Cognitive interaction and learning in home economics classes

Dorothy Jetty West Kizer

Iowa State University

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Cognitive interaction and learning in home economics classes

by

Dorothy Jetty West Kizer

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of DOCTOR OF PHILOSOPHY

Major: Home Economics Education

Approved:

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INTRODUCTION

After over 40 years of empirical studies of teaching, a considerable amount of educational research has been published (B. O. Smith, 1971, p. 1). It appears that studies are emerging that can yield more complete data on which to base continued improvements in teaching. This exploratory research was planned to make a contribution toward such improvements.

The Home Economics Education Department, Iowa State University, recognizes the need for improving teaching and teacher education. Research efforts oriented toward this goal include an ongoing professional competency study of home economics education graduates. The first phase of this exploratory study for assessing the professional competencies of graduates in home economics education has been conducted by Fanslow, Hughes, and Zimmerman (in progress). The investigator's study was planned to complement the competency study and contribute to the overall research goals of the Home Economics Education Department.

Recent developments such as videotapes and interaction analysis systems have made it possible to view classroom behavior in more objective and less obtrusive ways. Some researchers view these developments as breakthroughs in the study of teaching (B. O. Smith, 1971, pp. 2-3).

Classroom behaviors have been analyzed for the affective, and most recently the cognitive domain, to determine what is occurring in the interaction between teacher and students (Simon and Boyer, 1970). To this point little has been done to relate these cognitive behaviors to the learning of the students (Rosenshine and Furst, 1971).

Numerous kinds of cognitive behaviors occur and such behaviors can
be measured (Bellack, Davitz, Kliebard, and Hyman, 1966; Brown and Webb, 1968; Brun, 1970; Smith, Meux, Coombs, Eierdam, and Szoke, 1962). What is needed are data concerning how these behaviors affect learning. One of the first steps in this endeavor appears to be studies that will reveal the ways in which cognitive behaviors are related to cognitive learning. Based on past performance, process-product correlation studies offer promise of producing results which define or isolate variables (Rosenshine and Furst, 1971, p. 42). These variables could be used in rigorously controlled studies to provide hard data on which to build teacher education programs.

Process-product correlation studies are defined by Rosenshine and Furst (1971) in the following manner:

... investigations which attempt to relate observed teacher behaviors to student outcome measures ... Such studies are best labeled as 'correlational' because only naturally occurring behaviors are observed. (p. 42)

The objectives of this study are concerned with home economics education in order to provide data on which further studies can be based in this area of teacher education. This investigation is a process-product study to determine the association between cognitive behaviors and learning in the classroom. The objectives are:

1. To determine the relationship between levels of cognitive interaction in the classroom and student learning,

2. to determine if there are certain patterns or sequences of cognitive behaviors associated with student learning, and

3. to examine other selected variables associated with student learning.
The review of literature in this chapter is discussed in three sections. In the first section an overview is presented. The second section consists of a review of selected cognitive interaction analysis systems. The third section consists of a review of research which relates classroom behaviors to the cognitive learning of students.

Overview

For many years research on teaching was hindered by lack of objective observational systems for recording behaviors occurring in classrooms. In recent years the situation has changed. We now have a proliferation of instruments for this purpose. The problem remaining has to do with how the recorded classroom behaviors affect learning. This state of affairs was evidenced by Ackerman (1954) and Rosenshine (1971) as they reviewed studies on teaching.

Ackerman (1954) states that:

Because the actual behavior of the teacher in the classroom is such an important factor, it is necessary to devise means of observing and recording this behavior. Methods must be used in which only a minimum of inference is allowed . . . . Such a process does suggest a potentially wider range of investigation which is hoped will provide more reliable information in the areas of teacher effectiveness and pupil change. (pp. 286-287)

Rosenshine (1971) expresses present research needs as follows:

It is relatively easy to develop observational systems and obtain high inter-rater agreement. However, at some point we must ask which of the hundreds of behaviors that can be objectively and reliably counted are related to pupil growth. Many of these behaviors ought to have significant correlations with pupil growth . . . . (p. 52)
Cognitive Interaction Analysis Systems

Introduction

Since the time of Ackerman's statement, numerous observation systems, specifically interaction analysis systems, have been developed. Over 100 were found in current literature. Seventy-nine selected interaction analysis instruments are included in Mirrors for Behavior II, an anthology of observational instruments (Simon and Boyer, 1970).

A classroom interaction analysis system is a method of recording behaviors occurring as exchanges between teacher and student, or between student and student, or as exchanges between teacher or student and objects or situations. Simon and Boyer (1970) describe interaction analysis systems as "shorthand methods for collecting observable objective data about the way people talk and act" (Appendix, p. 1).

Systems most often used for research purposes in a classroom setting contain components of the affective and cognitive domain. Most systems are a combination of these two domains, but the primary focus of each system determines its classification.

In describing cognitive interaction systems Simon and Boyer (1970) state:

There are fewer systems dealing with the cognitive domain and they tend to be more complex. Apparently these cognitive systems deal with verbal behavior in two different ways. First, they note categories of verbal behavior such as giving data, asking for data, clarifying, defining and giving opinions and second, these systems attempt to get at some structured analysis of the thought processes themselves. To do this latter job, it is sometimes necessary to analyze a series of statements in order to determine what thought process is taking place. (Appendix, p. 1)
This review of cognitive interaction analysis systems consists of the Brun Cognitive Interaction System (BCIS) and selected relevant cognitive interaction systems not reviewed by Brun (1970). The systems reviewed can be used for research on teaching in a classroom setting. Each system was selected for review because of distinctive characteristics it possessed. The BCIS was developed and tested in home economics classrooms. The other cognitive interaction systems were developed in other types of classrooms.

**Brun Cognitive Interaction System developed in home economics**

The Brun Cognitive Interaction System (BCIS) was developed by Brun (1970). The purpose of the instrument was to provide a method for observing and recording verbal interaction occurring between teachers and their students in a teacher-led classroom discussion. The BCIS provides the basis for assessing the cognitive level of behaviors exhibited on a six-category basis classified from zero to five.

This system is built primarily on a synthesis of three cognitive classification systems: Taxonomy of Educational Objectives: Cognitive domain (Bloom, Engelhart, Furst, Hill, and Krathwohl, 1956), Hierarchical Schema of Mental Processes (Faculty of William M. Stewart Schools, ca 1965), and the Aschner-Gallagher System (Aschner, 1963; Gallagher and Aschner, 1963; Gallagher, 1968) for classifying thought processes. A distinctive characteristic of the BCIS is the classification of teacher behaviors according to the level of cognitive process the students would be expected to exhibit as a result of the teacher's behavior. It is
presupposed that the teacher stimulates and the students respond in a
one-way direction throughout a classroom discussion.

In the BCIS the categories of cognitive behavior for teachers and
students are arranged in hierarchical order. Thus these categories
constitute levels within the system ranging from 0 to 5. An abbreviation
of the categories which Brun (1970, pp. 63-79) fully defines is given
below:

Category 0: Unrelated behavior
Category 1: Recall or obtain information
Category 2: Use or select and apply knowledge
Category 3: Analyze, compare, contrast
Category 4: Judge, evaluate, determine significance
Category 5: Generalize or create.

By comparing the BCIS with the systems from which it was derived,
it will be noted that: (a) Category 0 corresponds to the "I. Routine"
category of the Aschner-Gallagher System (Aschner, 1963; Gallagher and
Aschner, 1963; Gallagher, 1968), (b) Category 2 is composed of classes
"Comprehension and Application" of the Bloom et al. (1956) system, and
(c) the order of the categories closely resembles those of the
Hierarchical Schema of Mental Processes (Faculty of the William M.
Stewart School, ca 1965), and the Aschner-Gallagher System (Aschner,

The procedure devised by Brun (1970) for recording the cognitive
interaction in the classroom calls for the observer to begin by entering
a category number (0 through 5) on a tally sheet for the teacher's
behavior. A tally sheet contains three columns of numbered pairs of
spaces for recording behaviors. The recording of the teacher's behavior is followed by the recording of the category of the student behavior it elicits, thus making one pair of recorded behaviors. Since the pairs are numbered in the order of their occurrence on the tally sheet the sequence of behaviors is preserved. When a student exhibits a cognitive behavior which has not been immediately preceded by a teacher behavior, the student's behavior is recorded first and the teacher's earlier behavior which prompted the student behavior is then entered for the teacher.

Brun (1970) performed inter-observer reliability checks throughout the development of the instrument to give clues as to where discrepancies might occur in categorizing observed behaviors (Brun, 1970, pp. 44-47, 48-53). This led to further refinements in category definitions and the examples of behavior used in illustrating these cognitive categories. The directions for using the system were also clarified in this manner. The reliability studies were repeated until it was shown that satisfactory agreement had been reached among observers in assessing both frequency and level of cognitive behaviors observed (Brun, 1970, p. 53).

The contingency chi-square technique (Wert, Neidt, and Ahmann, 1954, p. 155) was employed by Brun (1970) in the reliability calculations to test for differences among observers, using the frequency totals in each category of behavior. In the last reliability computation during the development of the BCIS a $\chi^2$ (8d.f.) = 11.29 (not significant at the .05 level) was obtained by using the tallies of the three observers in categorizing the behaviors portrayed in a full-length home economics videotaped class session (Brun, 1970, p. 50), thus indicating that the observers did not differ significantly in their categorizing of
behaviors. The instrument was then deemed ready to test in analyzing cognitive behaviors occurring in home economics classes. Intra-observer reliability was established by using two observations spaced one to four weeks apart on three different videotapes. The chi-square calculations from these observations yielded consistently nonsignificant chi-square values at the .05 level (Brun, 1970, p. 54).

As a part of the development of the BCIS, Brun (1970) sought to test the system in analyzing cognitive behavior which occurred in home economics classes. Her sample consisted of 20 ninth grade home economics classes in schools located within a 75 mile radius of Ames, Iowa. These classes were originally selected according to the requirements of a study by Zimmerman (1970) but in addition met the requirements of the research design of the study by Brun (1970). Videotapes were collected of classroom discussions held in these classes on two different days during the period between January 28, 1970 and April 14, 1970.

These 40 videotapes were viewed and analyzed in a randomly assigned order; no two tapes from the same classroom were analyzed in succession. Inter-observer reliability was established before the analysis of the tapes began and was computed again after 20 tapes had been analyzed. The chi-square values obtained were nonsignificant at the .05 level. The data concerning the kinds and number of cognitive behaviors exhibited by teachers and students in the 20 classes were used to answer three questions that Brun (1970, p. 59) studied in the test of the BCIS.

Question one: With what frequencies were the six levels of cognitive behaviors and the total of all cognitive behaviors exhibited by teachers and students in the selected ninth grade home economics classrooms as shown by application of the observational method?
Question two: What relationships existed between the stimulation of cognitive behaviors by teachers and the response by students in the selected ninth grade home economics classrooms as shown by application of the observational method?

Question three: Did the observational method when applied in analyzing cognitive behaviors in the selected ninth grade home economics classrooms, discriminate among the 20 different classrooms on each of the six different cognitive behaviors and on the total of all cognitive behaviors for teachers and for students?

With the exception of Category 0 Brun found that all categories of cognitive behavior were exhibited by teachers, but not all teachers exhibited all categories of cognitive behavior (Brun, 1970, p. 81). All teachers exhibited behaviors in Categories 1 and 2; 19 exhibited behaviors in Categories 1 through 3; 17 exhibited behaviors in Categories 1 through 4; 8 exhibited behaviors in Categories 1 through 5. The fact that the teachers exhibited cognitive behaviors in decreasing frequencies as the cognitive level arose supports the belief that the BCIS Categories form a hierarchy of cognitive behaviors (Brun, 1970, pp. 84-85).

Students exhibited behaviors tallied in Category 0 (unrelated behavior) in all 40 class sessions. Students and teachers had behaviors tallied in Categories 1, 2, 3, and 4 in an equal number of class sessions. It was noted that in one classroom where the teacher exhibited behavior in Category 5, no student behavior was tallied in this category. It was reported that in general, however, student behavior approximated the teacher's level of tallied behavior. An analysis of percentages revealed that:

Over 50 percent of all tallies were in category one, less than 20 percent in two and three, less than 4 percent in four, 0.4 percent in five, and 10 percent of student tallies in zero. (Brun, 1971, p. 4592-A)
By the use of 6 x 6 matrices of teacher-student behavior, Brun found that in 88.5 percent of the pairs, the two behaviors were at the same cognitive level. In 10 percent of the teacher-student pairs students were responding at the 0 Category, unrelated behavior (Brun, 1970, p. 93).

Brun computed single classification analyses of variance, fixed effects model, using raw and equated frequencies and percentages to determine if the observational method discriminated among the different classrooms on the six different cognitive levels. Significant F values at the .01 level, based on percentages, were obtained for teacher and student behaviors for Category 4. For student behaviors in Category 0 a significant F value at the .01 level was obtained for raw frequencies, and significant F values were obtained at the .05 level for percentages and equated frequencies.

To determine if the observational method discriminated among classrooms on the total number of behavior pairs exhibited, analyses of variance were computed using raw and equated frequencies. A significant F value at the .05 level was obtained for raw frequencies only, indicating if discussions were of equal length, classrooms would not likely differ significantly in the number of pairs of behaviors exhibited (Brun, 1970, p. 98).

Brun (1970) explained that the ability of the instrument to discriminate could be increased by more clearly defining the teaching technique needed in the interaction process (p. 99). She recommended that examples of the cognitive categories considered to be more nearly typical of classrooms be found to use in illustrating this observational system.
Systems developed in other subject matter areas

The Bellack System (Bellack, Davitz, Kliebard, and Hyman, 1963) resulted from a study concerned with the description and analysis of the "linguistic" behavior of 15 teachers and 345 students in 15 social studies classes in high schools in the New York area. The raw data consisted of tape recordings of four class lessons from each class. The transcriptions of the classroom discourses were used to develop an eight dimensional interaction system. The dimensions are (1) "pedagogical", that is, "structuring", "soliciting", "responding", and "reacting", (2) "content analysis", and (3) "logical" operations such as "defining", "interpreting", and "explaining" (Bellack et al., 1963, pp. 26-53).

From studying the dimensions found in the "linguistic" behavior of the teachers and the students in the classrooms, the noticeable similarity and consistency (p. 145) with which the behaviors were exhibited, prompted the investigators to develop their "Classroom Game" (p. 146). This game has rules for teachers and students. The object of the game is described by Bellack et al. (1963) as follows:

The eventual aim of the game, the ostensible reason for the play, is the pupil's learning of substantive and substantive-logical meanings. Learning is usually measured by test performance; therefore, the teacher's success depends upon the pupil's test performance. (p. 156)

One of the persistent problems encountered when analyzing cognitive classroom behavior is the interference of levels of conceptualizing with the logical mental processes. The Topic Classification System (Gallagher, 1967) provides a classification method which helps alleviate this problem. This dimension includes three levels which are data, concept, and generalization. The logical dimension of the system is composed of
description, explanation, evaluation, expansion, activity, and structure categories. The other dimension codes the topics into content or skill. The Topic Classification System requires that tape recordings be made within a classroom. These recordings are transcribed for analytical purposes. The topic is the unit for coding. A topic to be categorized must be at least 15 typewritten lines of the tape recording transcript (Simon and Boyer, 1970, System 6, pp. 1-3).

Cognitive interaction analysis systems which contain only the cognitive component without other components are rare. The Taxonomy of Image Provocation Profile (TIP) developed by Solomon (1969) is such a system. It is unique in another way, that is, it has as its theoretical bases the "theories of Piaget and Bruner" (Simon and Boyer, 1970, System 72, p. 1). A coder categorizes only teachers' behaviors as they occur in the classroom. The behaviors are categorized into five progressive categories on each of these imagery levels: (1) Concrete-imagery, (2) Representational, and (3) Abstract-imagery. The coding is further explained by Simon and Boyer (1970) as follows:

Teacher behaviors are coded on the basis of attempts to provoke imagery by using 'concrete phenomena', 'representations', or 'abstractions' in the visual, auditory, somatic (organic, kinesthetic or tactual), olfactory, or gustatory modes. (System 72, p. 1)

In discussing interaction analysis schemes of teaching, Yamamoto (1967) asserts that:

All these schemes seem to ascribe to the entire 'class' any verbal behavior revealed by individual children. Thus, any child may talk and the utterance is automatically regarded as an index of what is done by every member of the alleged group. (p. 209)

He further expanded on his position as follows:
To be sure, under certain circumstances, the teaching phenomena may be analyzed and explained on the basis of the records of collective verbal communication, and through application of the principles of general group processes. In many cases, however, a question, 'Interaction really between whom and whom?' could be profitably raised. (p. 210)

The Verbal Pupil-Behavior Category System (VPBCS) developed by Parakh (Simon and Boyer, 1970, System 62, p. 1) does not have some of the disadvantages that Yamamoto attributes to analysis schemes. In the VPBCS the focus is on the individual pupils in a class. This is done in coding by using a seating chart to record which student is speaking as well as his individual verbal behavior. This must be done live by a coder within the classroom. This system was devised to code the mode of talk and the categories of the modes as follows:

Modes of talk
- Asking questions, giving information, volunteering, and replying

Cognitive categories of each mode

Classroom Behavior and Cognitive Learning

Studies of the relationship between classroom behaviors and the cognitive learning of students are scarce in the literature. This fact is attested to by educational researchers such as Gage (1972) in the following statement referring to the relative neglect of cognitive aspects:

Strangely enough, this restriction is a very severe one. Much of the literature of research on teaching is not cognitively
oriented. Many if not most of the best known programs of research on teaching have been aimed at social and emotional aspects of how teachers behave and how students respond and develop. Indeed, it is probably also fair to say that the more successful programs of research on teaching have been noncognitively oriented. I can illustrate this point with reference to testing, rating, and observational studies of teaching. (p. 127)

Rosenshine (1971), writing in Research in Classroom Processes, began his discussion of the topic of cognitive aspects of instruction with the following sentence:

There has been much less systematic observation of the cognitive aspects of instruction than of affective aspects, and the observational measures developed by the different investigators are much more difficult to compare. (p. 77)

Due to the limited number of cognitive studies in the literature as noted above, classroom behaviors in this review are interpreted in the broad sense of the term, that is, they may or may not be observed and analyzed by a cognitive interaction system. They may be observed and quantified by some other means. The behaviors will have occurred, however, in a classroom setting, but in some cases with certain controls. Thus, they may or may not be normally occurring behaviors.

In the studies reviewed in this section, cognitive learning is interpreted to mean cognitive classroom learning. Cognitive classroom learning is assessed by achievement tests. From a student's performance on achievement tests, the extent of his learning is inferred.

