reprimand. The sixty-nine problem-solving questions received one statement of praise, five evasions, two mild reprimands, and one severe reprimand. The 139 cause-and-effect questions received three statements of praise, one evasion, and three mild reprimands. The four divergent questions received one evasion. Thus, the only category which received more negative than positive comments was that of problem solving. These data are summarized in Table 11.

TABLE 10

TEACHER'S VERBAL COMMENTS AS DIRECTED TOWARD TRAINED AND UNTRAINED STUDENTS

Student	Number of Higher-order Questions		Praise	Evasion	Mild Reprimand	Severe Reprimand
	Asked	Consequated by Teacher				
Alane	92	91	6	5	2	0
Beth	48	47	1	1	1	1
Paul P.	34	34	0	0	2	0
Amy	24	24	0	1	1	0
Matthew	28	28	0	0	0	0
Arthur	7	7	0	0	0	0
Billy	5	5	0	0	0	0
Paul W.	4	4	0	1	0	0

TABLE 11

TEACHER'S VERBAL COMMENTS AS DIRECTED TOWARD EACH HIGHER-ORDER QUESTION CATEGORY

Category of Higher-order Question	Number of Higher-order Questions		Praise	Evasion	Mild Reprimand	Severe Reprimand
	Asked	Consequated by Teacher				
Evaluation	17	16	0	0	0	0
Comparison	13	13	1	1	1	0
Problem solving	69	69	1	5	2	1
Cause and effect	139	138	3	1	3	0
Divergent	4	4	0	1	0	0

In summary, it can be seen that a majority of student-initiated, higher-order questions were consequated by this teacher. However, at times the asking of a higher-order question caused the questioner to receive a statement of praise, an evasion, or a reprimand. Reprimands usually occurred if a student asked a question concerning material that had been previously discussed or if the question was impolite or inappropriate. It was also found that all of the trained students except Alane received more negative than positive comments as a result of questioning. Four of the five component categories received a balance of positive and negative comments. The only higher-order question category which received more negative than positive comments was that of problem solving.

C H A P T E R V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

The purposes of this chapter are to summarize the experimental findings, to show related conclusions, and to suggest significant additional areas for research.

Summary

The experimental objective of this study was to increase the frequency of classroom content-related, higher-order question asking by four selected elementary-school students. Very briefly, the procedure implemented to achieve this objective was as follows. Four fifth-grade students from a group of eight were selected to receive microteaching training in higher-order question asking. A token economy was then put into effect. Each of these four students was rewarded with a point each time he asked a higher-order question in his social studies class. These points were exchanged for a variety of toys, games, and experiences.

In this experiment, data were collected in four areas: (1) availability of classroom interaction time, (2) rate of higher-order questioning by trained and untrained students, (3) rate of higher-order questioning by trained and untrained students in each of the five component categories, and (4)

teacher verbal comments during consequation of student-initiated, higher-order questions.

Over the course of the experiment's thirty-two sessions, it was found that taking exams; viewing movies, filmstrips, and classroom plays; and working silently on various projects often precluded the possibility of verbal interaction. At times, only 25 percent of the period was available for verbal interaction while at other times 100 percent of the period was available.

During the experiment, the class sometimes met for small-group instruction in three groups of eight apiece, and at other times for large-group instruction in one group of twenty-four. Throughout the experiment, 610 minutes were spent in small-group instruction, and 290 minutes were spent in large-group instruction. In all phases, the rate of higher-order questioning per five-minute interval for each of the eight students was greater in the small-group organization than in the large-group organization.

Data on rate of response indicate that the higher-order question asking of the trained students increased markedly as a result of the independent variable manipulations. During Phases I, II, and IV, when reinforcement was not in effect, the mean higher-order question-asking rate for the group of trained students was .07. In contrast, during Phases III and V, when reinforcement was in effect, the mean higher-order question-asking rate for the trained group was .62 per

five-minute interval.

The independent variable manipulations did not have this effect on the group of untrained students. In Phases I, II, and IV, when reinforcement was not in effect, the mean higher-order questioning rate for the untrained group was .07. In Phases III and V, when reinforcement was in effect for the trained students, the mean higher-order questioning rate for the untrained group was .05.

Data were also collected concerning rate of response of both groups of students in each of the five component categories. The data indicate that certain kinds of higher-order questions were used more frequently than others. Cause-and-effect questions were asked most frequently by both groups of students. Although there were not many higher-order questions asked in any of the categories by the untrained students, divergent and evaluation questions were asked least frequently by this group. The trained students asked sixteen evaluation, nine comprehension, forty-nine problem-solving, 109 cause-and-effect, and three divergent questions. The untrained students asked one evaluation, three comprehension, ten problem-solving, fourteen cause-and-effect, and one divergent question.

The final area in which data were collected concerned teacher consequation. Of the 242 higher-order questions asked, 240 were consequated by the teacher. Teacher comments while consequating student-initiated questions were categorized as statements of praise, evasion, mild reprimand, and severe

reprimand. The teacher made eight evasions, five statements of praise, six mild reprimands, and one severe reprimand.

It was shown by the data that teacher reprimands were more frequently directed to problem-solving questions than to any other component category. A possible explanation may be that problem-solving questions evoke the most complex thought processes and are the most difficult to answer. Thus, it might be particularly difficult and annoying for a teacher, struggling to keep up with the fast pace of classroom interaction, to answer problem-solving questions.

