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ABSTRACT

This document describes the development of an observation instrument which could provide an objective record of the content of the learning environment in the early childhood classroom. A team of early childhood specialists explored the critical dimensions of the preschool experience and developed a series of descriptive categories in terms of objective, observable events and materials. The literature on classroom observation was also reviewed. Data was analyzed in terms of frequency distribution programs, reliability programs, factor analytic studies and interpretations. Almost half the report is comprised of tables. (MS)

THE OBSERVATION OF SUBSTANTIVE CURRICULAR INTERACTIONS:

An objective record of the content of the learning environment in the early childhood classroom

FINAL REPORT

Research Projects in Early Childhood Learning

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TABLE OF CONTENTS

LIST OF TABLES

THE OBSERVATION OF SUBSTANTIVE CURRICULAR INTERACTIONS:
An objective record of the content of the learning environment in the early childhood classroom

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Introduction

While comparing the effectiveness of different instructional procedures has always been one of the major concerns of educational research, the recent large-scale investment in compensatory programs for young children has served to make the results of evaluative studies front page news. In essence, these assessments have made the implicit assumption that Head Start is a uniform, replicable experience for all the children attending these classes. Nothing could be further from the truth. Head Start is as varied as are the teachers, classes, communities, and geographic regions from which the data have been collected. Many programs are effective; some are ineffective; and others may be actually deleterious. It is not surprising that when the performance scores of children from these disparate settings are pooled the net gains are appreciably diluted. Using this type of conglomerate data, it is impossible to identify the critical features of effective programs, and consequently it is impossible to isolate those characteristics which are most closely related to and predictive of the desired changes in children.

The question of whether Head Start does produce gains in any way commensurate with its cost has also been raised. The front page headlines given to the Wolff & Stein report (1966), one of the earliest attempts to assess the continuing effects of Head Start experience, point up the dangers of evaluations based on post hoc analyses. The finding that Head Start children showed no educational superiority compared to children who did not have Head Start was publicized with the inference that this expensive preschool program had no significant impact and hence was a waste of money. Among other valid cricitisms of the Wolff-Stein report, Bronfenbrenner (1968) points out that the experimental design completely washed out the differences in programs and teachers. He emphasized the need to describe the environmental conditions which are provided to implement changes, and the relationship between these conditions and the relevant behavioral outcomes.

Gordon (1968) also notes that achievement scores of children are not related to variations in program characteristics. In fact, the investigators "treated large scale public-school-sponsored programs as if they were homogeneous in nature and impact." Obviously there is no such thing as a "typical" Head Start program; nor can the effectiveness of Head Start as a whole be assessed by averaging across the wide range of variation which characterizes this exceedingly heterogeneous educational experience.

In the spring of 1966, when the network of university-based Head Start Evaluation and Research Centers was first established, the assessment of Project Head Start was conceived within the framework of the traditional pre-post design. However, at their first meeting the E & R Center Directors forcefully presented the need for adopting a more sophisticated type of analysis. Thus, in October 1966 a new experimental design, addressed to the multifaceted question: "What kinds of programs make what kinds of differences with what kinds of children?" was proposed. This triple focus called for assessments of the medical-physical, psychological-cognitive, and social-emotional aspects of the child and his environment, both in terms of status as well as change measures. Most importantly, it emphasized the need to look at these variables as reflecting on-going processes involving a high degree of interaction. The characteristics of teachers and other adults, the features of physical environments at school and at home, and the nature of the stimulation provided the child in these settings, were recognized as important sources of variation in the obtained measures of change.

This comprehensive approach was frustrated at the very outset by the lack of relevant assessment criteria and instrumentation. In the eight-step paradigm of the evaluation process developed by Metfessel & Michael (1967) the key feature is the detailed listing of multiple criterion measures related to specific behavioral objectives. Because of the pressing need to carry out some type of evaluation during the first full year Head Start program, the development of appropriate measures was an unattainable luxury; reality decreed the adoption of a number of compromise measures. At the same time, task forces were set up to explore more appropriate tests for assessing cognitive and social-emotional changes in children as well as to design procedures for describing the curricular characteristics of the classroom. With Boston, Southern, Syracuse, Texas, and Tulane Universities, the Head Start Evaluation & Research Center at the University of California, Los Angeles, was charged with the responsibility for devising a classroom observation procedure. Inasmuch as the Observer Rating Form for the assessment of teacher behavior, developed at the University of Texas, was already part of the test battery, the new instrument was to focus specifically on what was happening to children, regardless of the source of the stimulus input.