Teacher behaviors and pupil achievement

Wright and Nuthall (1970) sought answers to the following questions:

Do teachers using different techniques make much differences to how pupils learn? Or is it a matter of little consequence how teachers perform, so long as they cover the same curriculum content in approximately the same time? (p. 477)
They attempted to identify the short term effects of teacher behaviors on the achievement of elementary school children. By using a pilot study of experienced teachers, they developed instructional materials to be used for three lessons.

In order to obtain wide variation in teaching behaviors for their three experimental groups they selected six experienced teachers and 11 student teachers at two different stages in their pre-professional training. Elementary school children of approximately eight years of age (N = 296) were taught in class groups of 20. These lessons were tape recorded. The day following the conclusion of the lessons, the pupils were administered an achievement test.

The behaviors recorded on the audiotapes were analyzed by an interaction analysis system which appears to have been adapted from several other interaction analysis systems. Using the quantified classroom behaviors in a process of intercorrelation, Wright and Nuthall (1970) obtained a set of 28 variables of teacher and pupil behaviors.

Results obtained from analyses using the 28 variables and the achievement test performance of the pupils suggested that 30 percent of the variance in the "achievement test scores is attributable to the intelligence ..." "Of the remaining variance about 14 percent can be attributed to differences between classes" (Wright and Nuthall, 1970, p. 484). Teacher variables which were found to be significant were further reduced to six categories or derived variables. Using these six variables in multiple correlation processes, results were obtained which suggested that approximately 79 percent of the variance in "residual
achievement (class means) was associated with the selected teacher behavior variables" (Wright and Nuthall, 1970, p. 488).

The following relationships were selected from among those identified as significant by the analyses of the data:

. . . tendency to ask one question is positively related to achievement, while the tendency to ask several questions is negatively correlated . . . . (p. 486)

. . . the percentage of teacher questions which were answered by pupils was positively correlated with achievement . . . . (p. 486)

. . . review at the end of a lesson was significant, but review at the beginning had no discernible effect. (p. 488)

Of the six derived variables found in the Wright and Nuthall (1970) study, the one most relevant to this investigation was the variable identified as "type of solicitation" (p. 487). This variable consisted of the classification of teachers' questions as to whether they were "closed" or "open". "Closed" was defined as questions which required pupil answers "of fact, description, definition, naming" (p. 487). "Open" was defined as questions which required pupil answers of "opinion, evaluation, explanation, inference" (p. 487).

When teacher frequencies in these two categories of questions, open and closed, were converted to percentages, it was found that the "greater the percentage of a teacher's questions which were 'closed', the higher the achievement of the pupils" (p. 487).

To interpret what this means, it must be mentioned that the achievement test was designed to measure the knowledge level of learning. The kinds of pupil responses required to answer the "closed" questions
correspond to this level of learning according to the **Taxonomy of Educational Objectives** (Bloom et al., 1956).

**Teacher questions and student achievement**

In an exploratory study Kleinman (1965) sought, among other purposes, to determine whether "the kinds of questions general science teachers ask influence pupils' understanding of science" (p. 5153). Her study was conducted in two stages. The first stage provided data on which to divide 23 seventh and eighth grade science teachers into two diverse groups on the criterion of the number of critical thinking questions asked by the teachers in their classes. The teachers were observed for two more class periods. The observation form which listed seven categories of teacher questions was used to record the classroom data. The group of 767 seventh and eighth grade pupils taking part in the study included boys and girls of high, average, and low abilities.

Kleinman (1965) reported significant differences at the .01 level between the proportions of factual and critical thinking questions asked by these two groups of teachers (p. 5153). After the students of these two groups of teachers had taken the Test on Understanding Science, the difference in the mean scores of the two groups was subjected to t tests. Significant differences at the .01 level were obtained indicating that the teachers who asked more critical thinking questions helped students acquire a better understanding of science.

Kleinman recommended that replications be made of this study because it strongly suggested that teachers who ask more critical questions "impart greater understanding" to students (1965, p. 5154).
A study by Hunkins (1968) reported results that indicate training students in particular kinds of question types such as knowledge as opposed to analysis-evaluation can make a difference in their performance on tests of these levels of cognitive learning. This study is reviewed by Brun (1970).

**Multiple classroom behaviors and achievement**

Viewing the teaching process as a complex of behaviors, Furst (1967) related cognitive components using the Bellack system and affective components of the Flanders system to pupil achievement. Her sample consisted of 15 teachers and 345 students. The teachers were grouped as high, middle, and low on the variables of cognitive behavior, affective behavior, and level of student achievement. Furst reported that on the basis of analyses of variance results, the three teachers with the highest achieving students were significantly higher in their use of a variety of types of cognitive processes (p. 961).

**Logical operations and achievement**

In order to provide information on the best way to teach concepts, Nuthall (1968) conducted a study using four "strategies" from the Smith et al. (1962) "logical operations" system. The four "strategies" Nuthall chose occur frequently in classroom teaching, especially in what Smith et al. (1962) called classroom discourse.

The four ways (strategies) which Nuthall used were teaching by such means as (1) describing of a "characteristic of a concept or listing the parts that make up a concept" (p. 562), (2) comparing concept with some similar thing, (3) identifying "of an instance or example of the
concept" (p. 562), and (4) the conditions attached to using the class term itself" (p. 562).

The subjects, 432 tenth and eleventh grade social science students, were taught in 17 classes. The raw data consisting of tape recordings of five consecutive lessons were analyzed to identify the teaching strategies. An achievement test was administered at the conclusion of the set of lessons. Nuthall (1968) reported that differences in teaching strategy were related to differences "in student performance" on the criterion test (p. 583).

Manipulating abstract thinking and pupil problem-solving

The previous review of studies hints that the type of behavior exhibited in the classroom may be related to the type of learning which occurred. Lundsteen (1970) explored this supposition further by an investigation to determine if learning of creative problem-solving is enhanced by training in abstract thinking.

In the design of her study 35 classes of fifth grade students were randomly assigned to five treatment groups. Three groups were given a common core of training in problem-solving, with three varying conditions. One of the experimental groups was given special training in the use of abstractions, another group received training for comprehension in listening, and the third group received extra practice in problem-solving. Two control groups were used.

According to the reported results obtained from Scheffé tests of means, the experimental groups scored significantly higher than the control groups on problem-solving. There was not a consistent increase
in productivity of the abstractly trained groups. Perhaps this finding should be examined in relation to the theories of Piaget.

**Classroom participation and achievement of pupils**

The results of the investigation of Hughes (1973) indicate that pupil participation in classroom responses to teacher questions has little effect on pupils' achievement. With a sample of 12-year-old students in 13 classes, three 40 minute science lessons were taught by specially trained teachers.

The students were asked questions by three predetermined schemes. The first scheme consisted of questions asked to the students at random, the second scheme involved asking questions according to the seating arrangement, and the third scheme consisted of asking questions only of pupils who wished to respond. No significant relationship was found between pupil achievement and the pupils' overt responses to teachers' solicitations.
MODEL

In the first section of this chapter an explanation of the conceptual model of the research study is given. The second section is a report of literature on the instruments used to assess the elements of the model.

Conceptual Model

The viewpoint from which this study was undertaken can be best understood by inspecting the model diagrammed in Figure 1. The term model as used here is defined by Snow (1973) in *Second Handbook of Research on Teaching* as follows:

In the present context, it seems most useful to consider models as well-developed descriptive analogies used to help visualize, often in a simplified or miniature way, phenomena that cannot be easily or directly observed. Each model is thus a projection of a possible system of relationships among phenomena, realized in verbal, material, graphic or symbolic terms. (p. 81)

The model shown in Figure 1 depicts the conceptualized relationships of the variables in this study. The basic outline of the model was derived from the evaluation model of T. C. Smith (1971). The model consists of the following components: (1) Input, (2) school, (3) class, (4) unit of study, (5) triad of teacher-student-concepts, and (6) output.

The input component involves the characteristics students bring to a learning situation. Ausubel (1968) speaks of the concept encompassed in this component as the student's learning set which is his inclination to relate new material to his existing cognitive structure. The following passage helps to explain Ausubel's meaning of cognitive structure:

... we are now in a position to discuss cognitive factors in classroom learning. Among these factors, the existing structure of knowledge at the time of learning (cognitive structure
FIGURE 1

Six components of model
variables) is, perhaps, the most important consideration. Since this involves, by definition, the impact of prior experience on current learning processes, it is synonymous with the problem of transfer. (p. 127)

Gagne (1970) refers to elements of the input component as the capabilities or the complex of learning skills that a student brings to the instructional process (pp. 66-67).

The input is brought to the learning situation or setting. This setting is composed of the school, class, and the unit of study. The setting provides the background for the dynamic component of the model which is the interaction of the three elements of the teacher-student-concept triad. In this inner component of the model the actual teaching process occurs.

Hyman (1967) explains the dynamic nature of the teacher-student-concept triad in the following manner:

Perhaps more important than the idea of multiple connections among the three elements in teaching is the dynamic quality of the triad. This quality is implied in the triadic conception of teaching because as the relationship between teacher and pupil changes, . . . the teacher must continually change his relationship with the [concepts] . . . . (p. 68)

The output includes learning acquired, the students' new learning sets, new cognitive structures, or new capabilities after conclusion of unit of study. The definition of learning used in this conceptualized component has been stated by Gagne (1970) as follows:

Learning is a change in human disposition or capability which can be retained, and which is not simply ascribable to the process of growth. (p. 3)

The components of the model, as represented by elements dealt with in this study, were perceived in the following manner:
1. Input was represented by the general educational abilities of students as measured by the Iowa Tests of Educational Development.

2. School was associated with teacher. Data were obtained from a home economics class and comparable group from each school.

3. Class is represented by the home economics classes included in the study. The aspect of class that was examined was the learning climate as measured by the Student Estimate of Teacher Concern and the Learning Environment Inventory.

4. Unit of study in this research was the child development unit in home economics eleventh and twelfth grade classes. The unit included instructional objectives, including behavioral and content aspects. The content area was limited to child development. The assumption was made that the instructional objectives included a common core among the home economics classes based on the teachers' stated objectives and the objectives in *A Guide for Developing a Curriculum in Human Development and the Family* (Iowa Department of Public Instruction, 1968). Another element of the study was the varying lengths of the units in the different schools.

5. Triad of teacher, student, and concepts is the interaction grouping. The concepts represent content aspects of the verbal interaction. The lines between the three parts of the triad represent the verbal interaction described in this study in terms of levels of cognitive behavior as categorized by the Brun Cognitive Interaction System.
6. Output is represented by the achievement as measured by the Children and Childhood test.

The instruments used to assess the elements of the model are shown in Figure 2.

The Instruments as Reported in Literature

The instruments used to assess the variables in this study are shown in the model in Figure 2. The Iowa Tests of Educational Development (ITED), the Student Estimate of Teacher Concern (SETC), and the Learning Environment Inventory (LEI), which have been used in numerous other studies, are discussed in this section because of their relationship to this model. The Brun Cognitive Interaction System (BCIS) is discussed in relation to other cognitive interaction systems in the Review of Literature chapter. The development of the Children and Childhood test is discussed in the Method of Procedure.

The Iowa Tests of Educational Development

The fifth edition of the Iowa Tests of Educational Development (ITED) is a battery of the following achievement tests: (1) Understanding of Basic Social Concepts, (2) General Background in the Natural Sciences, (3) Correctness and Appropriateness of Expression, (4) Ability to do Quantitative Thinking, (5) Ability to Interpret Reading Materials in the Social Studies, (6) Ability to Interpret Reading Materials in the Natural Sciences, (7) Ability to Interpret Literary Materials, (8) General Vocabulary, and (9) Use of Sources of Information. The ITED is designed to be administered to high school students in grades 9 through 12 on a
FIGURE 2

Instruments used to assess elements of model
periodical basis. In many schools it is administered annually. The fifth edition of the ITED which had been administered to the students in this study required 464 minutes of testing time (Science Research Associates, 1951).

Since 1972 the sixth edition of the ITED has been used in testing. This edition consists of the following seven tests: Expression, Quantitative Thinking, Social Studies, Natural Sciences, Literature, Vocabulary, and Use of Sources. The testing time required has been shortened to 240 minutes (University of Iowa, 1972).

The purposes of the ITED which are particularly applicable for this study are described in the General Manual as follows:

... designed to provide a comprehensive and dependable description of the general educational development of the high school student .... They are designed to measure relatively broad and generalized intellectual skills and abilities that are continuously developed in every student throughout all the years that he is in school. [The three tests which measure generalized reading skills] ... are intended to measure the student's ability to do critical thinking in each of these areas. They are concerned not so much with what the student has learned, in the sense of specific information, but rather with how well he can use whatever he has learned. The tests cover such skills as acquiring, interpreting and evaluating new ideas, relating new ideas to old, and applying broad concepts and generalizations to new situations or to the solution of problems. (Science Research Associates, 1951, p. 1)

According to technical data given in the school administrator manual, the content validity of the ITED must be assessed by the individual test user. It is suggested that this assessment be based on a "painstaking evaluation of the test materials" and a careful judgment as to the appropriateness of the tests for the students in the testing program (University of Iowa, 1970, p. 32).
A number of criterion-related validity studies have been conducted using ITED composite scores and other instruments of assessment. In one study (University of Iowa, 1970, pp. 35-36) validity coefficients ranging from .66 to .80 (N = 13,733) were obtained between ITED composite scores and eleventh and twelfth grade student scores on the American College Test (ACT). In the school administrator manual a table shows the validity coefficients between various achievement measures and the composite score on the ITED (University of Iowa, 1970, p. 34). Among the measures listed are rank in class, cumulative grade point, and subject matter grades. The range of validity coefficients is from .56 to .79. The correlations obtained between twelfth grade composite scores and college freshman grades were given as predictive validity with coefficients ranging from .61 to .71 (University of Iowa, 1970, p. 40).

The principal sources for construct validity on the ITED have been obtained from factor analyses and from studies concerned with pupil achievement which used the ITED (University of Iowa, 1970, p. 43). A factor analytic study by Evans (1967) found evidence of four factors in the ITED in addition to the one factor peculiar to each of the individual tests in battery. The factors dealt with different aspects of achievement such as general knowledge, factual knowledge, literary knowledge, and verbal reasoning (Evans, 1967, p. 186).

Reliability coefficients obtained using the Kuder-Richardson formula 20 were .98 and .99 for ITED composite scores in grades 9-12. The correlations obtained between composite scores for four successive years were .91, .93, and .95 (University of Iowa, 1970, p. 45).
For the ITED the percentile rank norms are derived from a nationwide testing of 51,098 students by stratified random sample according to region and size of student body.

Numerous studies utilizing ITED scores are reported in the literature. For example, Bennett, Seashore, and Wesman (1952) related composite scores on the ITED to scores on the Differential Aptitude Tests (DAT) for ninth grade students. From their findings the following were selected as being particularly meaningful to the present study: On Abstract Reasoning the correlation coefficient for girls was .62 and for boys, .64 (N = 91); on Verbal Reasoning a correlation coefficient of .79 was obtained for both girls and boys (Bennett, Seashore, and Wesman, 1952, pp. 5, 34-37).

Some studies have sought to determine the relationship between ITED and intelligence. For example, Lorge and Thorndike (1966) related ITED scores and the results of Lorge-Thorndike Separate Level Edition intelligence test to obtain correlation coefficients ranging from .42 to .84 in grades 9, 10, and 11. The most pertinent to this study is the correlation between the composite ITED score and the Lorge-Thorndike IQ obtained by tenth and eleventh grade students on the verbal batteries. These correlation coefficients ranged from .86 to .90 (N = 138-178) (Lorge and Thorndike, 1966, p. 21). In a study of 82 twelfth grade students in Le Mars, Iowa, Lamke and Nelson (1957) obtained a correlation coefficient of .848 between ITED composite score and Henmon-Nelson IQ (Lamke and Nelson, 1957, p. 11).

Pupils' ITED percentile ranks have been used in studies in Home Economics Education, Iowa State University, in determining if pupil gains were attributable to teacher effectiveness (Scruggs, 1959; Wachtel, 1963).
Using items from tests developed previously by Scruggs (1959), Roland (1961), and others in home economics education, Wachtel (1963) devised homemaking tests which discriminated among pupils on subject matter but controlled for pupil ability assessed by ITED (Wachtel, 1963, pp. 22-24).

**Student Estimate of Teacher Concern**

The Student Estimate of Teacher Concern (SETC) is an instrument originally developed by Nygren (1960) to measure students' perceptions of teacher concern. Nygren (1960) viewed teacher concern for student well-being as having three dimensions which were operationally defined as follows:

1. Recognition – the identification of an individual and the according of status.
2. Understanding – the knowledge of the causal factors related to the behavior of an individual.
3. Help – the desire and the attempt to bring benefit to an individual. (Nygren, 1960, pp. 177-178)

These dimensions of teacher concern were assessed by a 93-item questionnaire to which students responded in relation to how they perceived their home economics teacher.

Nygren (1960) compared the mean standard scores of the four selected New York homemaking teachers on the SETC with the teachers' own evaluations of their concern. The results appeared to support the belief that the SETC was a valid instrument. Nygren (1960) obtained a split-half reliability coefficient of .96 on this instrument using the scores of the original 53 students combined with scores of 143 students from a research project at Cornell University.
Ray (1959) did further study on the validity and reliability of the SETC as she sought to improve and revise the instrument. The sample for the study consisted of nine recent graduates of the New York College of Home Economics and their 468 pupils. Ray (1959) increased the discriminating power of the SETC and broke the help dimension into the two dimensions of help I, desire to help, and help II, help given. In discussing the findings, it was noted that the four dimensions produced significantly high intercorrelation coefficients. Ray therefore chose to use the SETC as a single measure of teacher concern.

Other studies employing the SETC include five at Iowa State University (Northey, 1961; Wachtel, 1963; Ott, 1963; Crabtree, 1965; Zimmerman, 1970) and four at Pennsylvania State University (Murray, 1968) and three additional studies (Zimmerman, 1970). A comprehensive review of eight of these studies was written by Zimmerman (1970), but will not be reviewed here.

Zimmerman (1970) used the SETC as a means of assessing the quality of teacher-student interaction. Her sample consisted of 20 teachers selected from a population of 126 by the criterion that they scored high or low on a measure of self-actualization. One of the three purposes of the study concerned the possible relationship between teacher-pupil rapport as measured by the SETC and the degree of teacher self-actualization. Using teachers' means on the SETC, a one-way analysis of variance was computed. No significant difference between the teachers who scored high on self-actualization and the teachers who scored low on self-actualization was found (Zimmerman, 1970, p. 121).