The data also indicate that more reprimands than statements of praise were directed at three of the trained students. Only Alane received more positive than negative comments. For the most part, negative comments were directed to students whose questions were impolite or inappropriate in that the information they asked for had been discussed at a previous time.

Anecdotal comments and interview data suggest that the students were not only aware of the teacher's negative remarks, but that they may have feared them as well. For example, after Beth was severely reprimanded by the teacher, she expressed anxiety about the teacher's being "mad" at her. Moreover, she formulated a policy of always answering one of the teacher's questions before asking one of her own.

An interview with the four trained students further disclosed the students' awareness of the teacher's negative

remarks. To the question, "Were you afraid that the teacher might get angry when you asked thought questions?" Beth, Amy, and Alane indicated that they were afraid of the teacher's anger. Alane commented further, "I was afraid because the teacher had already explained some things, and it made me feel dumb if I asked them again." Paul said that he was not afraid of the teacher's anger, but his denial was strongly qualified. He responded to the question, "No, I never thought the teacher might get angry. But I thought she might not like it if I asked something I should know the answer to." This student awareness of teacher annoyance during consequation of higher-order questions appears to be in direct conflict with the teacher's stated objective which was to "increase the participation of the quiet children in the class." In summary, it is possible that teacher reprimands and student awareness of them may have had an inhibiting effect on the frequency of student-initiated, higher-order questions.

Although the students were aware of teacher annoyance, the teacher remained relatively unaware of increased participation within her small group of eight students despite the dramatic changes in the frequency of higher-order questioning. At the conclusion of the experiment, she was asked in an interview, "Have you noticed any changes in your group of eight students in terms of their verbal participation?" She answered, "Not really. Perhaps with Beth and Matthew. Beth talked more and seemed to get more interested. Matthew talked less and

appeared to be able to wait for other students to talk."

This relative lack of perception by the teacher may possibly be attributed to the extremely fast pace of classroom interaction. Jackson (1965) indicates that in one study of elementary classrooms it was found that a teacher engages in as many as 1,000 personal interchanges each day. Perhaps this teacher's unawareness of increased questioning is an example, in microcosm, of the teacher's inability of recognize individual needs in the physical and verbal turmoil of the classroom.

Conclusions

The results of this study demonstrate that students can be trained to increase higher-order question asking through the independent variable manipulations put into effect in this experiment. This finding adds to the growing body of research concerned with the use of behavioral principles to manage and maintain the behavior of children who function in regular classrooms. The finding is also congruent with the previously cited studies of Farley (1968), Johns (1968), and Scovel (1968) whose work dealt with raising the frequency of student-initiated, higher-order questions. Further, this study extends their work in that microteaching was introduced as a technique for training students in question-asking behavior and in that verbal, student-initiated, higher-order question asking was maintained over an extended period of time.

The results of the study also demonstrate that the students who were trained to ask the five different kinds of higher-order questions used the cause-and-effect category most frequently and the divergent category least frequencly. This conclusion is in agreement with the previously cited work of Gallagher (1965) who found that of five categories--cognitive memory, convergent thinking, evaluative thinking, and routine--the category used least by both teachers and students was the divergent one. The conclusion is also consistent with the previously cited study by Clark (1964) who found that, in general, teachers did not call for, reward, or reinforce divergent contributions. Thus, this study forms part of a growing body of data which points to the need for more emphasis on divergent thinking in the classroom.

Another conclusion is that the teacher at times responded to student-initiated, higher-order questions with statements of praise, evasion, and reprimand, and that it is likely her reprimands had an inhibiting effect on the higher-order questioning rate of all the students. Clark arrived at a similar conclusion in his work. He discovered that teachers were more apt to respond negatively to material children had placed on the agenda than to material teachers themselves had introduced. Thus, this finding supports the premise that there is a need to train teachers to respond in a more flexible manner to student-initiated comments and questions which may lead classroom discussion in directions not foreseen by

the teacher.

A final and somewhat tangential conclusion is that each of the eight students in all phases of the experiment asked more higher-order questions when the class was organized in three small groups than when it met in a single group of twenty-four. This finding suggests that the small group may be a more appropriate organizational structure than the large group for encouraging higher-order question asking.

Other Considerations

It may be that training students in the asking of higher-order questions is related to processes which must be set up in order to teach thinking behavior. The way in which training in higher-order question asking is related to Skinner's concept of the teaching of thinking behavior is discussed below.

Skinner (1968) summarizes the basic problem that is faced in trying to teach students thinking behavior:

> The traditional view is that thinking is an obscure, intellectual "cognitive" activity--something which goes on in the mind and requires the use of rational powers and faculties. It leads to action when the thoughts to which it gives rise are expressed, but it is not of itself behavior. It can sometimes be observed by the thinker, but it can also be unconscious, and introspective accounts are therefore not very consistent or helpful [p. 117].

Defined in this way, thinking is hard to study and hard to teach. The teacher possesses no specific and clear description of the behavior he is to set up. He is forced to resort

to setting up problems and reinforcing the student when he solves these problems. Skinner criticizes the teaching of thinking by this process:

> If we throw a lot of children into a pool, some of them will manage to get to the edge and climb out. We may claim to have taught them to swim, although most of them swim badly. Others go to the bottom, and we rescue them. We do not see those who go to the bottom when we teach thinking, and many of those who survive think badly. The method does not teach; it simply selects those who learn without being taught [pp. 118-119].