INSTRUMENT DEVELOPMENT

In response to the charge to develop an observation instrument, two lines of activity were initiated. A team of specialists[1] in the field of early childhood education was assigned the task of exploring the critical dimensions of the preschool experience, and developing a series of descriptive categories in terms of objective, observable events and materials. At the same time, research assistants were sent to the reference library to comb the literature in the area of classroom observation.

The first part of this section will report the results of the latter effort. However, in order to provide a coherent rather than chronological presentation, it will also include research which did not appear in the literature until long after the OSCI had been developed and used as the national Head Start classroom evaluation instrument.

Research on Classroom Observation

In perhaps the earliest discussion of direct observation as a research method in the field of education, Jersild & Meigs (1939) predicted optimistically that there would be increasing application of this basic tool of physical science to the study of classroom

[1]At various times the team included Dr. Ada Leff, Mrs. Alita Letwin, Dr. Avima Lombard, Mrs. Eva Benesch, Miss Harriet Prichard, Mrs. Ruth Silberstein, and other members of the staff of the UCLA Head Start Evaluation and Research Center. Considerable assistance was also obtained from various Head Start Child Development supervisors and Head Start teachers.

environments. Far from fulfilling the expectations of these authors, the majority of educational researchers seemed to prefer questionnaires or other types of subjective reports, and the proportionate use of direct observation actually declined (Gellert, 1955). A similar lack of enthusiasm was also evident in developmental studies, where Wright (1960), reviewing the field of observation with young children, noted that only eight percent of investigations between 1890 and 1958 employed this technique.

However, the increase in interest in systematic observation during the past decade is evidenced by the publication of several excellent reviews in this comparatively new field. (Cf. Wrightstone, 1960; Withall, 1960; Baldwin, 1965; Boyd & DeVault, 1966; Meux, 1967; and Wright, 1967.) In addition, a number of instruments developed during this period have been collected and analysed (Simon & Boyer, 1968). Several investigators have also been concerned with the adaptation of tape recording and videotaping equipment for observation purposes (Schoggen, 1964, 1967; Spaulding, 1969; Herbert, 1969).

Herbert (1969) has pointed out some of the practical considerations and theoretical problems which may have discouraged the earlier use of observation in the classroom. One such area, the effect of the observer on the observed, was investigated by Masling & Stern (1969). No consistent patterns over time were detected with seven observers in 23 classes. Two possible explanations for this finding were advanced: a) teacher and pupil variables occurred episodically and were more important than the effect of the observer; or b) the effects of an observer are extremely complex and affect various aspects of classroom behavior. In either case, there seems to be no serious or valid objection to continuing research in this area, whereas the use of systematic observation offers a tremendous potential for increasing knowledge about the learning environment.

About 1951, developments in two somewhat unrelated fields laid the groundwork for renewed interest in the objective study of behavior. In the area of group problem-solving, Bales & Strodtbeck (1951) worked out a set of categories for describing the multiple interactions which characterize groups engaged in decision-making processes. To adapt the interactional analysis of group dynamics to teacher-student classroom behavior was a short but creative step. The research of Amidon & Flanders, reported in many articles (see Flanders, 1969) resulted in the earliest and probably the most widely used system of this type (see Aschner, 1963). The major inadequacy of the technique is that it concerns itself almost entirely with verbal interactions between the teacher and the class members, and is thus inappropriate where a large percentage of the behaviors are non-verbal.

The second important source of impact derives from the exploration of classroom climate or ecology, reported in the same journal issue by Withall (1951) and Wright, Barker, Nall, & Schoggen (1951). This approach, in contrast with the interactional one which tends to focus on the teacher, attempts to view the total environment of the classroom. The work of Gump (1964, 1967) has taken this direction.

Medley & Mitzel (1958, 1959) have been concerned with the measurement of both teacher effectiveness and classroom behaviors. These two authors have made important substantive contributions to the study of classroom observation. In addition to writing one of the most definitive reviews of the field (1963), they have developed an observation schedule and report (OScAR) which has gone through several revisions and has been used by many investigators interested in the study of the classroom process. In an important study with this instrument, differences were found among 49 beginning teachers in grades 3, 4, and 6, over 19 different schools. The data were analysed to select variables which would show reliable differences among classrooms. The discriminative items were combined into 14 scales on the basis of a priori judgments concerning such dimensions as teachers' problem-structuring statements, autonomous administrative groupings, freedom of movement, manifest teacher hostility, and supportive teacher behavior. The reliability coefficients ranged from .61 to .91. Factor analysis resulted in three factors: warmth of emotional climate, degree of verbal emphasis, and prevalence of pupil-initiated activity.