In the process of analyzing data, Zimmerman (1970) examined the responses to the SETC to determine if the instrument was additive.
"A pooled within group correlation matrix was computed among items and between items and the total score" (Zimmerman, 1970, p. 85). A single 39-item cluster emerged from this procedure. This finding of the single cluster refuted the belief held by Nygren (1960) and hypothesized by Ray (1959) that the SETC measured three or four separate dimensions of teacher concern. Zimmerman (1970), using a Spearman-Brown formula, obtained a .91 estimate of reliability on the 39-item cluster of the SETC.

**Learning Environment Inventory**

The Learning Environment Inventory (LEI) was developed by Anderson (1971) from the Classroom Climate Questionnaire (Walberg, 1968). The purpose of the instrument was to measure aspects of group effects which theory and research suggest influence cognitive learning.

The LEI consists of 15 scales which measure dimensions of the social climate within a class. The assessment is obtained from student responses to seven items for each of the following scales: Cohesiveness, Diversity, Formality, Speed, Environment, Friction, Goal Direction, Favoritism, Difficulty, Apathy, Democratic, Cliqueness, Satisfaction, Disorganization, and Competitiveness. The mean of student scores is the class estimate of the various scales of the LEI. The individual student's score on the LEI is his "perception" of the learning climate (Anderson, 1971).

During the development of the instrument, the items comprising each scale were evaluated by a panel of judges to insure homogeneity of content. The relatively high alpha reliability estimates, .54 to .85, obtained for
the scales verify the fact that homogeneity of content was attained. Estimates of test-retest reliability of .49 to .80 on the LEI scales were obtained from administration of the LEI to 139 Harvard Project Physics students in nine classes of grades 11 and 12 in three high schools in the Boston area (Anderson, 1971, pp. 5-11). Intercorrelations between LEI scales show many to be "substantially intercorrelated" but Anderson suggested "... they may be treated independently in analyses, providing conservative statistical tests are employed" (Anderson, 1971, p. 13).

Construct validity for the LEI has been defined for each scale in terms of "prior theoretical and research efforts" (Anderson, 1971, p. 13). The principal source of validity research data was a study of physics students (Anderson, 1969). The findings from this study indicated that student learning was affected by properties the LEI purported to assess. In addition, differing relationships were found between cognitive learning of girls and boys and LEI scales, and students of high and low ability and the LEI scales. Therefore, the conclusion was drawn that the scales measure distinct properties of the learning environment.

In the previously mentioned study, Anderson (1969) explored group influence on individual learning with a sample of 800 high school Harvard Project Physics (HPP) students selected at random from 113 classes during the 1967-68 school year. Group influence was interpreted to be the social climate of learning which included the profile of class group properties that are measurable. These class group properties were measured by the scales of the LEI. Anderson (1969) hypothesized that "class
properties differentially affect pupils of different sex and mental ability." Mental ability was defined according to intelligence quotients obtained from the Henmon-Nelson Tests of Mental Abilities.

To assess cognitive learning the subjects were given a pretest, a test at midpoint in their instruction, and a post test. The following instruments were used in the testing: Test on Understanding Science (TOUS), Science Process Inventory (SPI), Physics Achievement Test (PAT), and Pupil Activity Inventory (PAI). Using the Kuder-Richardson Formula 20, estimates of reliability of .72 to .90 were obtained on these tests.

Mean scores on the LEI scales for a student's class were related to his gains or "change" on the four tests in a manner that made it possible to examine the effect of individual characteristics of sex and ability (Anderson, 1969). A five-step multiple regression analysis procedure was employed which provided information needed for understanding nonlinear relationships as well as the interaction effects of the different variables.

Numerous significant relationships were found between the LEI and "student change" on the different instruments for students with different characteristics (Anderson, 1969). There were more interaction effects for females than for males. An interesting example of this was found with the Intimacy scale, "class cohesiveness", of the LEI and TOUS. The "class cohesiveness" was positively related to gains for high ability females and negatively related to females with low ability. Viewed in total the findings reported indicate that the learning "environment" affects cognitive learning and that it affects this learning differently for students with differing characteristics.
METHOD OF PROCEDURE

Purpose of Study

The purpose of this study was to investigate the process-product effects of teaching home economics in a selected group of high schools in Iowa. The investigator sought to relate the observed cognitive behaviors of teachers and students to the outcome as judged by the students' achievement of educational objectives. The relationship of other independent variables to student achievement was also examined in an attempt to identify additional factors associated with student achievement in the particular schools.

Objectives

The study was designed (1) to determine the relationship between levels of cognitive interaction in the classroom and student learning, (2) to determine if there are certain patterns or sequences of cognitive behaviors associated with student learning, and (3) to examine other selected variables associated with student learning and their relationship to levels of cognitive interaction.

Hypotheses

The general hypotheses of the study were:

1. There is a relationship between the levels of cognitive behavior exhibited in the classroom and the learning of the students in relation to the instructional objectives.

2. There are identifiable patterns of cognitive behavior that differentiate among teachers.
3. There is a relationship between patterns of cognitive behavior and learning of the students in regard to the instructional objectives.

Population and Selection of Sample

**Population**

The population consists of the 1970-71 home economics education graduates of Iowa State University who were employed in teaching home economics in Iowa during the second semester of the 1971-72 school year. There were 29 in this group of first-year home economics teachers. They were employed by school systems which ranged in size from a total school population of 265 pupils to 44,197 pupils. The distribution of the teachers according to the size of the school systems which employed them is shown in Table 1.

**TABLE 1**

Distribution of teachers according to size of school system

<table>
<thead>
<tr>
<th>Number of pupils</th>
<th>Number in population</th>
<th>Number in sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000 or more</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3,000 - 3,999</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2,000 - 2,999</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>1,000 - 1,999</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>500 - 999</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>499 or less</td>
<td>9</td>
<td>6</td>
</tr>
</tbody>
</table>
The teachers were employed by schools located in four equal geographic quadrants of the state bounded by east-west U.S. Highway 30 and north-south U.S. Highway 65. Ten schools were located in the northwest quadrant, 10 in the northeast, 3 in the southeast, and 6 in the southwest. The schools were located within a radius ranging from approximately 16 to 165 miles of Ames.

Sample

The purposive sample was selected from the population by the requirement that the teacher had planned a child development unit for an eleventh or twelfth grade home economics class to be taught between March 1 and the conclusion of the 1971-72 school year. Of the population of 29 first-year teachers, 17 reported that they would be teaching a child development unit during the stated time period.

All of these teachers indicated that they would be willing to participate in the research project involving the use of video and audio-taping equipment within their classrooms. Four of these teachers were unable to participate, however, because of conflicting circumstances in relation to their schedules. For example, an accumulation of unanticipated events such as career days, fashion shows, and field trips shortened classroom time and resulted in eliminating parts of the child development unit. One of the participating teachers was unable to schedule discussion for the days on which class sessions were taped.

The final sample included 13 first-year home economics teachers in schools located in the four quadrants of the state. These schools ranged in size from systems with a pupil population of 265 to 3,578. The
distribution of these teachers relative to the size of the employing school systems is shown in Table 1. The schools in the sample, as in the population, were located within a radius of 16 to 165 miles of Ames.

Selection and Development of Instruments

The measurement instruments employed in this study included the Brun Cognitive Interaction System, the Children and Childhood test developed by the investigator, the Iowa Tests of Educational Development, the Student Estimate of Teacher Concern, and the Learning Environment Inventory.

Brun Cognitive Interaction System

The Brun Cognitive Interaction System (BCIS) was selected as the instrument to use in assessing the levels of cognitive behaviors occurring in the selected classrooms. The BCIS was chosen for this purpose because of theoretical and empirical reasons. The BCIS, as discussed in the Review of Literature, combines some of the best features of generally accepted theoretical frameworks of cognitive processes. Brun (1970) demonstrated that the instrument could describe the cognitive behaviors occurring in home economics classes, and that the descriptions could be used as a basis for assessing the cognitive levels of these behaviors. The BCIS was considered appropriate for use in this study because the range of cognitive behaviors included in the system encompasses the mental processes necessary to deal with the child development content taught in the units.

A review of literature on interaction systems disclosed that no other appropriate cognitive interaction system was available which did
not also contain some component extraneous to the purposes of the study. For example, in *Mirrors for Behavior II*, an anthology of observational instruments, only one cognitive observation system is listed which does not contain noncognitive components (Simon and Boyer, 1970). In this system, The Taxonomy of Image Provocation Profile (TIP), the categories do not describe the manner in which child development concepts are usually dealt with in home economics classes. Most of the other systems reviewed combined components such as classroom management, content, or affect with the cognitive component. The BCIS does not have this disadvantage. It categorizes only the cognitive component of the behaviors observed.

The BCIS was particularly suitable for this study in that it was possible to tape the class sessions while the units were being taught and to assess cognitive behaviors at a later date after inter-observer reliability had been established. Approximately two months were required for establishing this inter-observer reliability.

The inter-observer reliability was established between the researcher and a faculty member of home economics education. The first step in the process was to study the BCIS by using videotapes selected from the videotape library of the Home Economics Education Department. Six tapes were chosen for practice sessions. One tape was used repeatedly while agreement was reached in applying the directions of the system. On the first two tapes short segments of approximately 5 minutes of viewing were analyzed simultaneously by the two observers. This procedure was continued, lengthening the segments until 40 minutes of a class session were viewed at a time. A complete class session of a third tape was then independently but simultaneously analyzed by both observers, and a
chi-square calculation by the same procedure used by Brun (1970, p. 43) was made to test the differences between observers. A chi-square value of 1.41 was obtained. For 3 degrees of freedom a chi-square of 9.49 is significant at the .05 level and of 13.28 at the .01 level. There was insufficient evidence to indicate that a difference existed between observers.

In practice sessions during the following two weeks, both observers worked independently in analyzing practice tapes. A reliability check was then made. A chi-square calculation was made yielding $\chi^2 (8\, \text{d.f.}) = 140.59$ which was significant at the .01 level. An inspection of the categorized behaviors revealed the sources of the significant differences in observers. The tape that had been chosen displayed a number of high-level cognitive behaviors as well as behaviors in Categories 1 and 2. Interpretation of the BCIS definition of behaviors in Categories 1, 2, and 4 had created some major differences between observers. A need for further agreement between observers on what constituted a behavior was also indicated.

In order to correct these problems a number of steps were taken by the investigator. Additions to the definitions of the categories of Brun (1970) were made in order to differentiate more precisely between Categories 2 and 1 and between 2 and 4. These additions were as follows:

1. Category 2 involves cognitive behaviors ranging from comprehension (interpretation, extrapolation, or translation) to problem solving.

2. If the teacher's question seems to be calling for an interpretation of meaning in a particular situation, categorize as level 2.
The following is an example: A picture is shown or an incident is recalled. The teacher then asks, "How did the child feel?"

3. A difference between recall (Category 1) and some Category 2 behaviors may involve complexity of concept. Recall behaviors may consist of single, simple concepts such as color, texture, and tone. Category 2 behaviors involve putting together several simple concepts such as the example "What is a baby like?"

4. Category 4 involves value. The observer would expect students at this cognitive level to use some sort of criteria on which to base their judgments. The criteria may or may not be evident to the observer. The decision on the part of the observer depends on what she believes to be expected for students in this situation.

The following instructions were written to clarify what constituted a behavior and to aid in the process of analyzing the behavior:

1. Behavior is the unit for recording the frequencies of the five levels of cognitive interaction in a classroom. A verbal behavior begins when the teacher starts speaking and ends when a student's response is indicated. A student's verbal behavior is his total response to the teacher's stimulation.

   It is possible when several statements make up a behavior for the teacher or student to change cognitive levels. When this occurs each level is recorded as a separate behavior.

2. If the teacher asks two questions of the same cognitive level without pausing between questions, the behavior is recorded as one teacher behavior.

   A pause is equal to six syllables at the teacher's pace of speaking.

3. When the teacher makes a statement or poses a question to indicate a change in the discussion, it may or may not be recorded as a behavior.
If the teacher's verbal expression involves a change in cognitive behavior, it is recorded as a behavior. If the teacher's verbal expression involves a change in topic without a change in cognitive level, it is not recorded as a behavior.

4. If several students are responding, record only distinctly different speakers. If distinctly different speakers cannot be identified by watching students,
   (1) write down key words spoken,
   (2) listen for speakers' different voices, or
   (3) watch teacher on video to see if she shifts her eye contact as different words are spoken.

5. Standard procedure for viewing tapes:

   Review example sheets.

   Observe first 5 minutes of tape to acquaint oneself with sounds and classroom layout.

   Rewind tape and begin observation for analysis of the following categories:
   (1) Recall or obtain information;
   (2) Use or select and apply knowledge;
   (3) Analyze, compare, contrast;
   (4) Judge, evaluate, determine significance;
   (5) Generalize or create.

The observers studied the new directions which were then applied in independently analyzing three tapes. A check of differences between observers was made on one of these tapes. A $\chi^2 (6 \text{ d.f.}) = 11.00$ was obtained which was not significant at the .05 level. On the basis of these data, no significant differences in observers were indicated. The decision was made for the investigator to analyze five of the tapes collected for the study, after which another test of difference between observers would be made.

A tape randomly selected from the first 5 tapes analyzed by the researcher was analyzed by the other observer. A chi-square calculation was made. The chi-square value obtained was sufficiently low (Table 2,
number 1) that it was decided that the researcher should continue analyzing the remaining 19 tapes. After the investigator had analyzed these 19 tapes, 3 randomly selected tapes were then analyzed by the home economics education faculty member. Chi-square calculations were made to test for differences between observers. The hypotheses of no difference between observers were not rejected because sufficiently low chi-square values were obtained (Table 2, numbers 2,3,4).

**TABLE 2**

<table>
<thead>
<tr>
<th>Number of inter-observer check</th>
<th>Chi-square value</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.02*</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>2.78</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4.37</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1.58</td>
<td>4</td>
</tr>
</tbody>
</table>

*None of the chi-square values was significant at the .05 level.

After all 24 tapes had been analyzed by the investigator, the intra-observer reliability was assessed. One tape was randomly selected from the first group of class sessions taped. The selected tape was analyzed again and a chi-square calculation was made of the two different analyses by the investigator to test for differences in observations. A $\chi^2_{(4\text{d.f.})} = 0.92$ which was nonsignificant at the .05 level was obtained. A tape from the second group of class sessions taped was randomly selected and the procedure to test for differences in observations was repeated. A
$\chi^2 (6 \text{d.f.}) = 2.27$ which was nonsignificant at the .05 level was obtained. These relatively low chi-square values indicated that there were not significant differences between the two observations in each group of tapes. Thus intra-observer reliability was established.

**Children and Childhood test**

The test entitled Children and Childhood was developed to measure the achievement of students toward educational objectives associated with child development units in the selected schools. Beginning with a pool of items contained in a test developed by Clover (1973) and Gray (1970), the present form of the Children and Childhood test was obtained by a process of deletion, revision, and addition of new items to meet the needs of this study.

Since a primary concern of the study was with cognitive levels of behavior, test items were developed to measure these levels. The researcher and three home economics education faculty members, two of whom were evaluation specialists, worked together on the original pool of items developed by Clover (1973) to establish agreement on the level of cognitive behavior demanded in responding to items. The levels of cognitive behavior were judged in accordance with the definitions of the categories of the BCIS (Brun, 1970). Each of the four members of the panel assessed each item as to the cognitive level it measured. If different assessments of an item were given by panel members, suggestions were made by a panel member on how to revise or otherwise improve the item to measure the cognitive level intended. The principal disagreement was related to Category 1 which Brun (1970) defined as recall. This
disagreement was resolved by using the criterion that the categorization be made according to the panel's judgment of the level at which secondary teachers would expect Home Economics III students to be able to deal with the content.

In order to sample basic child development content, the areas selected for coverage in the test were drawn from the scope and sequence chart of A Guide for Developing a Curriculum in Human Development and the Family (Iowa Department of Public Instruction, 1968). The table of specifications for the test included the following content areas and their assigned weights:

- Emotional development 10 percent
- Mental development 10 percent
- Physical development 10 percent
- Social development 10 percent
- Guidance and discipline of children 20 percent
- Children's play 20 percent
- Play materials 20 percent

After the deletion and revision of some of the original items and the addition of a sufficient number of items to meet the requirements of the table of specifications, a rough draft of the test was evaluated by a faculty member of the Child Development Department, Iowa State University. She made a number of suggestions including the revision and addition of content material. These suggestions were incorporated into the revised test which was evaluated a second time by the same faculty member. The test was then reviewed by two home economics education faculty members to judge whether or not it measured what it proposed to measure. After this
review and final editing the form of the test used in the study evolved (See Appendix A: Children and Childhood test.).

The Childhood and Children test consisted of 42 items; 35 are multiple choice and can be machine scored. The 12 items which measured achievement at higher cognitive levels required the services of a scorer.

Throughout the development of the test the scoring key was used to evaluate its adequacy for scoring the 12 items which required a scorer. Special consultations with a faculty member of the Child Development Department were necessary for development of the scoring key for the items measuring higher cognitive levels. This was required in order to attain the proportional assessment of the several dimensions included in each item. Two child development faculty members were consulted on one item to eliminate possible ambiguities that could occur in scoring.

During a period of 7 weeks the researcher worked with a faculty member of home economics education to refine an instructional procedure for using the scoring key until a precise score value could be given consistently to complete and partial answers to these items. This was accomplished through a process of (1) formalizing a procedure, (2) applying procedure in independently scoring a set of answer sheets, (3) comparing scored answer sheets for agreement, (4) examining for sources of differences, and (5) revising procedure. The last 4 steps of the process were repeated until consistent agreement was reached in scoring the items.

After agreement in scoring higher cognitive level items had been reached, the researcher scored 3 sets of answer sheets. A set of answer sheets consisted of answer sheets from class group and comparable
A group of one school. The faculty member scored 1 set of answer sheets randomly selected from the 3 sets scored by the researcher. A comparison of the scoring by both scorers on this set of answer sheets showed that agreement was still retained. The researcher scored the other 10 sets of answer sheets, after which the faculty member scored three randomly selected answer sheets. There was complete agreement on the score values assigned to these three answer sheets by both scorers.

Five days after three sets of answer sheets had been scored by the researcher, an intra-scorer consistency check was made. An answer sheet was randomly selected from these three sets and rescoring by the investigator. There was agreement on the values assigned to the answers on this sheet. Then all answer sheets were scored. Three randomly selected answer sheets were rescoring. The same values were assigned to item responses both times by the scorer. The scoring and rescoring on these three answer sheets was done 5 to 15 days apart.