Thus, Skinner indicates that it is not enough to reinforce a student when he thinks in such a way as to solve a problem. Direct instruction in thinking is necessary. The difficulty in teaching thinking directly is that so much thinking takes place at the covert level. Skinner proposes that we solve this problem by teaching thinking behavior at the overt level.

> In summary, then the self management exemplified by . . . the more characteristic forms of thinking . . . is hard to observe and teach at the covert level. Skillful thinkers may internalize their behavior to the point at which even the thinker himself cannot see what he's doing. Nevertheless, we can teach relevant techniques at the overt level, and we can to some extent facilitate the recession to the covert level if this is desirable [p. 127].

Teaching students to formulate questions of higher-order complexity may be a way of raising thinking from the covert level to the overt level. Thus, it may provide a situation in which direct instruction in thinking behavior is possible.

Implications for Further Research

This study suggests need for further investigation into various aspects of the questioning behavior of elementary school students. Also, further work is needed in the use of microteaching and of the token economy to train elementary school students in questioning behavior as well as in other related skills.

Not only the baseline data but also interview responses of the four trained students indicate that student-initiated questioning is behavior that is alien to the classroom. To the question, "Before this project began, you hardly ever asked questions in your social studies class. Why?" the students' answers were as follows:

Paul: Before I didn't enjoy asking questions because I had never done it. Now I enjoy answering and asking.

Beth: I had no reason to. I was just listening instead of asking. I wasn't that interested.

Amy: I didn't need to get points, and I never thought about asking questions.

Alane: I never thought about asking questions. It never occurred to me that I should.

This total lack of awareness of the importance of questioning as a means of learning further suggests the need for investigation into ways of training students in question-asking skills.

One potential area for research involves the investigation of the types of questions students do ask, and the

various content-matter areas and situations which prompt each type. Moreover, more work must be done in identifying the types of questions they should ask when working within these subject-matter areas and situations.

It would also be of importance to explore the relationship of various classroom organizational conditions to the question-asking behavior of elementary school students. Investigation should be carried out to ascertain group structures and sizes which encourage question-asking behavior and those which inhibit it. It would be of particular interest to investigate whether the Leicestershire or open-classroom environment, one which is relatively less organized than the traditional classroom, is conducive to higher-order question asking by elementary school students.

In this experiment, maintenance of the higher-order questioning behavior of the trained students was consequent on emission of material reinforcers. It would be of importance to explore the possibility of producing self-control of the behavior through use of procedures such as those put into effect in the experiment. If the process of self-control were in effect, the higher-order questioning behavior would be maintained over long periods of time without the frequent occurrence of external consequences.

The basic condition under which it is possible to produce self-control of the desired behavior is summarized by Eachus (1969) as follows:

> Only when a student finds his behavior successful can self-control operate. The occurrence of successful behavior must be paired with salient consequences in the environment in order for that behavior to gain strength as a reinforcer for its emission.

Thus self-control of higher-order question asking can be maintained only if there are reinforcing consequences other than that of material rewards occurring within the environment.

It is indicated in work by Lovaas (1969) that social contact can be established as a reinforcer for a child. In the experiment by Lovaas, social contact was paired with the primary reinforcer, food, and both were made consequent upon the emission of the desired behavior, in this case nondisruptive behavior. Then, the number of primary reinforcers were carefully reduced and the desired behavior was ultimately controlled by social contact without the presentation of food.

It would have been of interest to extend Phase V, continuing the emission of social reinforcement and carefully reducing the amount of material reinforcement presented in an attempt to produce self-maintenance of higher-order questioning. The emission of social reinforcement could be carried out by the outside experimenter or perhaps by the classroom teacher.

It is not clear from the design of this experiment whether microteaching or the token system of reinforcement was responsible for the change in behavior or whether it was joint operation of both which caused the increased higher-order questioning rate. Consequently, investigation should be conducted

into whether microteaching without the implementation of a token economy could raise the higher-order questioning levels of elementary school students. In this experiment, it would have been of interest to return to baseline conditions before Reinforcement I was put into effect. In this way, it would have been possible to investigate the effects of the microteaching training alone on the higher-order questioning rate. Also, research should be carried out to investigate the efficacy of a token economy, without the microteaching process, to attain the desired behavioral change.

Thus, the ways in which microteaching and token reinforcement can best be combined to create an effective student training process will need further exploration. It is very possible that the procedure should vary according to such factors as the age, intelligence, achievement level, and socioeconomic level of the participating students.

The examination of operants other than that of higher-order questioning behavior through procedures used in this experiment appears to be of particular significance. The adapted microteaching process combined with token reinforcement may also be effective for training students in other skills besides that of questioning behavior. Through further research, successful student behavior might be task analyzed and broken down into its discrete behavioral components. A possible final outcome might be the construction of a curriculum in which students practice, in adapted microteaching

clinics, the various components which constitute successful student behavior.

APPENDIXES

APPENDIX A

SYMBOLIC MODEL: STUDENT-INITIATED, CONTENT-RELATED QUESTION ASKING

Directions to Students: A lot of questions are asked in school. These questions are most often about the subject the class is studying. They may be about English, science, arithmetic, social studies, or some other subject.

In school one person does almost all of the question asking. That person is the teacher. Students ask very, very few questions.

Many people think that students should be asking more questions in their classes. These people say that asking questions helps students learn more. They also say that, when students ask questions, they like school more.