In spite of the care with which the classroom events were categorized, subsequent attempts to correlate cognitive or emotional changes in pupils to teacher ratings by themselves or their principals, or to any of the factor dimensions, failed to demonstrate a significant relationship. Evidently a further refinement of the procedure was needed. In an effort to relate classroom process to pupil outcomes, Spaulding (1964) observed 21 4th and 6th grade classrooms in nine elementary schools in an upper middle class suburban California city. Using a factor analysis procedure, 17 factors were identified; these were used as antecedent variables, with several pupil target behavioral outcomes as consequent variables. The major findings were that the 21 classrooms differed on all the pupil target behaviors: self-esteem, concern for divergency, attention to task, use of task-appropriate procedures and resource etc. Only one category, that of "businesslike lecture methods with insistence upon attention to task and conformity to rules of procedure" was found to be correlated significantly with pupils' gains in reading and mathematics, and with problem-solving performance. There was a negative relationship between dominating-threatening teacher behavior and gains in reading.

Attempting to gain a closer control over the observational recording system, Hill & Medley (1969) developed the Goal Oriented Teaching Exercise (GOTE). OScAR V was used to observe teacher social-emotional behavior during the teaching of a specific content unit. The instrument is concerned primarily with the affective and interpersonal interactions between pupil and teacher. It contains 18 separate categories, four for pupil utterances and 14 for teacher utterances. Six of the teacher categories are dual purpose, providing 20 teacher measures. These may be combined to form 68 different events, 13 kinds of statements, and 55 interchanges.

The experimental use of the GOTE unit covered a six day period, with three types of observational procedures: 1. Videotapes of each teacher in each of eight classes for one day; 2. Audio tapes of all lessons of all teachers; and 3. Live observations by two observers for each teacher. Four kinds data were collected: 1. recordings; 2. pupil gains; 3. content coverage; and 4. teacher behavior. With respect to the latter dimension, three kinds of information were obtained: psycho-social behavior, content coverage, and instructional objectives.

The final analyses showed that the students in one of the classes had gained significantly more than those in the other seven classes, especially in application. The gain of this class was seven times as great as that of the class showing the lowest gain. The teachers of the high and low gain classes had been rated as the most and least effective, respectively.

Similar results were obtained by Oppenlander (1969), who used the Flanders interaction analysis to tease out differences in the interaction of teachers and classes in a junior high school, where four teachers taught the same top and bottom sections of the sixth grade class. Over a two week period, the author observed each of the two sections with each of the four teachers for five class periods. Several of these sessions were tape-recorded and estimates of observer reliability of .73 and .78 were obtained, using two graduate students. Higher reliability might have been demonstrated if the tapes had been of better quality. A stability coefficient (.86) was also computed by having the same observer recode the tape after an interval of several months.

Post observations were carried out about four months later, providing a total of 80 class periods of observation. The hypothesis that the same teacher differs temporally, from day to day and situationally, from class to class, or from one child to another, was tested. No support was found for differences over time, but there were significant differences in behavior with the two sections. For all teachers, their behavior became more indirect with the less capable and more direct with the more capable group.

While the need for objective descriptions of classroom environments has been the subject of considerable research effort during the past 20 years, the applications to preschool or kindergarten ecologies is of considerably more recent vintage. Although the title of the work by

Cohen & Stern (1958) suggests a rigorous approach, it is actually a thesis on the art of writing descriptive anecdotal records. Perhaps the earliest reports of a systematic observational procedure in the early grades come from the work of Sears (1963) and her students (Kowatrakul, 1959 and Melville, 1959). Sears studied the relationship between teacher behaviors and pupil "target variables" with 195 children and 7 teachers in the 5th and 6th grades. The teacher variables included preferences for school activities, perceptions of individual children, and peer perceptions; the child variables included certain educational outcomes, self-concept, liking for other children, task-oriented classroom behavior, achievement test scores, attitudes toward school activities, and creativity test scores. The most interesting finding was that "Sheer frequency of independent, task-oriented work does not guarantee a payoff in better scores on achievement tests... but it is associated with good self-concepts and/or liking by others for the children who are below the group mean in mental ability."

Melville (1959) utilized two of the categories from the Sears observational schedule and compared the industrious behavior of children in 1st and 2nd grade classrooms with their achievement and work-oriented responses in a standardized doll play situation. She found that the children who scored high in industrious behavior exhibited consistent kinds of behavior in doll play. That is, children who were intent on classroom work much of the school day depicted dolls similarly engaged.