**Iowa Tests of Educational Development**

The battery of the fifth edition of the Iowa Tests of Educational Development was selected as a source of data to use in adjusting for the varying intellectual skills and abilities found among students. This instrument was selected for a number of reasons. It was the one measure of academic capabilities that was common to all schools in the study. The exemplary quality of psychometric characteristics (Page, 1965) of the instrument enabled the researcher to use ITED data with confidence (Buros, 1965). Because of the methods used in establishing norms, the between-school differences were expected to be minimized.
The characteristics of the ITED are discussed in the preceding chapter. Since verbal reasoning, factual knowledge, and general knowledge have been shown to be factors in the ITED (Evans, 1967), it was assumed that these factors were of sufficient importance to achievement in a child development unit that adjustment should be made when evaluating the effects of teaching behaviors.

**Student Estimate of Teacher Concern**

The Student Estimate of Teacher Concern (SETC) was chosen to assess students' perceptions of teacher concern as a component of the personal learning climate in the home economics classrooms. The form of the instrument used had been found to differentiate among first-year home economics teachers (Wachtel, 1963; Ott, 1963). The 39 items forming the cluster reported by Zimmerman (1970) constituted the questionnaire used in this study. Each student responded on a "true" or "false" basis in relation to the home economics teacher. The total number of "true" responses for an individual student represented his estimate of teacher concern, and the class mean on the SETC was interpreted as the students' estimate of the teacher's concern for the well-being of class members. The development of the SETC was discussed in the preceding chapter.

**Learning Environment Inventory**

The Learning Environment Inventory (LEI) was selected to use in this study because research data (Anderson, 1971) indicate that it measures group properties which are associated with cognitive learning. The LEI was more fully discussed in the preceding chapter. Of the 15 LEI scales, 4 were employed to assess the classroom learning climate because of
their suitability to the purpose of the study. Relatively high reliability coefficients, that is, alpha coefficients of internal consistency of .65 to .85 and test-retest coefficients of .64 have been reported for these four scales (Anderson, 1971, pp. 6-10).

**Environment** This scale measures the physical setting of the classroom and has been shown to be positively related to learning in males and negatively related to learning in females (Anderson, 1970). One of the reasons a measurement of this property appeared to be meaningful was because of the range in variation of physical settings possible within home economics classrooms.

**Goal Direction** This scale was chosen because the basic concept of behavioral objectives has been associated with Goal Direction. Behavioral objectives are considered important for effective teaching by many educators (Bloom et al., 1956; Mager, 1962; Tyler, 1969). This concept has been widely accepted in home economics education. It was assumed that Goal Direction would be positively related to student achievement.

**Satisfaction** Satisfaction has been found to be positively related to the cognitive learning in females (Anderson, 1969). Satisfaction was chosen for use in this study to investigate its relationship to learning in classes composed principally of females.

**Apathy** A number of relationships between Apathy and cognitive learning have been reported (Anderson, 1971). For example, in high ability students Apathy was shown to be negatively related to learning, but in low ability females, Apathy was found to be positively related to learning (Anderson, 1969). Based on these findings, Anderson (1971,
p. 19) concluded that "... the trends [in the relationship between Apathy and learning] are tentative at this time." Apathy intuitively appears to be negatively related to cognitive learning because learning is viewed as an active process.

Collection of Data

Arrangements for collection of data

Early in January, 1972, letters were mailed to the superintendents of schools where the 1970-71 Iowa State University graduates of the Home Economics Education Department were employed. (See Appendix B: Letter to Superintendents.) These superintendents were asked if they would be willing for their schools (the home economics teacher and her students) to participate in a research project. All superintendents indicated that they would be willing for their respective schools to participate.

After permission was obtained for the schools to participate, letters were mailed to the teachers explaining the purpose of the research project and asking for their cooperation. A form was enclosed for their response (See Appendix B: Teacher Letter 1.). This form requested the teacher's schedule and the projected dates for units of study in her classes.

After receiving these completed forms, the investigator mailed a second letter to the teachers explaining more fully the requirements of the research project (See Appendix B: Teacher Letter 2.). On an enclosed card the teacher was asked to give suggested dates for the first visit to collect data and to complete and return the card within three days.
From the returned cards a schedule was compiled. Dates for the first visits were confirmed with the teachers by telephone. The principals were informed of the planned visits. (See Appendix B: Letter to Principals.)

On the scheduled days the researcher and Dr. Alyce Fanslow, assistant professor, home economics education, Iowa State University traveled to the schools to audio and videotape the first of the two taped class sessions required in the study. During the first visit the details of the research project were outlined for the teacher, and the date for the second visit was scheduled.

The teachers were asked during the first visit if they would:

1. Identify a comparable group of high school students similar in educational background to the members of the videotaped class but without the experience of having studied child development.
2. Administer a child development test to both the class group and the comparable group.
3. Obtain ITED percentile ranks for both groups of students.

Each of the teachers in the sample agreed to perform these tasks.

Procedures in collecting types of data

Cognitive behaviors The cognitive behaviors were collected on audio and videotapes between March 3 and May 15, 1972. As previously arranged, the researcher videotaped two sessions of teacher-led discussion in eleventh and twelfth grade home economics classes that were studying child development. In these videotaped sessions 30 minutes of discussion had been requested of the teachers, but in most cases the taped discussions extended to 40 minutes.
In doing the taping of the class sessions, the researcher sought to place the equipment in positions to pick up as much verbal interaction as possible. A cassette tape recorder was placed in a central position within the classroom. Two microphones and a sound mixer were employed in connection with the videocorder to pick up sounds over the entire room. The camera was stationed in a position to focus on the teacher and as many students as possible at one time. The rotating arm of the tripod on which the camera rested made it possible to move the camera to focus on the person speaking. A zoom lens was also used to bring the speaker into better focus.

The tapes were labeled according to school, date, and order of taping and grouped according to first or second trip to school. This collection of tapes constituted the recorded data of the cognitive behaviors.

**Student achievement** At the time of the first trip to the schools, the teachers agreed to administer the child development achievement test as near the conclusion of their units as possible. These tests with accompanying answer sheets and test instructions were mailed between May 1 and May 11, 1972 to the teachers in the sample. The answer sheets were to be returned within 7 days.

The teachers administered the tests to their videotaped home economics classes and to the comparable nonclass groups. The comparable groups had been selected as nearly as possible according to the following criteria:

1. Same grade level as class members.
2. Same sex as class members.
3. Similar previous educational background to class members.
4. Had not studied child development during the present school year.

5. Were not enrolled in the videotaped class.

Answer sheets were received from 345 students, of whom 184 were members of class groups and 161 were members of comparable groups. Answer sheets were received from 13 classes and 13 comparable groups. Table 3 shows the distribution of the students according to the number in each group in the 13 schools.

**TABLE 3**

<table>
<thead>
<tr>
<th>School</th>
<th>Number in class group</th>
<th>Number in comparable group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>15</td>
</tr>
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<td>3</td>
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<td>7</td>
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<tr>
<td>12</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>13</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>184</td>
<td>161</td>
</tr>
</tbody>
</table>
General educational abilities

TED data to assess general educational abilities were obtained from student records (office of the principal or the counselor) and recorded on data sheets. These data sheets were included in the packet of test materials mailed to the teachers. The teachers filled in the student percentile ranks for the class group and comparable group, after which they mailed these data sheets and test answer sheets to the researcher.

Learning climate

The learning climate data were supplied by the answer sheets from the combined SETC and LEI instruments. These instruments were delivered to the teachers during the second visit of the researcher to the schools. They were administered by the teacher after the second taped class session, and answer sheets were mailed to the Home Economics Education Department.

Analysis of Data

Children and Childhood test

Student responses to the first 30 items of the Children and Childhood test were machine scored by the test scoring unit of the Student Counseling Service, Iowa State University. Each correct response received a score value of 1. An item analysis and a scoring analysis was obtained for each of the 26 groups scored. The 26 groups consisted of 13 home economics classes and the 13 comparable groups from the schools in which the classes were located. Each individual student's total score on the first 30 items was coded as a unit of data for key punching.

The programming of the coded data from the Children and Childhood test for analysis was performed by the Statistical Numerical Analysis
and Data Processing Section of Iowa State University Statistical Laboratory. Cards were punched, means of the total test scores for the 26 groups and correlations were computed. Analyses of variance were performed to determine if the groups differed significantly on their performance of the Children and Childhood test.

To estimate the reliability of the Children and Childhood test the following procedure was carried out: Individual students in each class were randomly assigned to two groups (half-classes). A mean test score was calculated for each of the half-classes. These mean scores were used to obtain a Pearson product-moment coefficient of correlation. The Spearman-Brown prophecy formula was used to correct for attenuation. This procedure was repeated for the comparable group.

A t test was computed for difference of means between the classes and comparable groups on the Children and Childhood test.

BCIS

The data on cognitive behaviors obtained from the classrooms were analyzed by the BCIS. From these categorized behaviors, median levels of cognitive behaviors were calculated for teachers and students for Session I and Session II.

In order to determine the extent of agreement in cognitive level in pairs of teacher-student behaviors, a bivariate frequency distribution was constructed from the tally sheets of pairs of teacher-student behavior. The level of the teachers' behaviors was plotted against the level of the students' behaviors. From this frequency distribution of pairs of behaviors, the proportion of pairs on the diagonal, above the
diagonal, and below the diagonal was calculated. This proportion of the
total number of pairs of teacher-student behaviors in each of the three
groups was expressed in percentages.

The cognitive levels of sequent behaviors of teachers were examined
to identify patterns of cognitive behavior. A one-way analysis of variance
was performed to determine if the patterns differentiated among teachers.

ITED

The raw data of the individual student's ITED percentile ranks
were entered on the instrument to prepare for key punching. Cards were
punched, means for classes and comparable groups and analyses of variance
were computed by the Computation Center, Iowa State University.

A t test of difference of means was performed on the difference
between the classes and the comparable groups on mean ITED percentile
ranks.

SETC and LEI

Mean scores for each of the 13 classes on these measures were coded
in preparation for the key punching. The mean scores were used in
examining interrelationships among variables.

Interrelationships

The interrelationships among the variables were examined by the use
of scatterplots printed by computer. The association between the two
variables in each scatterplot was visually inspected.
FINDINGS AND DISCUSSION

This chapter is divided into three sections. The findings pertaining to the descriptive characteristics of the sample are reported in the first section. In keeping with the objectives of the study, the interrelationships found among the variables are discussed in the second section. A synthesis of the findings is given in the third section of the chapter.

Descriptive Characteristics of Sample

The descriptive characteristics of the sample are discussed according to (1) variables assumed to affect learning, (2) levels of cognitive interaction, (3) patterns of cognitive behavior, and (4) student learning.

Variables assumed to affect learning

The variables assumed to affect learning are included in the components of the model in Figure 1. The components encompass the following variables: General educational ability, learning climate, and length of unit of study. They are discussed in that order.

General educational ability

The mean ITED percentile rank of each class was used as a measure of the general educational abilities that the students brought to the learning situation. (This variable was included in the input component of the model.) The means and standard deviations of the ITED percentile ranks for classes and comparable groups are reported in Table 4.

The range in means of ITED percentile ranks for classes was 35.69 to 53.69. Ten of the 13 classes had mean ITED percentile ranks of less than 49. Since these percentile ranks were obtained from Iowa norms,
TABLE 4

Comparison of ITED percentile ranks for classes and comparable groups

<table>
<thead>
<tr>
<th>Class</th>
<th>Teacher</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Comparable group</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Difference^a</th>
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<td></td>
<td>1</td>
<td>50.20</td>
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<td>51.67</td>
<td>25.40</td>
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<td></td>
<td>2</td>
<td>35.69</td>
<td>23.80</td>
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<tr>
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<td>3</td>
<td>43.67</td>
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<td></td>
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<td>47.53</td>
<td>22.89</td>
<td>53.25</td>
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</tr>
<tr>
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<td>44.09^b</td>
<td>5.65^c</td>
<td>54.24^b</td>
<td>8.75^c</td>
<td></td>
<td></td>
<td>-10.14^d</td>
</tr>
</tbody>
</table>

^a Mean of class minus mean of comparable group.

^b Mean of means.

^c Standard deviation of means.

^d Mean of differences.
this indicates that the average ability found in these 10 classes on the ITED was below the average of Iowa eleventh and twelfth grade students. The range in standard deviations for classes was 15.79 to 34.98 indicating that the classes were heterogeneous to varying extents on this measure.

The range in means of ITED percentile ranks for comparable groups was 38.71 to 67.78. Only 3 of the 13 comparable groups had ITED percentile ranks of less than 49 indicating that most of the comparable groups were above average in ability by Iowa ITED norms. The range in standard deviations for comparable groups was 12.37 to 34.05.

The apparent differences on mean ITED percentile ranks among these groups were examined by a one-way analysis of variance to determine if the groups differed significantly on this variable. An F value of 1.52, nonsignificant at the .05 level, was obtained indicating that the 26 groups did not differ significantly from each other on mean ITED percentile ranks.

The differences between the mean ITED percentile ranks for the classes and their respective comparable groups were then examined. The differences are shown in Table 4. In every school the class mean ITED percentile rank was a lower value than the mean ITED percentile rank for the comparable group. The largest difference between comparable group mean and class mean was the -26.78 found in School 6.

To determine if the difference between means of the two groups, classes and comparable groups, on the ITED percentile ranks was significant, a t test of differences of means was performed. The formula used was the standard score for means (Walker and Lev, 1969, p. 160):
\[ t = \frac{\bar{x} - \mu}{s/\sqrt{n}} \]

\( \bar{x} \) = mean of differences

\( s \) = standard deviation of differences

\( \mu = 0 \)

A \( t \) value of 4.01, significant beyond the .01 level, was obtained.

The \( t \) test provided evidence that even though the differences on ITED means among all groups were not significant, the differences between the pairs of classes and comparable groups were significant. Thus, it can be said that the comparable groups measured significantly higher on this variable of general educational ability that was brought to the learning situation.

Learning climate The learning climate found in each home economics class was assessed by the Student Estimate of Teacher Concern (SETC) and the Learning Environment Inventory (LEI) scales. The class mean scores on these assessments are reported in Table 5.

The class mean score on the SETC is the estimate of student perceptions of the teacher's concern about their well-being. Out of a possible score of 39 on the SETC, a range of 11.70 to 35.57 was found for the classes. Of all the classes, the students in School 2 perceived their teacher as having the most concern for their well-being, and the students in School 5 perceived their teacher as having the least concern for their well-being.

The LEI is made up of a number of scales, four of which were used to assess dimensions of the learning climate in the home economics classes. On each of these scales a score of 28 is possible. The range in class
TABLE 5
Distribution of class means on SETC and LEI scales

<table>
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<tr>
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<th>LEI factors&lt;sup&gt;a&lt;/sup&gt;</th>
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</thead>
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<td>4</td>
</tr>
<tr>
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<td>22.67</td>
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<td>X means</td>
<td>25.73</td>
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</tr>
<tr>
<td>s&lt;sub&gt;X&lt;/sub&gt;</td>
<td>6.64</td>
<td>2.51</td>
</tr>
</tbody>
</table>

<sup>a</sup>Code for LEI factors: 4 is Environment, 5 is Goal Direction, 8 is Satisfaction, and 10 is Apathy.

Means on the scales was as follows: 13.29 to 20.53 for Environment, 13.90 to 23.25 for Goal Direction, 11.80 to 21.24 for Satisfaction, and 12.00 to 21.30 for Apathy.

School 5 had the lowest mean score on Goal Direction and Satisfaction.
and the highest on Apathy. School 6 had the highest mean score on Goal Direction and the lowest on Apathy. Assuming that high scores on the SETC, Environment, Goal Direction, and Satisfaction and low scores on Apathy describe a good learning climate, the poorest learning climate appeared to exist in School 5 with the lowest mean on SETC, Goal Direction, and Satisfaction and the highest mean on Apathy. Schools 6 and 2 appeared to have the best learning climates as evidenced by the high means attained on two or more of the learning climate variables.

**Length of the unit of study**  
The number of weeks in the child development unit for each class was used as a variable in the study. The following list reports the different lengths of the units taught in the 13 schools of the study:

- 2-week units in Schools 5, 6, 9, 11, and 12,
- 4-week units in Schools 2, 4, and 8,
- 5-week unit in School 7,
- 9-week unit in School 3, and
- 16-week units in Schools 1, 10, and 13.

As the listing shows, there was a wide range of 2 to 16 weeks in the length of the child development units.

**Levels of cognitive interaction**

*Introduction*  
Behaviors portrayed on videotapes of discussion in 12 eleventh and twelfth grade home economics classes were analyzed according to the Brun Cognitive Interaction System (BCIS). Verbal behavior of the teachers and the verbal responses of the students were categorized into the following cognitive levels:
Category 0: Silence or verbal behavior unrelated to teacher's behavior (used for student behaviors only)

Category 1: Recall or obtain information (recall)

Category 2: Use or select and apply knowledge (apply)

Category 3: Analyze, compare, contrast (analyze)

Category 4: Judge, evaluate, determine significance (judge)

Category 5: Generalize or create (create).

These categorized behaviors were used to quantify the levels of cognitive interaction that occurred in the classrooms during Sessions I and II. The levels of cognitive interaction were examined in three different ways. These were the frequency of behaviors by cognitive level, the median levels of the cognitive behaviors exhibited in each session, and the pairs of teacher-student cognitive behaviors.

**Frequency of behaviors by cognitive level** In Table 6 the distribution of teacher behaviors exhibited in each cognitive level during the first videotaped session of class discussions is shown. Both the length of the session and the total number of behaviors vary among teachers.

Over 62 percent of the total number of cognitive behaviors exhibited by teachers during Session I were categorized at level 2, apply. Two exceptions to this general finding occurred in the classrooms of Teachers 3 and 12.

The stated instructional objectives of Teachers 3 and 12 for this class discussion, Session I, involved level 2 processes; however, certain conditions appeared to necessitate a change in their plans. For example, in the class of Teacher 3 insufficient reference materials were available for students to prepare for the discussion. In the class of Teacher 12
many students referred to their textbooks during the discussion. Both Teachers 3 and 12, therefore, appeared to exhibit more level 1 than level 2 behaviors in order to provide basic information for students.

### TABLE 6

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<th>Category (level)</th>
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<th>Minutes(^a)</th>
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<td>0</td>
<td>0</td>
<td>112</td>
<td>39</td>
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</table>

\(^a\)Number of minutes in discussion period.