There are two kinds of questions that students can ask. One kind of question is about the subject the class is studying. Here is an example. A class is studying about the Viet Nam War. A student could ask, "How long have American soldiers been fighting in Viet Nam?" This would be a Subject Question.

The other kind of question is one that is not about the subject the class is studying. Here is an example. The same class is still studying about the Viet Nam War. Another student might ask, "Can I sharpen my pencil?" This is a Non-

subject Question.

See if you understand the difference between Subject Questions and Non-subject Questions. Try this short test.

A first-grade class has just finished reading Cinderella. The students are talking about the story. Here are questions that the class asked the teacher during the lesson. Put a check mark after each question that is a Subject Question.

1. May I get a drink of water? _____
2. Why were Cinderella's stepsisters so cruel to her? _____
3. What size was the glass slipper? _____
4. What did the prince think when the clock struck twelve? _____
5. When are we going out to recess? _____
6. What is the cafeteria serving for lunch today? _____
7. What was the name of the fairy godmother? _____
8. When are the astronauts going to take another trip to the moon? _____

Sometimes you have to ask questions that are not about the subject. For example, your teacher tells you to write a story. You do not have a pen or pencil. Then you have to ask, "May I borrow a pen or pencil?" However, Non-subject Questions usually do not help students learn more about the subject.

Subject Questions do help students learn more about the subject. Therefore, it is good for students to ask Subject Questions.

During the next few days, you will get a chance to ask Subject Questions. Remember, you may have to ask a question that is not about the subject. But you should try to ask questions that <u>are</u> about the subject.

Tape Typescript--Student-initiated, content-related question asking.

All the Subject Questions that students asked in this lesson are underlined.

Teacher: What I want to do is start off today's class with a story that is something like a riddle. Let me tell you what it is. I want you to explain to me how this situation which I'm going to describe can actually happen. A man and his son were driving along in a car. They got into a terrible accident. The man died. And the son was brought to a hospital. Yes?

Lois: How did the accident happen?

Teacher: They were driving along in a car and they hit another truck. And that's how it happened. Yes?

Larry: I thought you said they were in a car. You just said they hit another truck.

Teacher: They hit a truck.

Larry: You said another truck.

Teacher: I meant just a truck. They were in a car and a truck was coming and they hit it. Okay? Is that clear? Yes?

Linda: What happened to the people in the truck?

Teacher: The people in the truck, luckily for them, weren't hurt at all. Do you know why? Yes, Reva?

Reva: They were up higher.

Teacher: They were up higher. What happens when they're up higher? Mike?

Mike: You usually don't get hurt that much. In a car people are down low, and when they get hit they get hurt. But in a truck people are higher and they don't get hurt.

Teacher: Very good. Well, the man died, unfortunately. He died on the way to the hospital. And the son also was very, very seriously hurt, but he didn't die. They took him to the hospital and said, "This boy needs an emergency operation." They took him to the operating room.

Mike: What did he need an operation for?

Teacher: Because they saw that he was all bloody on the inside and they said, "We have to take a look inside and cut him open and see what's wrong. There is something wrong. There is blood coming out." They took him into the operating room. They put him on the table. They started operating.

Reva: Do you mean they took X-rays of him?

Teacher: They took X-rays and they looked at him and they saw he was all messed up. Larry?

Larry: Didn't they use ether?

Teacher: They used ether in the operating room. Without it, it would hurt. Right? They gave him ether. They had him down on the operating table, and the surgeon came in. The boy looked up just before the ether took effect. He looked up and saw a person come in. This person was the surgeon. The surgeon looked down and said, "Oh my god, that's my son!" How can that be? How can the surgeon say that?

Mike: Maybe the guy who was driving must have been his foster father.

Teacher: That was his real father.

Larry: Then the surgeon was his foster father.

Teacher: No.

Mike: How can that be?

Teacher: How can that be? Reva.

Reva: Because the surgeon was his mother.

Teacher: The surgeon was his mother. Why didn't anyone think of that? (Silence) Why didn't anyone think of that? Becky?

Becky: Because you usually think of surgeons as men, not women.

Teacher: That's right, Becky, we usually think of surgeons as men, not women.

APPENDIX B

SYMBOLIC MODEL: STUDENT-INITIATED, CONTENT-RELATED, HIGHER-ORDER QUESTION ASKING

Directions to Students: You have learned that it is good for students to ask Subject Questions. You have had a chance to ask these Subject Questions in your microteaching lessons.

Now you will learn more about Subject Questions. There are two kinds of Subject Questions. One kind is called Memory Questions. The other kind is called Thought Questions.

A Memory Question is one you can answer just by remembering. You have seen, heard, read, or figured out the answer before. Here is an example. Someone asks you, "Who was the first President of the United States?" To answer, you would not have to do any new thinking. You know the answer already.

A Thought Question is harder to answer. You can't answer it just by remembering. You have to figure the answer out. Here are some of the ways you might have to think to answer Thought Questions.

1. You might have to compare two or more things.

   Example: You live in 1870 instead of 1970. How would your life be different?

2. You might have to figure out what caused something to happen.

   Example: Why are people fighting in the Middle East?

3. You might have to decide which of two or more things is better.

   Example: What do you think was the most important thing that happened between 1960 and 1970? Why?

4. You might have to solve a problem.

   Example: What could you do to make black people and white people get along better?

5. You might have to use a general rule in one problem.

   Example: You have studied gravity. Tell why a ball falls after you throw it up.