The first study which is actually concerned with a preschool environment is that of Shure (1963) Adapting Wright & Barker's ecological approach to the study of a nursery school, Shure divided the indoor area into five activity settings: block corner, art area, housekeeping area, story area, and science corner. She then observed in these five areas during the free play period, recording the number of children (population density) at each activity, the amounts of several kinds of social participation, constructiveness, and affect. Not unexpectedly, the findings were that there were different densities and different behaviors in the various areas. The conclusion is drawn that certain arrangements may operate to coerce certain kinds of child behavior.

The relevance of a study with middle-class nursery children for understanding what is happening to disadvantaged children in a compensatory preschool program is of course open to question. An approach specifically designed for poverty children is presented in the form of a "Taxonomy of objectives and an evaluative model" by Metfessel (1965). Unfortunately, the usefulness of the model is limited by its attempts to categorize a wide variety of events into a too-rigorous framework.

By 1969, the field had attained sufficient maturity to warrant the presentation of a symposium on the analysis of preschool environments (Datta, 1969). In her own paper for this session, Datta discussed some of the theoretical assumptions on which preschool environment analyses should be based. The three basic components of any preschool environment were identified as: a) the responsible adult; b) the substantive content or goals of the interaction between the adult and the child; and c) the instructional orientation or process variables through which the content is implemented. These components can provide a set of dimensions along which to compare different classrooms.

At this same meeting, Formanek (1969) reported on the validation of an observational instrument for predicting school success with Head

Start children. Using the procedure developed by Spaulding (1969), which provides a Coping Analysis Schedule for Educational Settings (CASES) Formanek observed 33 boys and 21 girls between the ages of 4-7 and 6-0. The children were in five different classrooms in three private nurseries for the eight-week summer Head Start in 1965. The observations of the traditional nursery school program were in two-minute units and provided narrative accounts over the specified time periods. No interpretations of the observed events were accepted.

The collected data consisted of 2000 two-minute specimen descriptions for the total group. It was possible to record as many as 30 bits of behavior (e.g., looks at blocks; picks up one block; etc.) in each two-minute segment. Interobserver reliability was .90. There were three time periods of 12 days each. The settings were described as either "free play" or "teacher directed." The data were analyzed to produce means for the types of behavior for groups and individuals as well as change scores from one time period to the next, using the 16 categories described by Spaulding.

The analysis of the results showed that 95% of the behaviors were assigned to six of the categories: 32% were independent productive; 29% passive conforming; 17% socially participating; 13% restless and distractible; and 4% fidgeting and daydreaming. Only a very small percentage of the children demonstrated aggression, unusual dependency, or withdrawal. There were no significant differences between boys and girls, or between the three time periods. The analysis of change over time offered insurmountable difficulties for this observational data. However, the changes were in the expected direction, toward increasing school adaptive behavior, with the trend stronger for girls than for boys.

Following the alternative model for classroom observation, several studies of preschool environments have focused specifically on the teacher as the primary input variable. Harvey, White, Prather & Alter (1966) found support for the hypothesis that teachers having more abstract belief systems would be more resourceful, less dictatorial and punitive, and obtain better academic performance from the children than teachers with more rigid or concrete belief systems.

Seifert (1969) compared the amount of verbal interaction with two teachers using either the Weikart or Bereiter-Engelmann programs. Three observations, lasting from 20 to 30 minutes each, were made with the OScAR system. Medley's three main dimensions include social-emotional climate (warmth vs. hostility), verbal emphasis, and social structure. Seifert used five categories or scales: total statements, verbal feedback (approval or disapproval), pupil initiation, teacher management, and teacher affect (warmth vs. hostility). All five scale frequencies were totalled over the six observation periods. Since the observations varied in length, the frequencies were converted to ratios (total scores divided by length in minutes of that observation). The mean scores for each class-room were subjected to t tests.

The results showed that the Bereiter-Engelmann program was significantly higher only in total statements per minute. Since previous studies have also indicated no differences in outcomes between the two types of programs, it seems safe to assume that there are really few important differences between these two divergent programs, at least as they are implemented by the teachers. Seifert states: "In spite of superficial differences in the goals and activities of these two programs, the teachers use much the same style in talking with their pupils, at least during the group teaching situations, and the general cognitive ability of the pupils improves in similar amounts."