Data in Table 6 indicate that all teachers exhibited cognitive behaviors in Categories 1, recall, and 2, apply. Nine teachers exhibited behaviors in Category 3, analyze, and four teachers exhibited behaviors in Category 4, judge, and 5, create.
Only one teacher exhibited behaviors in both Categories 4 and 5. This exception was Teacher 7. Her principal instructional objective for Session I was to "Evaluate objectively the pros and cons of . . . ." This objective required higher levels of cognitive processes than was required by the stated instructional objectives of the other teachers for this discussion session.

Teachers 5, 8, and 12 did not exhibit level 4 behavior (judge) but used a method of concluding the discussion by stimulating students to respond at level 5. Thus, they exhibited and elicited (See Table 7.) behaviors at level 5 without exhibiting any behaviors at level 4.

The distribution of student behaviors exhibited at each cognitive level in response to teacher behaviors in Session I is given in Table 7. Category 0 is shown for student behaviors in this table.

The total number of student behaviors exhibited in Category 1 was greater than the total number of teacher behaviors exhibited in this category for Session I; however, the students of Teachers 1, 3, and 4 exhibited fewer level 1 behaviors than their respective teachers. The students of Teacher 7 exhibited the same number of level 1 behaviors as their teacher.

The total number of student behaviors exhibited which were categorized at levels 2, 3, 4, and 5 was fewer, 79, than that found for teachers, 126, during Session I. It is interesting, however, that students of Teachers 4 and 9 exhibited behaviors in Category 5, while their teachers did not exhibit any behaviors in this category. Although Category 0 includes silence and irrelevant behaviors in the verbal cognitive interaction system, a considerable number of these occurrences were tallied as Table 7 shows.
### TABLE 7

Distribution of student behaviors categorized by cognitive level for Session I

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<th>Total</th>
<th>Minutes&lt;sup&gt;a&lt;/sup&gt;</th>
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</table>

<sup>a</sup>Number of minutes in discussion period.

In Table 8 the distribution of teacher behaviors exhibited in each cognitive level during the second videotaped session of class discussions is shown. The length of the discussions varied from 30 to 50 minutes.

Over 65 percent of the total number of cognitive behaviors exhibited by teachers during Session II were categorized at level 2, apply.

Teachers 5 and 11 were exceptions to this overall percentage, since they
TABLE 8

Distribution of teacher behaviors categorized by cognitive level for Session II

<table>
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<td>1591</td>
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</table>

^aNumber of minutes in discussion period.

both exhibited more cognitive behaviors categorized at level 1, recall, than level 2, apply.

The principal instructional objectives of Teachers 5 and 11 for this discussion involved level 2 cognitive processes; however, the manner in which these teachers conducted the discussion utilized more level 1 behaviors than level 2. For instance, Teacher 5 used a large number of visual illustrations in such a way that her behaviors were categorized
as level 1, while Teacher 11 repeatedly asked her students to recall how children in a previous play-school had performed certain tasks.

In Table 8 the data show that all teachers exhibited behaviors categorized at levels 1 and 2, but only nine teachers exhibited behaviors categorized at level 3, analyze. Teachers 2, 9, and 10 did not exhibit any cognitive behaviors categorized at levels higher than level 2. The stated objectives of these teachers required the students to apply the concepts dealt with during this discussion session. Thus, the observed cognitive behaviors of the teachers were consistent with their instructional objectives for Session II.

During Session II Teachers 3, 6, and 12 exhibited cognitive behaviors categorized at level 4, judge, while Teachers 7 and 8 exhibited cognitive behaviors categorized at level 5, create. With Teacher 8 these level 5 cognitive behaviors constituted her method of concluding the discussion. She asked her students to synthesize or create generalizations encompassing concepts dealt with during Session II. Teachers 7 and 8 exhibited level 5 cognitive behaviors without having used any level 4 (judge) behaviors during the discussion.

The distribution of student behaviors exhibited in response to teacher behaviors in Session II is shown in Table 9. The total number of student behaviors exhibited in Category 1 did not differ greatly from the total number of teacher behaviors exhibited at this level. An exception was found for the students of Teacher 12. Data show that these students exhibited 51 cognitive behaviors in this category while their teacher exhibited only 8. The levels of categorized behaviors of students of Teacher 12 were also exceptional in that they exhibited less than one-half
as many behaviors categorized at level 2 as did their teachers. During
Session II noticeably fewer level 3 behaviors were exhibited by students
than by teachers. The students of Teachers 7 and 8, as well as their
teachers, exhibited behaviors categorized at level 5 without exhibiting
any level 4 behaviors during this session.

**TABLE 9**

Distribution of student behaviors categorized
by cognitive level for Session II

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Category (level)</th>
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<th></th>
<th></th>
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</tr>
<tr>
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<td>10</td>
<td>50</td>
<td>91</td>
<td>11</td>
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<td>0</td>
<td>163</td>
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<td>18</td>
<td>17</td>
<td>75</td>
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<td>87</td>
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<td>0</td>
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<td>162</td>
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<td>9</td>
<td>13</td>
<td>45</td>
<td>47</td>
<td>1</td>
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<td>106</td>
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<td>10</td>
<td>15</td>
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<td>0</td>
<td>175</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>69</td>
<td>32</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>124</td>
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<tr>
<td>12</td>
<td></td>
<td>35</td>
<td>51</td>
<td>70</td>
<td>12</td>
<td>1</td>
<td>169</td>
</tr>
<tr>
<td>Totals</td>
<td>269</td>
<td>480</td>
<td>763</td>
<td>64</td>
<td>2</td>
<td>8</td>
<td>1591</td>
</tr>
</tbody>
</table>

	extsuperscript{a}Number of minutes in discussion period.
In summary the following findings are noteworthy:

1. Student behaviors tended to parallel teacher behaviors, but at somewhat lower levels. Variations from this tendency did occur, however. The frequency of behaviors of teachers and students were least alike at level 1 and most nearly alike at level 5. The totals for level 1 behaviors were larger for students than teachers, but at level 5 the numbers of behaviors were similar.

2. The predominant level at which teachers exhibited cognitive behaviors was level 2. One-fourth of the teachers did not exhibit any behaviors beyond level 2, apply. This level, also, predominated in their stated instructional objectives for the discussion. Thus, their behaviors were consistent with their objectives.

3. An interesting finding occurred in relation to level 5 behaviors. Only one teacher exhibited level 4 and level 5 behaviors in the same discussion, and she failed to elicit any level 5 student behaviors. Excluding this instance, the teachers who exhibited level 5 behaviors did not exhibit level 4 behaviors.

In Figures 3, 4, 5, and 6 the consistency with which teachers and students exhibited the same number of cognitive behaviors at levels 1 and 2 is illustrated. The extent to which the intercept points fall along the diagonal from the lower left to the upper right indicates the extent to which the teacher or students are consistent from Session I to Session II in the number of behaviors exhibited at a given level.

In Figure 3, 8 teachers' positions were found to lie near the diagonal of the scatterplot indicating these teachers were more consistent
FIGURE 3

Relation between number of Category 1 behaviors exhibited by teachers in Session I and Session II
FIGURE 4

Relation between number of Category 1 behaviors exhibited by students in Session I and Session II
FIGURE 5

Relation between number of Category 2 behaviors exhibited by teachers in Session I and Session II
FIGURE 6
Relation between number of Category 2 behaviors exhibited by students in Session I and Session II
than teachers 9, 10, 11, and 12. In Figure 4 the consistency of student behaviors at level 1 follows a pattern similar to the teacher behaviors.

As illustrated in Figure 5, less consistency was found for level 2 teacher behaviors than for the level 1 behaviors in Figure 3, that is, there was more scatter over the whole area of the plot which represented the range of level 2 behaviors. The student behaviors plotted in Figure 6 depict little consistency between the two sessions. This illustrates another point in relation to consistency. The higher the cognitive level, the less consistent were teachers and students in exhibiting the same number of behaviors. This last statement was based on the lack of consistency found in the scatterplots of levels 3, 4, and 5 which were examined but not included in the thesis.

**Median levels of cognitive behaviors** From the previously described frequency distributions of teacher and student behaviors, the median levels of cognitive behaviors were derived. Category 0 was not used in calculating median levels of student behaviors. Median levels of cognitive behavior of teachers and students for each videotaped class session are reported in Table 10.

The range in median levels for teacher cognitive behaviors for Session I was 1.38 to 2.02. From visual inspection of these medians, the "peak point" (Walker and Lev, 1969, p. 96), that is, the point at which medians become higher or lower, is 1.81 for this session. Teachers 1, 4, and 10 had median levels at this point. Teachers 2, 6, 7, and 9 had median levels above this point, while Teachers 3, 5, 8, 10, 11, and 12 had median levels below this point.
TABLE 10
Median levels of cognitive behaviors of teachers and students for each session

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Session I</th>
<th></th>
<th>Session II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher behavior</td>
<td></td>
<td>Student behavior</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.81</td>
<td></td>
<td>1.89</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.00</td>
<td></td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.38</td>
<td></td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1.81</td>
<td></td>
<td>1.91</td>
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<tr>
<td>5</td>
<td>1.72</td>
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<td>1.52</td>
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<tr>
<td>6</td>
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<td>1.89</td>
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<tr>
<td>7</td>
<td>1.96</td>
<td></td>
<td>1.97</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1.76</td>
<td></td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1.97</td>
<td></td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1.81</td>
<td></td>
<td>1.67</td>
<td></td>
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<tr>
<td>11</td>
<td>1.75</td>
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<td>1.41</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1.50</td>
<td></td>
<td>2.03</td>
<td></td>
</tr>
</tbody>
</table>

aCategory 0 was not used for calculation of median levels of cognitive behavior.

The range in median levels for student cognitive behaviors for Session I was 1.23 to 1.90. From visual inspection these medians can also be divided into three groupings. These are the (1) medians at the peak point which include students of Teachers 4 and 10, (2) medians above this point which include students of Teachers 1, 2, 6, 7, and 9, and (3) medians below this point which include students of Teachers 3, 5, 8, 11, and 12.
For Session II the range in median levels for teacher cognitive behaviors was 1.41 to 2.03. When the medians were divided according to whether they were high, medium, or low, the following groups were found for the median levels of teacher cognitive behavior for Session II:

1. High group consisting of Teachers 2, 4, 7, 8, and 12,
2. Medium group consisting of Teachers 1 and 6, and
3. Low group consisting of Teachers 3, 5, 9, 10, and 11.

The range in median levels for student cognitive behaviors was 1.32 to 1.96 for Session II. The median levels of student cognitive behaviors grouped by the previously described procedure were these:

1. High group consisting of students of Teachers 1, 2, 4, 6, 7, and 8,
2. Medium group consisting of students of Teachers 3 and 12, and
3. Low group consisting of students of Teachers 5, 9, 10, and 11.

The range in median levels of teacher cognitive behaviors for both sessions was 1.38 to 2.03. This indicates that 50 percent of each teacher's behaviors were below the upper limits of Category 2 which includes cognitive behaviors stimulating students to use or select and apply knowledge they possess. As previously stated two teachers' median levels were below the upper limit of Category 1 which includes cognitive behaviors stimulating students to recall or obtain information. There was less than two-thirds level difference found among median levels of teacher behaviors. Thus it may be said the teachers were similar in their cognitive behaviors as described by the median level. The median levels of student behaviors in both sessions were similar to their teachers, but were slightly lower, ranging from 1.23 to 1.96.
In Figures 7 and 8 the extent of the consistency of median levels of cognitive interaction is illustrated for teachers and students. This extent of consistency is similar to that found in Figures 3, 4, 5, and 6, that is, there is little or no relationship between the two sessions in terms of median levels of behaviors.

Pairs of teacher and student behaviors This variable describes the extent of agreement in terms of levels of pairs of teacher and student cognitive behaviors. As the raw data portrayed on videotape were analyzed, the categorized teacher and student behaviors were recorded on tally sheets by pairs. From these tally sheets, a bivariate frequency distribution was constructed using the categorized levels of the pairs as the axes. The position of the pairs in relation to the main diagonal described whether the pairs were composed of behaviors (1) at the same cognitive level, on the diagonal; (2) with the teacher's behavior at a higher level than the student's, above the diagonal; or (3) with the teacher's behavior lower than the student's, below the diagonal. The percentages of pairs of behavior at each of the three positions were calculated for Sessions I and II. These data are shown in Tables 11 and 12.

Over 80 percent of all pairs of behaviors for both sessions were at the same cognitive level, indicating that the students and teachers were able to communicate with each other in a consistent manner.

The range in percentages of pairs of teacher-student behaviors categorized at the same cognitive level, on the diagonal, was 60.2 percent to 96.6 percent for Session I and 63.4 percent to 94.3 percent for Session II. Teacher 1 had the highest percentage of agreement both times. This
FIGURE 7

Relation between median levels of teacher cognitive behaviors in Session I and Session II
FIGURE 8

Relation between median levels of student cognitive behaviors in Session I and Session II
TABLE 11
Distribution of pairs of teacher-student behaviors in Session I

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Percent on diagonal&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Percent above diagonal&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Percent below diagonal&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96.6</td>
<td>3.4</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>69.5</td>
<td>29.4</td>
<td>1.1</td>
</tr>
<tr>
<td>3</td>
<td>83.3</td>
<td>9.5</td>
<td>7.2</td>
</tr>
<tr>
<td>4</td>
<td>88.9</td>
<td>6.7</td>
<td>4.4</td>
</tr>
<tr>
<td>5</td>
<td>72.7</td>
<td>18.2</td>
<td>9.1</td>
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<tr>
<td>6</td>
<td>76.3</td>
<td>19.3</td>
<td>4.4</td>
</tr>
<tr>
<td>7</td>
<td>83.0</td>
<td>13.0</td>
<td>4.0</td>
</tr>
<tr>
<td>8</td>
<td>90.5</td>
<td>8.7</td>
<td>0.8</td>
</tr>
<tr>
<td>9</td>
<td>86.6</td>
<td>11.5</td>
<td>1.9</td>
</tr>
<tr>
<td>10</td>
<td>76.6</td>
<td>15.6</td>
<td>7.8</td>
</tr>
<tr>
<td>11</td>
<td>60.2</td>
<td>36.9</td>
<td>2.9</td>
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<tr>
<td>12</td>
<td>77.7</td>
<td>18.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Mean</td>
<td>80.2</td>
<td>15.9</td>
<td>3.9</td>
</tr>
</tbody>
</table>

<sup>a</sup>Pairs at the same cognitive level.

<sup>b</sup>Pairs with teacher behavior at a higher cognitive level than student behavior.

<sup>c</sup>Pairs with teacher behavior at a lower cognitive level than student behavior.
TABLE 12

Distribution of pairs of teacher-student behaviors in Session II

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Percent on diagonal&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Percent above diagonal&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Percent below diagonal&lt;sup&gt;c&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>94.3</td>
<td>1.9</td>
<td>3.8</td>
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<tr>
<td>2</td>
<td>88.6</td>
<td>10.1</td>
<td>1.3</td>
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<td>74.4</td>
<td>18.6</td>
<td>7.0</td>
</tr>
<tr>
<td>4</td>
<td>85.0</td>
<td>10.0</td>
<td>5.0</td>
</tr>
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<td>5</td>
<td>70.2</td>
<td>21.2</td>
<td>8.6</td>
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<td>92.9</td>
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<td>11.7</td>
<td>4.1</td>
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<td>92.8</td>
<td>14.0</td>
<td>3.2</td>
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<td>89.7</td>
<td>7.1</td>
<td>3.2</td>
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<tr>
<td>11</td>
<td>69.3</td>
<td>17.5</td>
<td>13.2</td>
</tr>
<tr>
<td>12</td>
<td>63.4</td>
<td>34.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Mean</td>
<td>81.6</td>
<td>13.8</td>
<td>4.6</td>
</tr>
</tbody>
</table>

<sup>a</sup>Pairs at the same cognitive level.

<sup>b</sup>Pairs with teacher behavior at a higher cognitive level than student behavior.

<sup>c</sup>Pairs with teacher behavior at a lower cognitive level than student behavior.
could mean that she was doing a better job of "cueing" for her students, that is, she was communicating the level of cognitive process more successfully.

In the pairs composed of behaviors of unequal cognitive level, larger percentages were found for the pairs above the diagonal than below the diagonal. This is consistent with the idea that teachers stimulate students to learn to deal with information on progressively higher cognitive levels.

Teacher 11 in Session II had the largest percentage of pairs with the teacher behavior at a lower level than student behavior. This can be partially explained by the way she stimulated students to recall and expected them to apply what was recalled. In other words, it was her method of "cueing" the student response that caused the high percentage of the pairs which were below the diagonal. Teacher 11 had the largest percentage of pairs above the diagonal for Session I.

In Figures 9, 10, and 11 the consistency with which pairs of teacher and student behaviors on the diagonal, above the diagonal, and below the diagonal were found in the classrooms in Sessions I and II is illustrated. Little consistency was found between the two sessions for the behavior pairs.

Patterns of cognitive behavior

It was hypothesized that identifiable patterns of behavior would be found for teachers. Patterns of behavior were defined in the sense that Gage (1969) used the term in Encyclopedia of Educational Research. He was
FIGURE 9

Relation between the percent of teacher-student pairs on the diagonal in Session I and Session II
Relation between the percent of teacher-student pairs above the diagonal in Session I and Session II
FIGURE 11

Relation between the percent of teacher-student pairs below the diagonal in Session I and Session II
speaking of a discussion-type classroom setting which he described as follows:

Here the component behaviors are the teacher's asking a question, the pupil's response, the teacher's response or rating of the pupil's response; their occurrence in given sequence constitutes the pattern . . . . (p. 1446)

It was found that a difference occurred among teachers in the frequency with which they exhibited sequent behaviors of differing cognitive levels. For example, in the first 10 cognitive behaviors teachers exhibited during a discussion, one teacher exhibited sequent cognitive behaviors categorized at levels 1, 1, 1, 1, 2, 1, 2, 1, 2, and 1, while another teacher exhibited cognitive behaviors at 1, 1, 1, 1, 1, 1, 1, 2, 2, and 2. Although the same cognitive levels of behavior were exhibited, the first teacher's behaviors were more varied. This variation pattern was quantified by using the percentage of each teacher's behaviors which represented a change in cognitive level from the preceding behavior. These percentages describe the variation patterns of cognitive behaviors found among the teachers.

The variation patterns for teachers in Session I and Session II are given in Table 13. Based on findings in both sessions, Teachers 1 and 3 exhibited cognitive behaviors with the most variation in level, while Teachers 2 and 9 exhibited cognitive behaviors with the least variation in level. The most variation for either session was 40.7 percent exhibited by Teacher 12. The least variation during a session was 4.6 percent exhibited by Teacher 2.