6. You might have to think in unusual ways and tell how you feel about something. These questions have no right answer.

   Example: How do you feel when you see a hippy walking along the street?

See if you know the difference between Thought Questions and Memory Questions. Try this test. Here are some questions. In the space after each question, write "Thought Question" if it is a Thought Question. Write "Memory Question" if it is a Memory Question.

1. Why is it hotter at the Equator than it is at the North Pole? _____

2. What would happen if you left your bicycle outside during a rainy summer? _____

3. What are the names of the nine planets? _____

4. Your house can have either a TV or a telephone.

Which one would you choose? Why? _____

5. Who wrote the poem, "Stopping by Woods on a Snowy Evening?" _____

6. Which do you think is more important--a doctor or a teacher? Why? _____

7. What is the name of the man who said, "I have not yet begun to fight"? _____

It is good for students to ask either Thought or Memory Questions. However, when you answer Thought Questions, you have to do new thinking. Therefore, it is better to ask Thought Questions.

During the next few days, you will have a chance to ask more questions. You may ask questions that are either Thought or Memory Questions. But you should try to ask as many Thought Questions as you can.

Tape Typescript--Student-initiated, content-related question asking.

All the Thought and Memory Questions which students asked are underlined and explained.

Teacher: I read a story in the paper the other day. It was very interesting, and so I decided to tell it to you today to get your opinions about the story. According to this story, there was an applicant for this job and the applicant had everything that the job needed. This particular applicant was better than all the other people who tried out for the job.

Lois: How did they know he was better? (This is a Thought Question. Lois asks what caused people to know the applicant was better for the job.)

Teacher: This applicant was better because they tried them on the job and this applicant was the best on the job.

Larry: What kind of job was he after? (This is a Memory Question. The person who answers only has to remember. He does not have to do any new thinking.)

Teacher: What's the job? The job was a football player, and this applicant was the best football player. The applicant was a kicker. And this player would kick field goals forty or fifty yards.

Linda: What team? (Again, this is a Memory Question and not a Thought Question.)

Teacher: The New York Giants. Larry?

Larry: Who do you think was better, him or Joe Namath? (This is a Thought Question. The person who answers will have to decide which of two persons plays better.)

Teacher: Well, Joe Namath was a different player. This player kicked the ball. Joe Namath threw the ball better than him. But he could kick it a lot better than Joe Namath.

Mike: Joe Namath threw the ball a lot better than he did.

Teacher: That's right. Reva?

Reva: Why do you think he was better? (This is a Thought Question. Reva asks what causes the teacher to think this player is better.)

Teacher: This applicant was better because they had all the applicants go to the forty-yard line and kick the ball. This applicant kicked it right through the field goal. You know how you have to kick it right through those two posts in football? This applicant did it. Then they had them all do it at the sixty-yard line. This was the only person, the only player, who could kick the ball from the sixty-yard line. Lois?

Lois: What would happen if he didn't kick it in there between the two poles? (This could be either a Memory or a Thought Question. The teacher could have answered it as if it were a Thought Question. He could think in an unusual way. However, he answers it as if it were a Memory Question. He remembers a football rule.)

Teacher: Then he doesn't get any points for the team and they wouldn't hire him.

Linda: What makes him so special, I mean how come he was able to kick the ball so much better than everyone else? (This is a Thought Question. Linda asks what caused this player to be so good.)

Teacher: They say practice. This person had practiced ever since high school. Larry?

Larry: Did he play any other positions? (This is a Memory Question. The teacher just has to remember.)

Teacher: Just a kicker but that's all they needed. Let me tell you the end of the story. He kicked from the sixty-yard line. I don't know how much you know about football but very few players can kick from the sixty-yard line. Maybe one or two every three or four years, or five years, kick a field goal that big. But they didn't hire this person, the best kicker who ever applied. They didn't hire this person.

Students: Why not? (This is a Thought Question. The students ask what caused this person not to be hired.)

Becky: If this person was so good, why didn't they hire him? (One person repeats the Thought Question.)

Teacher: Because you're all making an assumption.

Larry: Was it a girl? (This is a Memory Question. The teacher just has to remember.)

Teacher: Yes. It was a girl. I don't know if you read in the papers yesterday, but there is another girl playing on a football team who holds the ball.

Linda: Why can't there be girls on the football team? (This is a Thought Question. Linda asks what causes girls to be unable to play on football teams.)

Teacher: Why can't there be girls on the football team?

Linda: Girls could be rough.

Teacher: This team didn't think so.

Larry: Because girls have more delicate places than boys and when they play football they're in trouble. Right?

Teacher: I don't know. Would you hire this person if you were the manager of this team?

Becky: There's discrimination against women on any team like that. But if they're willing to take the risk that they will get hurt, well that's up to them. They should be allowed the chance.

Linda: Why do women always say that you should let the boys be the ones in sports like baseball and basketball? They're always saying, well boys are the best ones. I think girls can be just as good. (Again, a Thought Question. Linda asks what causes girls to say that boys should have the main role in sports.)

Mike: How would you like to get hit with a bat in baseball? (This is a thought Question. Mike asks Linda how she would feel about getting hit with a bat.)

Linda: I don't think that girls are that much weaker. Some girls can be as tough as boys.

Mike: You mean you want to get hit by a bat? O.K. That's your problem. (Mike repeats his Thought Question in different words.)

Lois: Which do you think is better, a man or a lady in football? (This is a Thought Question. Lois asks the others to decide who plays better football--a man or a woman.)

Teacher: I think it depends on the skill.

Linda: In a way I think a man might be. But, I guess, as you said, the skill and how they're built. I mean, if you're going to have a weakling. I mean, if there was a girl who could kick really good, if she was a hundred-pound weakling or if she was really dainty and everything, I wouldn't hire her. But if she was really rough and everything, I'd probably hire her.

Reva: Why shouldn't she be able to? (This is a Thought Question.) Why would they let her try out if they weren't going to let her be on the team if she could? (Reva asks what caused this woman to be turned down for the job.)

Teacher: I wonder why?

Linda: They probably didn't hire her because they thought they'd be discriminating or something like that. Because they'd be the only team with all men and one woman.

Teacher: Why do you think they didn't hire her? Maybe they thought it was a joke. Becky?

Becky: What do you think would happen if they did use this player and she didn't get beaten up, and she was good? I mean, and then they could start something new. (This is a Thought Question. Becky asks the listeners to think in an unusual way. There is no right answer to this question.)

Linda: Why didn't they give her a fair chance? (This is a Thought Question. Linda asks what caused this girl not to get a fair chance.)

Teacher: It would seem like that would be the fair thing to do, wouldn't it?

Linda: At least they should give her a chance. Why didn't they? (Linda repeats her Thought Question.)

APPENDIX C

SAMPLES OF HIGHER-ORDER QUESTIONS IN EACH CATEGORY AS ASKED BY THE EIGHT SUBJECTS

Two questions from each component category of higher-order questions are listed for each of the eight subjects. These samples were drawn from the raw data. They were selected so as to give the reader a clearer conception of the types of questions that students were asking in each category. Examples were chosen which did not require a detailed explanation of the context in which they were asked.

Alane:

Evaluation

1. Were there any good kings?
2. Weren't the priests greedy?

Comparison

1. Were the priests like kings?
2. Which weighs more--a freight train or a pyramid?

Problem Solving

1. How would cavemen draw pictures of verbs?
2. How did languages begin?

Cause and Effect

1. I don't understand that kind of justice. Why would someone poke out an eye?
2. Why don't you hear as much about Sumer as you do about other civilizations?

Divergent (only one divergent question was asked by Alane.)

1. Would you like to be an archeologist? (To teacher)

Beth: Evaluation

1. Is this letter good?

2. How big are the cylinders where they are big enough?

Comparison

(No comparison questions were asked by Beth.)

Problem Solving

1. If a new civilization were discovered, what would they do about the history books?

2. How do they get the imprint into it? (Beth is talking about writing on clay tablets.)

Cause and Effect

1. Why should we think about the Sumerian civilization?

2. Why would an archaeologist have to learn and not do just what he felt like?

Divergent

1. Do you think he'll like this? (Beth is speaking of a thank-you note she has written to a guest speaker.)

2. What kind of colors do you like?

Paul: Evaluation

(Only one evaluation question was asked by Paul.)

1. Would you say that they had plenty of money?

Comparison

(Only one comparison question was asked by Paul.)

1. Would steel rot away like bone?

Problem Solving

1. How does some land blow over to other land?
2. How did they put it together? (Paul is talking about weapons.)

Cause and Effect

1. What would happen if writing was never invented?
2. Why did they call that land Arcadia?

Divergent

(No divergent questions were asked by Paul.)

Amy: Evaluation

1. Is stone good to build from?
2. Were the farmers good at planting?

Comparison

1. Did farmers work harder than priests?
2. Which disintegrates faster--hair or bones?

Problem Solving

(No problem-solving questions were asked by Amy.)

Cause and Effect

1. Why were Sumerians mostly farm workers?
2. Why didn't Napoleon's army carry food with them?

Divergent

(No divergent questions were asked by Amy.)

Matthew: Evaluation

(Only one evaluation question was asked by Matthew.)

1. Would the Amazon River Valley be a good place to grow things in?

Comparison

1. Would a priest be in a higher or a lower class than a teacher?

2. Did people migrate to Egypt, or did they just develop there?

Problem Solving

1. If they had questions about the gods, couldn't they see the falsity of the religion?

2. How do they dry the skulls?

Cause and Effect

1. Why did he (a Sumerian tyrant) want more land?

2. Why did they make up a story to explain the flood? (Matthew is talking about Noah and the ark.)

Divergent

(No divergent questions were asked by Matthew.)

Arthur: Evaluation

(No evaluation questions were asked by Arthur.)

Comparison

(No comparison questions were asked by Arthur.)

Problem Solving

(Only one problem-solving question was asked by Arthur.)

1. How did they write with a wedge-shaped tool?

Cause and Effect

1. How come the Sumerians didn't use our language?

2. Why didn't the cavemen die young?

Divergent

(No divergent questions were asked by Arthur.)

Billy: Evaluation

(No evaluation questions were asked by Billy.)

Comparison

(No comparison questions were asked by Billy.)

Problem Solving

1. How did they bury people in the pyramids?

2. How could it be unified before it was started? (Billy is referring to an error made by the teacher in her explanation.)

Cause and Effect

1. Why did the Sumerians speak in that language?

Divergent

(No divergent questions were asked by Billy.)

Paul W.: Evaluation

(No evaluation questions were asked by Paul W.)

Comparison

(No comparison questions were asked by Paul W.)

Problem Solving

(Only one problem-solving question was asked by Paul W.)