The usefulness of such a measure has been suggested by Flanders (1970) in the following passage:
TABLE 13

Variation patterns of sequent behaviors of teachers for Session I and Session II

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Percentage of variation&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Session I</th>
<th>Session II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32.0</td>
<td>39.9</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>12.1</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>34.5</td>
<td>35.3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15.8</td>
<td>16.6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>34.8</td>
<td>17.7</td>
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<td>6</td>
<td>16.7</td>
<td>13.4</td>
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<td>7</td>
<td>38.3</td>
<td>21.4</td>
<td></td>
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<tr>
<td>8</td>
<td>25.7</td>
<td>22.8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6.0</td>
<td>10.3</td>
<td></td>
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<tr>
<td>10</td>
<td>27.9</td>
<td>17.6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>20.5</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>40.7</td>
<td>13.0</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Indicates percentage of behaviors of a different level from the preceding behavior.

Although specific variation in teaching behavior . . . was investigated in only two projects . . . it seems reasonable to report a tentative finding that teaching behavior varies with time. In fact, all associations of pupil growth with flexibility of teaching behavior suggest that this kind of variation over time influences educational outcomes. Interactive agents form chains which can be identified as patterns. These in turn are strung together to form strategies. This variation with time is seldom investigated. Yet such variation may help to explain why the simple proportional incidence of different events [An event is a small bit of behavior that can be assigned to a category.] does not always produce consistent results, one project compared with another. (p. 425)
In this study it was believed that the examination of this variable would help in understanding phenomena occurring in classrooms. Thus, it would be adding another dimension to Brun's (1970) category system. In addition, it would supply further data relating teacher behavior to student learning.

The patterns of teacher behavior were also examined according to average number of behaviors exhibited per minute by each teacher. Based on the variation found among teachers this pattern of teacher behavior seemed to warrant further study.

**Student learning**

Student learning was assessed by the students' achievement on the Children and Childhood test. The findings concerning student learning are discussed according to the reliability of the test, student scores on the test, and differences on the test between classes and comparable groups.

**Reliability of test** Estimates of the reliability of the Children and Childhood test as a measure of achievement in the classes and comparable groups were computed using a split-half procedure. Students in each class were randomly assigned into two equal groups (half-classes). Means of scores on the test were calculated for the students in each group. The correlation between the pairs of means for the 13 classes was computed. The same procedure was repeated for the comparable groups.

After the correlation coefficient for each group was obtained by the previously explained procedure, the Spearman-Brown prophecy formula was used in correcting for attenuation. Coefficients of reliability of .48 for class groups and .69 for comparable groups were obtained.
The low reliability obtained for the class groups may be partially explained by examining the scatterplot of the half-class groups in Figure 12. The means of the two halves of the comparable group are shown in Figure 13. The difference in the means of the two half-classes of Teachers 3, 8, and 11, as shown in Figure 12, contributed substantially to the low correlation obtained for all classes.

The class of Teacher 11 was composed of students with a range in ITED percentile ranks of 1 to 99 and by chance the two halves used in the correlation had mean ITED percentile ranks of 17 and 67. Similar unequal divisions for half-classes occurred for Teachers 3 and 8. Since some of the classes were small (less than 12) and had wide ranges in ITED percentile ranks, the likelihood of obtaining unequal ability groups when randomly dividing the class was high.

In this correlation procedure, it was assumed that the half-classes were equally capable of scoring well on the test. This was not true for three classes due to chance occurrence of the division into groups of unequal general educational ability (ITED percentile ranks). Because of the small number of classes in the study (N = 13), these three classes contributed substantially to the low reliability coefficient.

An F value of 2.59, significant beyond the .01 level, was obtained from a one-way analysis of variance indicating that the test differentiated among the classes and comparable groups.

*Student scores on the test* Out of a possible test score of 55 points, the mean of scores of all home economics students on the achievement test was 27.40 with a standard deviation of 6.86. The mean of 27.40 was "optimal", that is, "slightly higher than 50 percent of the maximum possible score" for a test "designed to discriminate between
"Odd" half-class test means

FIGURE 12

Relation between test means of "even" half and "odd" half of class
FIGURE 13

Relation between test means of "even" half and "odd" half of comparable group
students" (Brown, 1970, p. 274). The standard deviation indicates that 68 percent of all home economics students' scores were between 20.54 and 34.26 on the test.

The distribution of means for all classes and groups on the achievement test is reported in Table 14. The range in means for classes was 23.50 to 31.94. The distribution of the means approached a normal distribution from one standpoint; 9 out of the 13 means (61 percent) fell within one standard deviation of the overall mean. Five of the means were above the overall mean and four were below. The overall mean for classes was 27.07, which is approximately 50 percent of the maximum possible score for the test. This also indicates an optimal level of difficulty over all classes. The range in standard deviations of class mean scores was 4.55 to 9.22.

The range in mean scores for comparable groups on the achievement test was from 20.93 to 29.28. Nine (69 percent) of the 13 groups had means within one standard deviation of the overall mean of 25.84. Six groups had means above the overall mean and three below. The range in standard deviations was from 2.97 to 6.46.

**Differences between classes and comparable groups on test** In Table 14 the differences between mean test scores of comparable groups and the mean test scores of classes are shown. The largest difference was found between the comparable group and class of Teacher 3, and the least difference was found for Teacher 10. Negative values were obtained for the differences between means of classes and comparable groups of Teachers 5, 6, 8, and 9 indicating that the mean score for the class was lower than the mean score for the comparable group.
TABLE 14
Comparison of test scores for classes and comparable groups

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Class Mean</th>
<th>Standard deviation</th>
<th>Comparable group Mean</th>
<th>Standard deviation</th>
<th>Difference^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29.53</td>
<td>5.34</td>
<td>26.93</td>
<td>5.78</td>
<td>2.60</td>
</tr>
<tr>
<td>2</td>
<td>24.56</td>
<td>5.18</td>
<td>20.93</td>
<td>6.45</td>
<td>3.63</td>
</tr>
<tr>
<td>3</td>
<td>32.33</td>
<td>5.68</td>
<td>24.67</td>
<td>5.79</td>
<td>7.66</td>
</tr>
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<td>4</td>
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<td>26.00</td>
<td>4.80</td>
<td>5.94</td>
</tr>
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<td>25.63</td>
<td>5.22</td>
<td>29.28</td>
<td>4.86</td>
<td>-3.66</td>
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<td>6</td>
<td>23.88</td>
<td>6.53</td>
<td>25.89</td>
<td>4.75</td>
<td>-2.01</td>
</tr>
<tr>
<td>7</td>
<td>29.00</td>
<td>5.37</td>
<td>27.05</td>
<td>6.28</td>
<td>1.95</td>
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^aMean of class minus mean of comparable group.

^bMean of means.

^cStandard deviation of means.

^dMean of differences.
It was shown in Table 4 that in all schools the general educational abilities of students in the comparable groups, as measured by the mean ITED percentile rank, were higher than for students in classes. For Teachers 6, 7, 8, and 12 the differences in mean ITED percentile ranks were more than 20 points.

A t test of difference between means of the two groups on mean test scores was performed using the same formula as for the t test regarding ITED percentile ranks. The result was a t value of 1.22 which was not significant at the .05 level.

Interrelationship of Variables

The findings concerning the interrelationship of variables are reported according to the objectives of the study. As previously stated, the objectives were to: (1) determine the relationship between levels of cognitive interaction in the classroom and student learning, (2) determine if there are certain patterns or sequences of cognitive behavior associated with student learning, and (3) examine other selected variables associated with student learning and their relationship to levels of cognitive interaction. The interrelationships are discussed in the above order.

Levels of cognitive interaction and student learning

Interrelationships found between levels of cognitive interaction in the classrooms and student learning are illustrated in scatter-plots. Class means of student scores on the Children and Childhood test were plotted against two measures of levels of cognitive interaction
for both videotaped sessions. Since results were similar for the two sessions, only Session II plots are reported. The two measures of interaction are median levels of cognitive behaviors and pairs of teacher-student behaviors.

**Median levels of cognitive behaviors** Figure 14 shows the relationship between class mean test scores and the median levels of cognitive behaviors exhibited by each of the 12 teachers during the second videotaped class discussion. Lines are drawn connecting the highest and lowest values on each of the two variables, that is, Teacher 3 had the highest mean test score, while Teacher 8 had the lowest mean test score. Teacher 12 had the highest median level of cognitive behavior, while Teacher 11 had the lowest.

The scatterplot is divided into quadrants according to the range of actual scores obtained for each variable. The upper left quadrant indicates lower median levels of cognitive behavior associated with higher mean test scores. The upper right quadrant indicates higher median levels of cognitive behavior associated with the higher test scores. The lower left quadrant indicates lower median levels of cognitive behavior associated with lower test scores. The lower right quadrant indicates higher median levels of cognitive behavior associated with lower test scores.

Four of the higher median levels of cognitive behavior (for Teachers 1, 3, 4, and 7) were associated with higher mean test scores and one (for Teacher 10) with lower mean test scores as shown in the two upper quadrants of Figure 14. Four of the higher median levels were associated with the lower mean test scores as shown in the lower right quadrant. The intercept points for Teachers 5 and 11 were in the lower left quadrant.
FIGURE 14

Relation between class mean test scores and median levels of teachers' cognitive behavior for Session II
indicating lower mean test scores and lower median levels of cognitive behavior.

The relationship between the student median levels of cognitive behavior of Session II and mean test scores is shown in Figure 15. The pattern of relationships appeared similar to that found for the teachers' median levels of cognitive behavior.

Based on the data in this study, no clear direct association existed between median levels of cognitive behavior for either teacher or student behaviors and student learning. It appeared that some other variables were operating which exerted a greater influence on student learning.

**Pairs of teacher-student behaviors** As explained in the previous section of this chapter, this variable was derived from the pairs of teacher-student behaviors recorded on tally sheets. From a bivariate frequency distribution which used the cognitive level of each of the behaviors as axes, the pairs were examined in relation to their position to the main diagonal of the distribution (plot). Three positions were noted. They were as follows: on the diagonal, denoting agreement in cognitive level; above the diagonal, denoting that the teacher's behavior was higher than the students'; and below the diagonal, denoting that the teacher's behavior was lower than the students'. The proportion of pairs in each of the three positions was expressed in percentages.

The relationship between student learning and the percentage of teacher-student behavior pairs on the diagonal for Session II is shown in Figure 16. Each of the drawn lines connect the extreme values of each of the variables. The highest mean test score (for Teacher 3) is associated with a medium value for the percentage of pairs of behaviors on the
Median levels of student cognitive behaviors

FIGURE 15

Relation between class mean test scores and median levels of students' cognitive behavior for Session II
FIGURE 16
Relation between class mean test scores and percent of teacher-student pairs of behaviors on the diagonal for Session II
diagonal. The lowest mean test score (for Teacher 8) is associated with a higher medium percentage value of pairs of behaviors on the diagonal. The highest percentage of pairs of behaviors on the diagonal (for Teacher 1) is associated with a higher mean test score, while the lowest percentage of pairs on the diagonal (for Teacher 12) is associated with the lower scores. Evidence of a positive relationship between mean test score and pairs of behaviors on the diagonal is limited.

The relationship between the percentage of teacher-student behavior pairs above the diagonal for Session II and student learning is illustrated in Figure 17. The highest (Teacher 3) and the lowest (Teacher 8) mean test scores are associated with medium percentage values of pairs of behaviors above the diagonal. The highest percentage value (Teacher 12) was associated with lower class mean test scores, while the lowest percentage value (Teacher 1) was associated with the higher mean test scores for classes. Little relationship exists between the two variables.

In Figure 18 the relationship between the percentage of teacher-student behavior pairs below the diagonal for Session II and student learning is shown. The highest and lowest class mean test scores (Teachers 3 and 8) had a medium position in relation to the percentage of pairs of behaviors; however, the highest mean test score (Teacher 3) was located nearer the diagonal than in the previous two plots of behavior pairs and mean test scores. The lowest percentage of teacher-student behavior pairs below the diagonal (Teacher 7) was associated with a medium position in regard to mean test scores, while the highest percentage of teacher-student behavior pairs below the diagonal (Teacher 11) was associated with the lower mean test scores.
Relation between class mean test scores and percent of teacher-student pairs of behaviors above the diagonal for Session II
Relation between class mean test scores and percent of teacher-student pairs of behaviors below the diagonal for Session II

FIGURE 18
From visual inspection of the relationships shown in the scatterplots, Figures 16, 17, and 18, little association existed between the three types of pairs of student-teacher behaviors and mean test scores. This finding was not consistent with what was expected. It is possible that error in the study associated with differences in length of unit and in the extent to which objectives for the classes were comparable to objectives measured by the post test obscured relationships that may exist.

Patterns of cognitive behavior and learning

The variation patterns of cognitive behaviors found to exist in sequent behaviors of the 12 teachers are described in terms of percentages which express the proportion of the teachers' behaviors which represent a change in cognitive level from the preceding behavior.

In Figure 19 each teacher's variation pattern for Session II is plotted against the mean test score. (The mean test scores are the horizontal axis in this scatterplot.) The highest variation (Teacher 1) is located in the upper right quadrant which represents the higher scores for each variable. The lowest variation is located in the lower left quadrant which represents the lower scores for each variable.

The highest mean test score (Teacher 3) is in the same quadrant as the highest variation. The lowest mean test score (Teacher 8) is associated with a middle position on the variation axis. Six of the lower mean test scores and three of the higher mean test scores had lower percentages of variation. Since mixed results were obtained, no tenable conclusions could be drawn. Further examination of association between variables seems warranted under more controlled conditions.
Relation between variation patterns of sequent behaviors of teachers for Session II and class test mean scores
Other selected variables and student learning

Three variables selected to examine in relation to student learning were assumed to affect learning. The interrelationship of these variables and student learning is discussed in the following order: (1) general educational ability, (2) learning climate, and (3) length of unit of study.

General educational ability and student learning

The general educational ability of the students was assessed by the mean percentile ranks on the Iowa Tests of Educational Development (ITED). The relationship between this variable and student learning is shown in Figure 20.

The mean test scores for classes and comparable groups are plotted against mean ITED percentile ranks in Figure 20. Figure 20 is divided into quadrants on the basis of the midpoint of the extreme values of each variable. The lines in Figure 20 connect the extreme mean test scores of the classes (of Teachers 3 and 8) and the extreme mean test scores of the comparable groups (of Teachers 2 and 4).

The class of Teacher 4 had the highest mean ITED percentile rank of the classes and had the second highest mean test score. The class of Teacher 2 had the lowest mean ITED percentile rank and its mean test score was among the lowest.

The classes who had the highest and lowest mean test scores were located in the lower half of the groups, both class and comparable, on mean ITED percentile ranks. In fact, with the exception of classes of Teachers 4 and 5, all class groups were in the lower half of the mean ITED percentile ranks. Classes of Teachers 3 and 8 had the highest and lowest mean test scores of the classes, respectively, but had essentially the same mean ITED percentile rank.
Relation between mean test scores and mean ITED percentile ranks for classes and comparable groups
The highest mean ITED percentile rank for the comparable groups (Teacher 6) was associated with the lower mean test scores. The lowest mean ITED percentile rank for the comparable groups (Teacher 10) was associated with the higher mean test scores.

When viewing the scatterplot by quadrants, 5 of the 13 comparable groups and 1 class group were found in the quadrant which represented the highest mean ITED percentile ranks and the highest mean test scores. The quadrant which represented the lowest mean ITED percentile ranks and the lowest mean test scores contained 6 of the 13 class groups and 2 of the comparable groups.

The quadrant which represented the lowest mean ITED percentile ranks and the highest mean test scores contained 5 class groups and 1 comparable group. The quadrant which represented the groups with the highest mean ITED percentile ranks and the lowest mean test scores contained 5 comparable groups and 1 class group.

In summary, there appears to be no relationship between mean ITED percentile ranks and mean test scores in the classes or in the comparable groups.

**Learning climate and student learning**

Learning climate was assessed by the Student Estimate of Teacher Concern (SETC) and four scales of the Learning Environment Inventory (LEI). The scales of the LEI used were Environment, Goal Direction, Satisfaction, and Apathy.

The relationship between SETC and student learning is shown in Figure 21. No association appeared to exist between the extent to which students perceived their teachers as being concerned about their well-being and their learning as measured by mean test scores. This is
FIGURE 21
Relation of class mean test scores to SETC scores
illustrated by the vertical line which connects the highest and lowest class mean test scores (Teachers 3 and 8).

The relationship between Environment and student learning is shown in Figure 22. The highest mean score on the test (Teacher 3) is associated with the lowest score on the Environment scale. The lowest mean test score (Teacher 8) is associated with the higher Environment scores, and the highest Environment score (Teacher 6) is associated with the second lowest mean test score. Little or no relationship between Environment and mean test score is shown.

The interrelationships found between student learning and the LEI scales of Goal Direction, Satisfaction, and Apathy are shown in Figures 23, 24, and 25, respectively. No conclusive association was found between any of these three measures of learning climate and student learning. The lines in the figures are used to help in the visual inspection since each line connects the extreme values of each variable. The highest mean test score of Teacher 3 and the lowest mean test score of Teacher 8 remain constant in all plots.

Length of unit of study and student learning The relation between the length of the unit of study and student learning is shown in Figure 26. The figure is divided into quadrants. The classes were grouped into three of the quadrants.

The five classes which had 2-week units along with classes of Teachers 2 and 8 were in the lower left quadrant. The three classes which had the 16-week units were in the upper right quadrant. The classes of Teachers 4 and 7 formed the third group in the upper left quadrant. The class of Teacher 3 with a 9-week unit had the highest mean test score.
FIGURE 22
Relation of class mean test scores to LEI Environment scale
FIGURE 23

Relation of class mean test scores to LEI Goal Direction scale


FIGURE 24

Relation of class mean test scores to LEI Satisfaction scale
FIGURE 25
Relation of class mean test scores to LEI Apathy scale
FIGURE 26
Relation of class mean test scores to weeks in unit of study
Classes of Teachers 3, 4, and 7 appeared to learn the most, and the classes of Teachers 2 and 8 learned the least in relation to the length of the unit of study.

This variable of length of unit was found to be associated with student learning. A range of less than 2 points was found among classes with 2-week units and among classes with 16-week units.

Selected variables and cognitive interaction The selected variables of general educational ability and learning climate were examined in relation to cognitive interaction by means of scatterplots. From visual inspection of these scatterplots, no discernible association was found between level of cognitive interaction and mean ITED percentile ranks, SETC, or the scale values of the LEI. The four scales of the LEI examined in this way were Environment, Goal Direction, Satisfaction, and Apathy.