1. How did the Sumerians learn to write?

Cause and Effect

1. Why was the father allowed to say who his daughter would marry?

2. Why did they build their homes in that shape?

Divergent

(Only one divergent question was asked by Paul W.)

1. If a black cat crossed your path, what would you do?

BIBLIOGRAPHY

Ahlbrand, W. Correlates of pupil participation during classroom questioning in selected fourth, fifth, and sixth grade social studies classes. Unpublished doctoral dissertation, University of Washington, 1968.

Allen, D. W. Microteaching: a new framework for in-service education. The High School Journal, 1966, 49, 355-362.

Allen, D. W. and Eve, A. S. Microteaching. Theory into Practice, 1968, 7, 181-185.

Allen, D. W. and Ryan, K. A. Microteaching. Reading, Mass.: Addison-Wesley, 1969.

Allen, D. W., Ryan, K. A., Bush, R. N., and Cooper, J. M. Teaching skills for elementary and secondary teachers. New York: General Learning Corporation, 1969.

Allen, E., Hart, B., Buell, J., Harris, F., Wolf, M. Effects of social reinforcement on isolate behavior of a nursery school child. Child Development, 1964, 35, 511-518.

Amidon, E. and Flanders, N. The role of the teacher in the classroom. Minneapolis, Minn.: Paul S. Amidon and Assoc., 1963.

Anderson, H. The measurement of domination and of socially integrative behavior in teachers' contacts with children. Child Development, 1939, 10, 73-89.

Ayllon, T. and Azrin, N. The token economy: a motivational system for therapy and rehabilitation. New York: Appleton-Century-Crofts, 1968.

Bellack, A. The language of the classroom. New York: Teachers College, Columbia University, 1965.

Benowitz, M. and Busse, T. Material incentives and the learning of spelling words in a typical school situation. Journal of Educational Psychology, 1970, 61, 24-26.

Berg, W. The minicourse as a vehicle for changing teacher behavior: the research evidence. Paper presented at the meeting of the American Educational Research Association, Los Angeles, February, 1969.

Berliner, D. Microteaching and the technical skills approach to teacher training. Technical Report No. 8. Stanford Center for Research and Development in Teaching, 1969.

Berman, M. Shaping performance on programmed materials. Psychological Reports, 1967, 21, 29-32.

Birnbraver, J. S., Wolf, M. M., Kidder, J. D., and Tague, C. E. Classroom behavior of retarded pupils with token reinforcement. Journal of Experimental Child Psychology, 1965, 2, 219-235.

Blank, S. and Covington, M. Inducing children to ask questions in solving problems. The Journal of Educational Research, 1965, 59, 21-27.

Bloom, D. (Ed.) Taxonomy of educational objectives: the classification of educational goals: handbook I. cognitive domain. New York: David McKay Co., 1956.

Bloom, B. Thought-processes in lectures and discussions. Journal of General Education, 1953, 7, 160-169.

Broden, M. Effects of teacher attention and a token reinforcement system in a junior high school special education class. Exceptional Children, 1970, 36, 341-349.

Bushell, D., Wrobel, P., Michaelis, M. Applying "group" contingencies to the classroom study behavior of preschool children. Journal of Applied Behavior Analysis, 1968, 1, 55-61.

Campbell, J. and Barnes, C. Interaction analysis--a breakthrough? Phi Delta Kappa, 1969, 50, 587-590.

Clark, G. Teachers' use of children's personal contributions in classroom discussions. Unpublished doctoral dissertation, University of Utah, 1964.

Clark, M., Lackowicz, J., and Wolf, M. A pilot basic education program for school dropouts incorporating a token reinforcement system. Behavior, Research, and Therapy, 1968, 6, 183-188.

Clements, R. Question types, patterns, and sequences used by art teachers in the classroom. Unpublished doctoral dissertation, The Pennsylvania State University, 1964.

Cooper, J. and Allen, D. Microteaching: history and present status. ERIC Clearinghouse on Teacher Education, Commissioned State of the Art Paper, 1970.

Dodl, N. Pupil questioning behavior in the context of classroom interaction. Unpublished doctoral dissertation, Stanford University, 1965.

Eachus, T. The effects of token reinforcement and verbal remediation on the rate, accuracy, and length of sentence composition by deaf children. Unpublished doctoral dissertation, University of Massachusetts, 1969.

Farly, G. Increasing the cognitive level of classroom questions: an application of Bloom's Taxonomy of Educational Objectives. Unpublished doctoral dissertation, University of Massachusetts, 1968.

Flanders, N. Teacher influence in the classroom. In E. Amidon and J. Hough (Eds.) Interaction analysis: theory, research, and application. Reading, Mass.: Addison-Wesley, 1967.

Floyd, W. D. An analysis of the oral questioning activity in selected Colorado primary classrooms. Unpublished doctoral dissertation, Colorado State College, 1960.

Fry, E. A readability formula that saves time. Journal of Reading, 1968, 22, 513-517+.

Gall, M. The use of questions in teaching. Review of Educational Research, 1970, 40, 707-721.

Gallagher, J. Expressive thought by gifted children in the classroom. Elementary English, 1965, 42, 559-569.

German, R. An experimental study of the effectiveness of several combinations of lecture and discussion for students in an educational psychology course. Unpublished doctoral dissertation, Fordham University, 1962.

Glynn, E. Classroom applications of self-determined reinforcement. Journal of Applied Behavior Analysis, 1970, 3, 123-132.

Guszak, F. A study of teacher solicitation and student response interaction about reading content in selected second, fourth, and sixth grades. Unpublished doctoral dissertation, University of Wisconsin, 1966.

Houston, V. Improving the quality of classroom questions and questioning. Educational Administration and Supervision, 1938, 24, 17-28.

Haring, N. and Hauck, M. Improved learning conditions in the establishment of reading skills with disabled readers. Exceptional Children, 1969, 35, 341-352.

Jackson, P. Life in classrooms. New York: Holt, Rinehart and Winston, 1968.

Johns, J. The relationship between teacher behaviors and the incidence of thought provoking questions by students in secondary schools. The Journal of Educational Research, 1968, 62, 117-122.

Johnson, C. The transfer effect of treatment group composition on pupils' classroom participation. Unpublished doctoral dissertation, Stanford University, 1964.

Krumboltz, J. and Thoresen, C. The effect of behavioral counseling in group and individual settings on information-seeking behavior. Journal of Counseling Psychology, 1964, 2, 324-333.

Kuypers, D., Becker, W., O'Leary, K. How to make a token system fail. Exceptional Children, 1968, 35, 101-109.

Langer, P. The range of teaching skills that can be changed by the minicourse model. Paper presented at the meeting of the American Psychological Association, 1968.

Lippit, R. Training for participation. Adult Leadership, 1965, 14, 43-44.

Loree, R. and Koch, M. Use of verbal reinforcement in developing group discussion skills. The Journal of Educational Psychology, 1960, 51, 164-168.

Lovaas, O. Behavior modification: teaching language to psychotic children (color film). New York: Appleton-Century-Crofts, 1969.

McDonald, F. and Allen, D. Training effects of feedbacks and modeling procedures on teaching performance. Stanford University: United States Office of Education, 1967.

McKenzie, H., Clark, M., Wolf, M., Kothera, R., Benson, C. Behavior modification of children with learning disabilities using grades as tokens and allowances as back up reinforcers. Exceptional Children, 1968, 34, 745-752.

Nelson, Lois. The effect of classroom interaction on pupil linguistic performance. Unpublished doctoral dissertation, University of California, Los Angeles, 1964.

O'Leary, D., Becker, W., Evans, M., and Saudargas, R. A token reinforcement program in a public school: a replication and systematic analysis. Journal of Applied Behavior Analysis, 1969, 2, 3-13.

Orme, M. and Purnell, R. Behavior modification and transfer in an out-of-control classroom. Monograph No. 5. Center for Research and Development on Educational Differences, Harvard University, 1968.

Philips, E. Achievement place: token reinforcement procedures in a home-style rehabilitation setting for "predelinquent" boys. Journal of Applied Behavior Analysis, 1968, 3, 213-223.

Porta, R. Relationship of participation to satisfaction in small group discussions. The Journal of Educational Research, 1965, 59, 128-132.

Ryan, A. and Krumboltz, J. Effect of planned reinforcement counseling on client decision-making behavior. Journal of Counseling Psychology, 1964, 2, 315-323.

Sanders, N. Classroom questions: what kinds? New York: Harper and Row, 1966.

Scovel, D. A study analyzing high school questioning behavior in American history classes. Unpublished doctoral dissertation, State University of Iowa, 1968.

Shaffer, V. The categorization of student inquiries and the responses made within the context of classroom interaction. Unpublished doctoral dissertation, University of Utah, 1966.

Shores, R. Performance of learning disabled and normal children from differing social classes under tangible or intangible reinforcement conditions. Exceptional Children, 1969, 35, 634-644.

Sidman, M. Tactics of scientific research. New York: Basic Books, 1960.

Skinner, B. F. Cumulative record. New York: Appleton-Century-Crofts, Inc., 1959.

Skinner, B. F. Science and human behavior. New York: Macmillan, 1953.

Skinner, B. F. The technology of teaching. New York: Appleton-Century-Crofts, 1968.

Skinner, B. F. Walden II. New York: Macmillan, 1948.

Staats, A. and Butterfield, W. Treatment of nonreading in a culturally deprived juvenile delinquent: an application of reinforcement principles. Child Development, 1965, 36, 925-942.

Taba, H. The teaching of thinking. Elementary English, 1965, 42, 534-542.

Thompson, E. and Galloway, C. Material reinforcement and success in spelling. The Elementary School Journal, 1970, 70, 395-398.

Thompson, R. Learning to question. The Journal of Higher Education, 1969, 6, 467-472.

Tyler, V. and Brown, D. Token reinforcement of academic performance with institutionalized delinquent boys. Journal of Educational Psychology, 1968, 59, 164-168.

Waetjen, W. Recent analyses of teaching. The Bulletin of the National Association of Secondary School Principals, 1966, 50, 17-29.

Washton, N. Teaching science creatively: a taxonomy of pupil questions. Science Education, 1967, 51, 428-431.

Whelan, R. and Haring, N. Modification and maintenance of behavior through systematic application of consequences. Exceptional Children, 1965, 32, 281-289.

Wolf, M., Files, D., and Hall, V. Experiments with token reinforcement in a remedial classroom. Behavior, Research, and Therapy, 1968, 6, 51-64.

Zimmerman, E. and Zimmerman, J. The alteration of behavior in a special classroom situation. Journal of the Experimental Analysis of Behavior, 1962, 5, 59-60.