In order to illustrate the relationship found between level of cognitive interaction and these selected variables, Figures 27 and 28 are presented. They portray the typical relationship found.

In Figure 27 the relationship between mean ITED percentile ranks and median levels of teacher cognitive behavior is shown. The highest and the lowest mean percentile ranks (Teachers 4 and 2) are associated with the same median level of cognitive behavior, and the highest and lowest median levels of cognitive behavior (Teachers 12 and 11) are associated with the lower mean ITED percentile ranks. No relationship appears to exist between the two variables.

In Figure 28 the relationship between the LEI scale, Goal Direction, and median level of teacher cognitive behavior is shown. The extremes of the range of each variable are connected by a line. The highest and the
Relation between median levels of teacher cognitive behaviors in Session II and means of ITED percentile ranks

FIGURE 27
FIGURE 28

Relation between Goal Direction scale of LEI and median levels of teacher cognitive behavior in Session II.
lowest mean scores on Goal Direction (Teachers 6 and 5) are located in the central third of the area representing the range of median levels of cognitive behavior, and the highest and lowest median levels of cognitive behavior (Teachers 12 and 11) are located in a central position in regard to Goal Direction. Again, there appears to be no relationship between these two variables.

Synthesis of Findings

Primary purpose of the study

Since the primary purpose of this study was to examine the relationship between cognitive interaction and learning within the natural setting of classrooms, a number of extraneous variables were present. Those variables which were extraneous to this primary purpose but assumed to affect learning were examined in relation to learning and cognitive interaction.

Little association was found between cognitive interaction and the selected extraneous variables (general educational ability, learning climate, and length of unit of study). With the exception of length of unit of study, little association was found between the selected variables and learning. Length of the unit of study was associated with learning.

The two variables, length of unit of study and general educational ability, were used in further investigation of the relationship between cognitive interaction and learning. A scatterplot was constructed using differences between classes and comparable groups on mean test scores and on ITED percentile ranks as the two variables. The differences were
obtained by subtracting the mean of each comparable group from the mean of its respective class. The intercept points thus obtained are shown in Figure 29. These points were examined in relation to median levels of teacher and student cognitive behaviors and are discussed in terms of length of unit of study.

It was assumed that if ability and learning were related with a perfect positive correlation, all intercept points would lie on the "true" diagonal. Therefore, the relative distance of intercept points from the "true" diagonal could give clues as to how well a class learned in relation to its ability. The lower the mean ITED of the class in relation to the comparable group, the less difference would be expected in mean test scores.

By visual inspection of the position of the classes in Figure 29, a comparison of classes of like length was made. In this inspection (1) an estimate was made of how well each class learned in relation to ability, and (2) a determination was made of the association of the median levels of cognitive interaction to this estimate of learning.

No consistent relationship between variables was found for all classes having 2-week units (Teachers 5, 6, 9, 11, and 12). However, the two classes (Teachers 6 and 12) with intercept points nearest the diagonal tended to have higher median cognitive levels of interaction than the other classes.

In examining the relative positions of the two classes (Teachers 1 and 10) of 16-week units for whom cognitive behaviors had been obtained, it appears that the class of Teacher 1 learned more than the class of Teacher 10 when compared with their comparable groups. The median levels of cognitive behavior were higher for the class of Teacher 1.
FIGURE 29

Relation between difference between classes and comparable groups on mean test scores to difference of classes and comparable groups on means of ITED percentile ranks

○ = 4-, 5-, and 9-week units
θ = 2-week units
▲ = 16-week units

Numbers in parentheses:

The upper row of numbers indicates teacher-student median levels of cognitive behavior for Session I.

The lower row of numbers indicates teacher-student median levels of cognitive behavior for Session II.
Differences in mean ITED percentile ranks

- Two week units
- Sixteen week units

- (1.38-1.45)
- (1.80-1.73)
- (1.81-1.68)
- (1.91-1.96)
- (2.00-1.78)
- (1.92-1.84)
- (1.75-1.23)
- (1.41-1.33)
- (1.81-1.78)
- (1.89-1.87)
- (1.96-1.90)
- (1.97-1.93)
- (1.50-1.25)
- (2.03-1.73)
- (1.89-1.79)
- (1.76-1.61)
- (2.02-1.86)
- (1.72-1.53)
- (1.89-1.79)
- (1.76-1.61)
- (1.50-1.25)
- (2.03-1.73)
- (1.89-1.79)
- (1.76-1.61)
- (2.02-1.86)
Among the other schools there was a tendency for higher estimates of learning (as indicated by relative position to diagonal) to be associated with higher median cognitive levels of behavior.

An examination of all of the data in Figure 29 led to the following conclusions. Higher median levels of cognitive interaction contributed more to learning than the lower median levels of cognitive behavior. An increase in median cognitive level from Session I to Session II was associated with more learning and a decrease in median cognitive level was associated with less learning.

General hypotheses

A synthesis of the findings in relation to each of the general hypotheses is as follows:

**Hypothesis 1** There is a relationship between the levels of cognitive behavior exhibited in the classroom and the learning of the students in relation to the instructional objectives.

Based on the data in this study, when no attempt was made to control for ability or length of unit of study, no clear direct association existed between median level of cognitive interaction for either teacher or student behavior and student learning.

From clues obtained when an attempt was made to control for length of unit and general educational ability, there was a tendency for higher median levels of cognitive behaviors to be associated with more learning. An increase in median cognitive level from Session I to Session II was associated with more learning and a decrease in median cognitive level was associated with less learning.
Hypothesis 2  There are identifiable patterns of cognitive behavior that differentiate among teachers. The empirical hypothesis associated with this general hypothesis was as follows: There is no difference among teachers on identified patterns of behavior.

Patterns of cognitive behaviors were identified by percentage of teachers' sequent behaviors which represented a change in cognitive level. A one-way analysis of variance was performed on teacher percentages. An F value of 0.58, nonsignificant at the .05 level, was obtained. This result indicated that based on the percentages, the patterns of cognitive behaviors did not differentiate among teachers; therefore, the null hypothesis was not rejected.

Hypothesis 3  There is a relationship between patterns of cognitive behavior and learning of the students in regard to the instructional objectives. From visual inspection of a scatterplot using these two variables, little association was found between patterns of cognitive behavior of teachers and mean test scores.
SUMMARY AND RECOMMENDATIONS

The relationship between cognitive behaviors exhibited in the classroom and the cognitive learning of the students is a relatively neglected area in educational research. Recent development of videotape techniques and cognitive interaction analysis systems enhance the possibilities of investigating this relationship.

The present study sought to explore the relationship between cognitive behaviors and cognitive learning in home economics classes. Cognitive behaviors exhibited in the natural setting of classrooms were videotaped and later analyzed by the Brun Cognitive Interaction System (BCIS).

The objectives of this study were:
1. To determine the relationship between levels of cognitive interaction in the classroom and student learning,
2. to determine if there are certain patterns or sequences of cognitive behaviors associated with student learning, and
3. to examine other selected variables associated with student learning and their relationship to levels of cognitive interaction.

A model was employed to present the conceptualized relationships among the selected variables of the study. These variables consisted of the general educational abilities of the students, learning climate of the class, the length of the units of study, cognitive interaction, and student learning.

The population of the study consisted of the 1970-71 home economics
education graduates of Iowa State University who were employed in teaching home economics in Iowa during the second semester of the 1971-72 school year. After permission was obtained from the school administrators for these home economics teachers to participate in the study, the teachers were contacted by mail. From the 17 teachers who planned to teach child development units in eleventh or twelfth grade home economics classes between March 1 and the conclusion of the school year, 13 teachers were able to participate in the study. The total number of students who participated in the study was 345. This included 184 home economics students enrolled in the classes studying child development and 161 students from comparable groups not studying child development.

The 13 teachers obtained Iowa Tests of Educational Development (ITED) percentile ranks for students (classes and comparable groups) who were participating in the study. These data were used to assess general educational abilities of students. The teachers administered the Student Estimate of Teacher Concern (SETC) and the Learning Environment Inventory (LEI) to their classes. These two instruments assessed the learning climate of the classrooms. In addition, the teachers administered an achievement test to their classes and to the comparable groups. The achievement test, entitled Children and Childhood, was developed by the investigator to measure child development content and cognitive processes. Student responses to the SETC, LEI, and achievement test were recorded on answer sheets, and student ITED percentile ranks were recorded by the teachers on data sheets. The teachers mailed these raw data to the investigator.
Cognitive behaviors exhibited during discussions on two different days, Session I and Session II, were recorded on videotapes for 12 of the 13 classrooms. These cognitive behaviors were analyzed by the investigator through the use of the BCIS. The BCIS is a verbal interaction system providing a method for assessing the cognitive processes stimulated by teachers and exhibited in the responses of students.

Before the tapes were analyzed by the BCIS, inter-observer reliability was established between the investigator and a faculty member observer. A chi-square analysis was used to test for differences between the two observers in terms of the frequency totals in each category. Nonsignificant chi-square values were consistently obtained after a training period of 6 weeks. Four inter-observer reliability checks were made during and after the analysis of the videotapes. These reliability checks yielded chi-square values which were nonsignificant at the .05 level. After all tapes were analyzed, intra-observer reliability was established by the same chi-square procedure. Using two observations of two different tapes, two chi-square values were calculated. Chi-square values nonsignificant at the .05 level were obtained for both calculations.

The following findings were derived from the categorized behaviors of teachers and students using the BCIS:

1. More teachers and classes of students exhibited level 2 behaviors than any other level.

2. The range in median levels of cognitive behaviors exhibited by teachers was 1.38 and 2.03 in the two sessions.

3. The range in median levels of cognitive behaviors exhibited by students was 1.23 and 1.96 in the two sessions.
4. An examination of teacher-student pairs of behaviors revealed that in most classes teachers and students exhibited behavior pairs at the same cognitive level over 70 percent of the time.

The reliability of the Children and Childhood test was estimated at .48 for classes and .69 for comparable groups. This reliability was established using a technique which divided each class and comparable group into half-groups. The mean test scores of each half-group was used in the correlation procedures. A Pearson product-moment correlation coefficient using the means of the half-groups was thus obtained for both class groups and comparable groups. The Spearman-Brown formula was used in correcting for attenuation of the two coefficients. The lower reliability for the classes may be partially explained by the wide range of ITED percentile ranks of students within classes.

The maximum score possible on the Children and Childhood test was 55. Mean test scores ranged from 23.50 to 32.33 for classes and 20.93 to 29.28 for comparable groups. A one-way analysis of variance was computed using the means of the 26 groups. The F value obtained was significant beyond the .01 level thus indicating that the Children and Childhood test differentiated among the 26 groups of students. However, a t test of difference between classes and comparable groups in mean test scores indicated no difference between the two groups at the .05 level of significance.

The following findings are concerned with the other variables in the model of the study:

1. Means of ITED percentile ranks ranged from 35.69 to 53.69 for classes and 38.71 to 67.78 for comparable groups. A t test of
differences between means of the classes and comparable groups obtained a t value, significant beyond .01 level, indicating that the two groups (classes and comparable groups) differed significantly on general educational ability.

2. The length of the child development units used in the study varied from 2 to 16 weeks.

3. The classes scored highest in Goal Direction and lowest in Apathy on the factors of learning climate.

The interrelationships among the variables of the study were examined by visual inspection of scatterplots. With the exception of an association between length of unit of study and student learning, little or no association was found between student learning and any other variable of the study.

The consistency with which teachers and students exhibited levels of cognitive behaviors was also examined. Visual inspection of scatterplots using Session I plotted against Session II revealed little consistency by teachers or students.

Based on the data obtained in this study, three hypotheses were examined. Hypothesis 1 was that a relationship existed between the levels of cognitive behaviors exhibited in the classroom and learning. From clues obtained when an attempt was made to control for length of unit and educational ability, there was a tendency for higher median levels of cognitive behaviors to be associated with more learning.

Hypothesis 2, stated in null form, was that there is no difference among teachers on identified patterns of behavior. Sequent behaviors of teachers were used to identify variation patterns of cognitive behavior.
When these patterns, expressed in percentages of teacher behaviors representing a change in cognitive level, were used in a one-way analysis of variance, an F value, nonsignificant at the .05 level, was obtained. Thus, the null hypothesis was not rejected. These patterns did not differentiate among teachers.

Hypothesis 3 was that a relationship existed between patterns of cognitive behavior and learning. From visual inspection of scatterplots of these two variables, no association was found.

On the basis of the findings of this study, it is recommended that cognitive interaction and classroom learning be examined under more controlled conditions. Control of length of unit of study and behavioral objectives is suggested in addition to variables controlled in this study. It is also recommended that more than two samples of teacher and student cognitive behaviors be obtained. A study to serve as a base for judging size of sample needed would be desirable. It is further suggested that provision be made to include more variation in cognitive processes among classrooms than was found in this study. Additional refinements of the category definitions of the BCIS seem warranted.
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APPENDIX A: CHILDREN AND CHILDHOOD TEST

Children and Childhood Test

Record answer on IBM sheet.

1. Many psychologists agree that the most critical stage in the emotional and intellectual development of an individual is
   A. from birth to age six.
   B. between the ages of six and ten.
   C. during the preteen years.
   D. during early adolescence.

2. The period of life when physical growth is most rapid is
   A. babyhood.
   B. early childhood.
   C. later childhood.
   D. adolescence.

3. The five year old is sometimes called fascinating because
   A. he is usually eager to begin preschool.
   B. he is different from those around him.
   C. he manipulates toys in unusual ways.
   D. he challenges himself to new learnings.

4. Children who are around six years of age are most fearful of
   A. loud noises.
   B. imaginary dangers.
   C. unfriendly adults.
   D. large animals.
Record answer on IBM sheet.

5. In preparing for their roles as parents, the most basic quality individuals need to develop is
   A. a democratic attitude of either strictness or leniency.
   B. a flexible attitude of either permissiveness or authoritarianism.
   C. a set of guidelines for behavior.
   D. an attitude of healthy self-acceptance.

6. The most important characteritic in disciplining youngsters is
   A. consistency.
   B. leniency.
   C. permissiveness.
   D. flexibility.

7. Which of the following characteristics is least likely to be found in a child’s toys?
   A. shape.
   B. texture.
   C. color.
   D. odor.

8. Which of the following would be a good toy for the three-year-old?
   A. tricycle.
   B. record player.
   C. 20 piece puzzle.
   D. pull toy.

9. Which of the following is the best example of a versatile toy?
   A. puzzle.
   B. blocks.
   C. record player.
   D. truck.
Record answer on IBM sheet.

10. Which of the following would make a toy unsafe for a small child?

   A. it has round edges.
   B. it is painted with a lead-free paint.
   C. it has no detachable parts.
   D. it is made of a soft wood.

11. If parents too severely restrict their child's handling of objects, the area of development most likely to be hindered is

   A. motor manipulation.
   B. sight exploration.
   C. reasoning.
   D. questioning.

12. A pleasant or unpleasant family life greatly affects a child's development in all of the following areas except his

   A. self-confidence.
   B. ability to get along with others.
   C. physical characteristics.
   D. sense of humor.

Two suggestions for stimulating children's primary mental abilities are given below. Which mental ability is stimulated most by each of these activities?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mental abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Read literature of good quality to the child.</td>
<td>A. Word fluency.</td>
</tr>
<tr>
<td></td>
<td>C. Verbal comprehension.</td>
</tr>
<tr>
<td></td>
<td>D. Relaxation.</td>
</tr>
</tbody>
</table>
Record answer on IBM sheet.

15. Mrs. Jones wants Tommy to learn to share his toys with other children. When he is selfish she should
   A. take his toys away from him for a time.
   B. give some of his toys to his friends to play with.
   C. suggest that toys are for sharing.
   D. suggest how he and his friends can use the toys together.

16. An attitude of consideration for others can be developed most effectively in a child by parents who
   A. set an example of consideration for the child.
   B. explain to the child why he should be considerate of others.
   C. are consistent in praising the child when he is considerate of others.
   D. point out to the child when he has been inconsiderate.

17. Which of the following would a four-year-old child be least likely to acquire in play?
   A. consistent behavior.
   B. new information and ideas.
   C. awareness of how the other children perceive him.
   D. improved communication skills.

18. Three-year-old Jane, who has taken almost half of the available clay, starts to reach for some more. Several other children are using the clay. The teacher should say:
   A. "Aren't you going to let the other children have some of the clay?"
   B. "You must not take any more clay, Jane. The other children want to use it, too."
   C. "Use the clay you have, Jane. The rest of the clay is for the other children to use."
   D. "Don't be selfish, Jane. You must share the clay with the rest of the children."
19. Six-year-old Mary is at the table using crayons with several other children. She has 10 crayons in her lap protecting them from the others. The teacher should

A. make sure that there are enough crayons for the other children so they do not need the ones Mary has.

B. say, "You need to use only one crayon at a time, Mary. Put them on the table. We share them with all the children."

C. say, "Mary, you must share. If you don't you will have to leave the table."

D. place Mary at another table by herself to impress upon her the importance of sharing.

20. A mother sees four-year-old Bob hitting his playmate Mary because he wants the tricycle she is using and she won't give it to him. The mother should stop Bob by saying:

A. "You are not being nice, Bob. You go into the house and play until you can behave with the others."

B. "You should hit him right back, Mary, so that he can learn how it feels."

C. "Mary's using the tricycle, Bob. You can tell her you want it when she's through. I'll help you find something else to do while you're waiting."

D. "It's not nice to hit people, Bob, so I'm going to let Mary ride the tricycle. You must learn the importance of respecting other people's rights."

21. Toys such as nests of cubes, puzzles and tricycles promote the child's perceptual development in which of the following areas?

A. space.

B. weight.

C. number.

D. time.
22. The order in which the following kinds of play appear during childhood is:

Kinds of play
   a. dramatic play
   b. parallel play
   c. social play
   d. solitary play

Order of appearance
A. d a b c
B. d b c a
C. d c a b
D. d a c b

23. Mary plays the piano because she enjoys it. Sue plays the piano primarily because her mother makes her practice 30 minutes a day. Playing the piano is really play for
A. both Mary and Sue.
B. Mary only.
C. Sue only.
D. neither Mary nor Sue.

24. Common methods for guiding children's behavior include punishment, help, bribery, and substitution of another activity. Which response to the following situation indicates the mother is using the help method?

Seven-year-old Bill likes to win when he plays games. Bill and his friend Max have been playing a game with Bill's new game set. After the game is over, Bill is sulky when he tells his mother about it because he didn't win the game. His mother said:

A. "Bill, we must all learn to be good sports. Until you have decided you can be a good loser you don't need your new game."

B. "We can't always win when we play games, but practice will help. After supper Daddy will play the game with you so you can learn how to enjoy the game."

C. "Come on, Bill, you can't win them all. Don't be a mop-head. Just think how good you've made Max feel for once."

D. "You can't win them all so stop that sulking."
25. When talking about a child's growth, we can refer to his chronological age, mental age, reading age, height age, weight age, dental age, and so on. Which statement explains why we can speak of these various "growth ages"?

A. all parts and systems of an individual develop in the same sequence.
B. all parts and systems of an individual develop at the same rate.
C. not all parts and systems of an individual develop at the same rate.
D. not all parts and systems of an individual develop in the same sequence.

26. Parents use various types of discipline with their children. Strict discipline and harsh discipline are often confused. Which of the following is typical of strict discipline but is not typical of harsh discipline?

A. guides a child's behavior.
B. has an effect on the socialization of the child.
C. helps to develop a strong sense of security.
D. can be applied consistently.

In the sandbox Jack is playing with his dump truck and Becky is playing with a spoon and tin can. Ben is sitting on the side of the sandbox, telling Jack to "make a big hill." Sitting next to Ben is Jean who is glancing around the playground and occasionally sprinkling sand over her feet. Bobby is riding his tricycle around the sandbox. Which type of social participation is displayed by each child?

<table>
<thead>
<tr>
<th>Child</th>
<th>Forms of Social Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Jack</td>
<td>A. unoccupied behavior.</td>
</tr>
<tr>
<td>28. Jean</td>
<td>B. onlooker behavior.</td>
</tr>
<tr>
<td>29. Bobby</td>
<td>C. solitary, independent play.</td>
</tr>
<tr>
<td></td>
<td>D. parallel play.</td>
</tr>
</tbody>
</table>
Record answer on IBM sheet.

30. When children are about three or four years old, their communication with one another is known as collective monologue. They derive great satisfaction from talking in turn although their remarks to one another are not related. The following is an example of part of a collective monologue:

Peter: "It still hurts."

Mary: "When we went on a picnic in the woods, I was a bunny."

Peter: "I got this big blue mark on my knee when I fell down. It really hurts."

Mary: "There were so many ants in the woods. They even got into our food."

The collective monologue is a verbal version of which type of play?
A. associative play.
B. parallel play.
C. dramatic play.
D. manipulative play.

Answer items 31 through 40 on Answer Sheet #2

31. Circle the correct capital letter on answer sheet for this item.

Shortly after the arrival of his baby sister, three-year-old Steven began refusing to feed and dress himself. His parents can best deal with Steven by

A. telling him he is a big boy now and he should act like one.
B. not allowing him to have ice cream or watch television until he starts feeding and dressing himself.
C. promising him candy if he feeds or dresses himself.
D. holding him and spending more time playing with him.

32. Write one generalization (principle) to support the answer you chose for the above question. (Use answer sheet #2)
33. Circle the correct capital letter on answer sheet for this item.

Jerry, age seven, and his sister Amy, age five, are quarreling about how to divide the Halloween candy they collected. Which of the following should their mother do?

A. divide the candy according to their ages, appetites and preferences and give each his share.

B. divide the candy equally and give each child a share.

C. take the candy away, explaining that she is doing this because all they have done is fight about it.

D. have one child divide the candy and the other take first choice of the shares.

34. Write one generalization (principle) to support the answer you chose for the above question. (Use answer sheet #2)

35. Circle the correct capital letter on answer sheet for this item.

Gary is a four-year-old boy who was unhappy when he had to help his mother put away his toys. He kicked her on the leg and said, "I'll kick your leg off." If you were the mother, what should you do?

A. kick Gary on his leg - not hard enough to do any damage but just hard enough to let him know a four-year-old shouldn't act that way.

B. explain to Gary that you know he is unhappy, but that he has to help put away the toys.

C. explain to Gary that it hurt when he kicked your leg and he was a naughty boy.

D. spank him immediately so that he will understand not to kick people.

36. Write one generalization (principle) to support the answer you chose for the above question. (Use answer sheet #2)
37. Circle the correct capital letter on answer sheet for this item.

Bonnie and Dale were uncertain how to react when their four-year-old daughter Sally said, "There is a great big black bear out under the tree." Bonnie and Dale should

A. explain to Sally why she should tell the truth.
B. tell Sally to show them the big black bear so that she will realize she is not telling the truth.
C. show their surprise and ask Sally to tell them more about the bear.
D. tell Sally that they do not believe her.

38. Write one generalization (principle) to support the answer you chose for the above question. (Use answer sheet #2)

39. Circle the correct capital letter on answer sheet for this item.

How can parents best help their children learn to appreciate beautiful things in nature?

A. point out to them some of the wonders of nature during family hikes and outings.
B. answer their questions about nature.
C. respect and appreciate beautiful things.
D. buy them books which contain beautiful pictures of nature.

40. Write one generalization (principle) to support the answer you chose for the above question. (Use answer sheet #2)

Answer the remaining items on Answer Sheet #3.

41. - 45. List the ways in which a parent might help a preschool-age-child develop independence.

46. - 50. List as many different ways as you can think of to use cardboard boxes in making play materials for children.
## Scoring Key for Multiple Choice Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Answer</th>
<th>Item</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A</td>
<td>18.</td>
<td>C</td>
</tr>
<tr>
<td>3.</td>
<td>D</td>
<td>20.</td>
<td>C</td>
</tr>
<tr>
<td>4.</td>
<td>B</td>
<td>21.</td>
<td>A</td>
</tr>
<tr>
<td>5.</td>
<td>D</td>
<td>22.</td>
<td>B</td>
</tr>
<tr>
<td>6.</td>
<td>A</td>
<td>23.</td>
<td>B</td>
</tr>
<tr>
<td>7.</td>
<td>D</td>
<td>24.</td>
<td>B</td>
</tr>
<tr>
<td>8.</td>
<td>A</td>
<td>25.</td>
<td>C</td>
</tr>
<tr>
<td>10.</td>
<td>D</td>
<td>27.</td>
<td>D</td>
</tr>
<tr>
<td>11.</td>
<td>A</td>
<td>28.</td>
<td>A</td>
</tr>
<tr>
<td>12.</td>
<td>C</td>
<td>29.</td>
<td>C</td>
</tr>
<tr>
<td>13.</td>
<td>C</td>
<td>30.</td>
<td>B</td>
</tr>
<tr>
<td>15.</td>
<td>D</td>
<td>33.</td>
<td>D</td>
</tr>
<tr>
<td>16.</td>
<td>A</td>
<td>35.</td>
<td>B</td>
</tr>
<tr>
<td>17.</td>
<td>A</td>
<td>37.</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39.</td>
<td>A or C</td>
</tr>
</tbody>
</table>
Scoring Procedure for Essay Items

Even-numbered items 32-40

Instructions These items are designed to assess ability to synthesize or generate an appropriate principle. Therefore, no credit is given for an analysis of the problem stated in an item. In four of these items (32, 34, 36, and 38) there is one correct answer. In item 40 either of two correct answers is given full credit value. Each correct answer contains one or more concepts (ideas). Each complete answer to an item has a score value of 2. For partially correct answers one point is given for each correct concept stated.

(This means that in three concept items full credit is given if two of the required concepts are included in the answer.) All items require interpretation of student ideas in relation to correct concepts.

Correct responses for even-numbered items 32-40

<table>
<thead>
<tr>
<th>Item</th>
<th>Concepts</th>
<th>Complete response</th>
</tr>
</thead>
</table>
| 32.  | 1        | When a child's position is threatened,  
         | 1        | stress can be lessened if the child is  
         | 1        | given assurance  
         | 3        | that he is loved.  
| 34.  | 1        | To function in a democratic society  
         | 1        | one needs to learn to help make the  
         | 2        | rules by which he lives.  
| 36.  | 1        | Children often need emotional support  
         | 2        | while acquiring a sense of responsibility.  
| 38.  | 1        | Parental acceptance recognizes  
         | 2        | that it is natural for children of  
         |          | this age to be developing imaginations  
         |          | by telling highly fanciful stories.  


<table>
<thead>
<tr>
<th>Item</th>
<th>Concepts</th>
<th>Complete response</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.</td>
<td>1</td>
<td>Children learn best by overt example.</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td>If parents are committed to a value,</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>they will find appropriate ways of</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>teaching their children.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Item 41-45**

Independence is the state of being self-reliant, i.e., depending on self, relatively autonomous. This involves a lack of dependence upon others. The socialization of the child requires concern for both self and others.

This item has a possible score value of 5. Each idea contained in a response has a possible value of 1 depending upon whether the idea is both relevant to independence and appropriate for a preschool child. Values are assigned to responses by the following method:

a. If an idea is not relevant to independence, give no credit.

b. If an idea is relevant to independence, give $\frac{1}{2}$ point credit.

c. If an idea is relevant to independence and appropriate for a preschool-age-child, give 1 point credit.

Since independence for a preschool-age-child involves both self and others, this dimension of the item is handled in the following manner:

a. No more than 3 ideas will be scored for self.

b. No more than 3 ideas will be scored for others.

c. If an idea has a score value of 0, it must still be scored either for self or others.

d. Ideas are scored in the order listed in the response.
e. An example of a scored response to item 41-45:

<table>
<thead>
<tr>
<th>Self</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>not scored</td>
<td></td>
</tr>
</tbody>
</table>

1. Give him a small but important job to do around the house or yard.
2. Let him decide which of two outfits he would like to wear somewhere.
3. Let him dress himself as much as possible.
4. Send him to the market.
5. Teach him to share.

Score = 3

The even-number rule applies in total score, that is, if the value is 1/2, give 0 score and if value of response is 1 1/2 give score of 2.

Item 46-50

This item has a possible value of 5. Value can be given to the responses to this item whether they are from the standpoint of a child or adult.

Each way of using cardboard for play is given 1/2 point credit.

The even-number rule is applied in counting score.
Teacher Letter 1
Miss Jane Smith
Any High School
Anywhere, Iowa

Dear Miss Smith:

Greetings to you from all of the Home Economics Education Faculty at Iowa State. We hope that you are having a challenging and rewarding experience in your first year of home economics teaching.

From February to May, 1972, several of our faculty will visit beginning teachers. We hope to assist you in your home economics program and to visit with you concerning your teaching activities.

We would also like to use this visit as an opportunity to collect some data on our 1970-71 home economics education graduates which will help us evaluate the home economics teacher education program. All data collected will be summarized for the group; data for each participating teacher will remain anonymous.

We would like to collect the following data: two video and/or audiotapes of classroom discussions from your home economics classes and responses to a short questionnaire by the pupils in the classes taped and by you. Response time to the student questionnaire will be approximately 10 minutes; to the teacher questionnaire, 45 minutes.

We hope that it will be possible for us to visit you and to collect the desired data. We have also contacted your superintendent requesting permission to visit you and to collect the designated data. Please check with him concerning his willingness to have us visit and to collect data. We encourage your participation in the proposed evaluation as we do need the data from each of our graduates who is teaching in order to evaluate the teacher education program.

In order for us to make plans for our visit, would you please send us your schedule and a projection of the subject matter areas you plan to be teaching at each grade level from February to May, 1972. A form on which to provide this information along with a stamped, addressed envelope is enclosed to facilitate your reply.
We look forward to visiting with you and to learning about your experiences on your first teaching position. If you have any questions concerning the visit or the data to be collected, please call Dr. Alyce Fanslow collect at 515-294-5307.

Sincerely,

(Mrs.) Alyce M. Fanslow, Ph.D.
Assistant Professor

(Mrs.) Ruth P. Hughes, Ph.D.
Head, Home Economics Education

Enclosure
NAME____________________________________

SCHOOL__________________________ DATE__________________________

____ __Yes  I would like to have you visit.

____ __Yes  I am willing to participate in the proposed evaluation of the
home economics teacher education program and have talked with
my superintendent and determined that your proposed data
collection is alright with him.

____ __No  I would prefer that you did not visit.

____ __No  I would prefer not to participate in the proposed evaluation.

Please indicate your daily schedule on the form below.

COURSE ___________________________ GRADE LEVEL ___________________________

<table>
<thead>
<tr>
<th>TIME</th>
<th></th>
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<tbody>
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<table>
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<tr>
<th>DAY</th>
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<tbody>
<tr>
<td>MON.</td>
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<tr>
<td>TUES.</td>
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<td>WED.</td>
<td></td>
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<tr>
<td>THURS.</td>
<td></td>
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<tr>
<td>FRI.</td>
<td></td>
</tr>
</tbody>
</table>
If it would help us, if we had a projection of the subject matter areas you expect to be teaching from February 1 to May 31 for each grade level. Please provide this information on the form below.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>UNIT</th>
<th>PROJECTED DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Between 2/1/72 - 5/31/72</td>
</tr>
</tbody>
</table>

Signed

Home Economics Teacher
Teacher Letter 2
Miss Jane Smith  
Any High School  
Anywhere, Iowa  

Dear Miss Smith:

We are looking forward to visiting with you concerning your experiences as a first year teacher. We would also like to express our appreciation for your willingness to participate in the research project designed to provide some data for helping us to evaluate our teacher education program.

Dr. Karen Zimmerman or I will be visiting you; we will plan on spending most of the day with you. We would like to see several classes in regular session and to work with you during one of your free periods. Will you think through the questions on the enclosed sheet before our visit and select those which are most important to you to discuss?

At the time of our visit, we would also like to discuss the proposed research as it has now been defined. The following list contains essentially the information we’d like to collect for our research project:

1. two videotapes of your 11-12 grade class in the unit which relates to child development which meets at

2. responses by you to a questionnaire.

3. responses by your students in the class that is videotaped to a brief questionnaire following the second tape.

When we visit you, we will bring with us the necessary video equipment and tape. We will also tape the class session. Mrs. Dorothy Kizer, a graduate student in the Home Economics Education Department, will accompany us and will assist in making the tape of the class session.

The sessions we would like to tape should involve teacher-pupil discussion of approximately 30 minutes in length. The discussion should include an exchange of questions and ideas with the teacher leading the discussion. Since we are not including the following in our definition of discussion,
please do not include in the class session to be taped such experiences as pupil buzz groups, laboratory sessions or pupil reports. Role playing would be acceptable as a basis for discussion if it does not exceed five minutes.

The other visit will be made only for the purpose of making the videotape and will be only as long as that class period. Mrs. Kizer will visit your school to make this tape.

We will bring with us the questionnaire that we'd like you to complete. The questionnaire to be completed by students will be left with you after the second tape is made. We'd like to have you administer these to the students.

Since the tentative course schedule that you sent me may have changed, will you verify when the child development unit is scheduled on the enclosed card? About two weeks before the unit is to begin, I will write you again to make plans for our first visit.

We are also writing your principal at this time explaining the purpose of our visit. When plans are made for the first visit, a second letter will be sent to him informing him of the day we expect to be in your school; you may also wish to tell him. When we do visit, we will also want to have a conference with him. Perhaps at that time you can help to arrange an appointment.

We will be looking forward to visiting with you. Please return the enclosed card within three days so that we can begin scheduling our trips. Thank you.

Sincerely,

(Mrs.) Alyce M. Fanslow, Ph.D.
Assistant Professor

enclosures
Yes, I plan on teaching the child development unit in the class period which meets at from to .

If your answer above was yes, please suggest two dates when the lesson will be in a discussion format during the period of to .

First date suggested for visit________________________
Second date suggested for visit________________________

No, my plans are changed. The unit will be taught from _____________ to _____________ (dates).

If your answer above was no, please suggest two dates when the planned lesson will be in a discussion format during the first one-half of the unit.

First date suggested for visit________________________
Second date suggested for visit________________________

Number of pupils in class which meets at _____________.

Signature - Home Economics Teacher
Letter to Superintendent
Mr. John Doe  
Superintendent  
Any High School  
Anywhere, Iowa

Dear Sir:

The faculty members of the Home Economics Education Department of Iowa State University are pleased that one of our graduates has joined your teaching staff. We hope that she is making a worthwhile contribution to your home economics program this year.

The interest that we have in our students and our concern for their continued professional growth does not end at the time of their graduation, but continues as an in-service program. One part of this program provides that some of our faculty members will make visits to all of the home economics education graduates who are beginning teachers of home economics in Iowa. Through these visits we hope to assist and encourage beginning teachers as well as to help us evaluate the effectiveness of the home economics teacher education curriculum.

We would also like to use these visits as an opportunity for the Home Economics Education Department at Iowa State University to collect some data related to our continuing effort to improve the teacher education program. The purpose of the research project in which these data will be used is to help us evaluate the effectiveness of the home economics program. All information will be treated as confidential; the research project is being conducted by Dr. Alyce Fanslow and Dr. Ruth Hughes.

Participation in the study would involve video and/or audiotaping two classroom discussions and having the home economics teacher, students in the classroom that are taped, and her principal complete a short questionnaire. Response time for the teacher and the principal would be approximately 45 minutes; for the students 10 minutes.

Plans are being made at Iowa State for several faculty members to visit from February to May, 1972. Enclosed is a copy of the contact letter written to your home economics teacher.
We sincerely hope that your school will not only be willing for us to visit with the first-year teacher but also that it will be possible for us to collect the designated data. If you will indicate your willingness on the card enclosed for your reply, we will begin to make plans for our first visit. If you have any questions, please call Dr. Alyce Fanslow collect at 515-294-5307.

Since we assume that our future contacts will be made with the principal of the school in which the home economics teacher is employed, it would be most helpful if you informed him of our planned visits. The principal's name, as recorded in the 1970-71 edition of the Iowa Educational Directory, is also cited on the enclosed card. If it is incorrect, please correct it for us.

Sincerely,

(Mrs.) Alyce M. Fanslow, Ph.D.
Assistant Professor

(Mrs.) Ruth P. Hughes, Ph.D.
Head, Home Economics Education

Enclosures

mc
Letter to Principal
February 1, 1972

Mr. James Jones
Principal
Any High School
Anywhere, Iowa

Dear Sir:

In early January, 1972, we contacted the superintendent and the home economics teacher in your school system and obtained permission to visit the home economics teacher who is one of the 1970-71 graduates of Iowa State University (ISU). We also obtained permission to collect data for the purpose of helping us evaluate the home economics teacher education program at ISU.

We are expecting to make these visits between March 1 and May 31, 1972. One of our regular supervising teachers will make the visit; she will write you and the home economics teacher informing you of the exact day she expects to visit. At this time, we are also writing the home economics teacher to explain to her in more detail the purpose of the first year visit and to outline the data we'd like to collect. A copy of that letter is enclosed for your information.

We look forward to visiting with you and the home economics teacher during the next few months.

Sincerely,

(Mrs.) Alyce M. Fanslow, Ph.D.
Assistant Professor

Enclosure