The critical importance of the teacher was also pointed up by Katz (1969), in a similar comparison between two types of preschool programs. The observation instrument, The Child Behavior Survey, has been developed specifically for this study. It categorizes children's classroom behavior along the dimensions of orientation to classroom activities, selected cognitive behaviors, and apparent satisfaction in classroom settings. The observations revealed that the experimental treatment was not being implemented by the teachers. The hypothesis that high frequency of directions and low frequency of reinforcement would provide a largely restrictive and nonsupportive classroom atmosphere could not be tested because the praise and approval required by the treatment condition was not being supplied. In both groups the children decreased in task-involvement and attentiveness to teacher and increased in aimless wandering and disruptiveness. There were no significant gains in cognitive growth.

This experiment, as well as that of Seifert cited above, underscores the necessity for including some type of classroom observation in curricular comparisons. Without this type of evidence it is impossible to determine whether or not two theoretically different programs actually produce different types of change in children. A final point made in this study is that there is a need to identify what kinds of children profit most from what kind of teacher. Just as Oppenlander had reported that teachers behave differently with different children, it seems equally true that different kinds of children thrive under different teachers and conditions; no single method appears capable of serving the needs of all children.

Made aware of the need for classroom observation through the experiment reported above, Katz (1969) made a survey of teaching in preschools and found that only nine studies reported findings based on observations of teachers in Head Start classes, and that there were only 20 observational studies for all preschool classrooms. Changes in children are measured in terms of pre-post gains, unrelated to the intervening classroom experiences, while studies of teachers look at teacher role and style as separate aspects of teaching.

Katz reports a study by Conners & Eisenberg of 38 Head Start teachers in the 1965 six-week summer program. Trained observers recorded discrete episodes, defined as a change in triangular relationship between teacher, children, and environment. The episodes were scored in terms of values or implicit goals such as development of self-concept, consideration for others, intellectual growth, etc. Teachers were classified as high, medium, or low on each of the value dimensions, and were also given global ratings on continua of warmth, permissiveness, activity, and variety. The children were pre- and posttested with the Peabody Picture Vocabulary Test, and the gains correlated with teacher characteristics. The results showed that teachers rated high on both intellectual growth and warmth produced greatest gains in children; neither variable alone had any consistent effect.

Another study reported in this survey is one by E. Kuno Beller. He found that the children of teachers who made less distinction between work and play, who were more flexible in room arrangements, and more flexible in programming, performed better on problem-solving tasks. Similarly, Prescott & Jones were cited as having demonstrated a relationship between positive responses in children and teacher encouragement, emphasis on verbal skills, lessons in consideration, etc.; negative responses were related to restriction, guidance, and lessons in control and restraint. Other important determinants of outcomes from the preschool experience are listed by Katz. These include size of center, sponsorship, physical space and equipment available, and the weather or climate.

In recognition of the importance of the question of process description in the entire area of Head Start research, one of the series of Research Seminars organized by Dr. Edith Grotberg under OEO sponsorship, was addressed to the teacher and classroom management. The paper read by Dr. Martha Rashid, as well as the lengthy comments of the discussants, Dr. Helen Richards and Dr. Ira Gordon, have been published (see Rashid, 1969), and provides an excellent review of the work in this field. However, most important for the purposes of the present paper are the practical comments of Dr. Gordon on the problem of devising an observational instrument. The complexity of the problem is reflected in the ambivalence of the comments: at one point there is a statement to the effect that we cannot go into a classroom and "capture everything that is going on in some type of behavior analysis writeup." Later he states: "We need to go in first and simply try to describe what we see. No prejudgments about the importance or relationships between variables." In essence, both these lines of attack were adopted in the preparation of the OSCI.

Descriptors of Early Childhood Environments

As indicated earlier, a team of early childhood specialists had been assigned the task of compiling a seemingly inexhaustible pool of items which described some aspect of the preschool experience. These were categorized along many dimensions and typed out on several sets of checklists. The original concept was to provide observers with these materials to use as reference guides, while recording frequencies of observed occurrence on another form. Unfortunately, this format demonstrated many inadequacies, the most telling of which was the physical impossibility of handling the voluminous sets of materials.

Starting with the categorized pool of items, a new approach was to develop mneumonic codes which would be used either singly or in combination in describing a wide variety of activities and program inputs. Various coding systems and record sheets were devised and tried out before arriving at the form which was finally accepted as the instrument for assessing curricular input for the 1967-1968 national Head Start evaluation. The instrument is described in detail in the OSCI Manual and Codebook, which accompanies this report.

Briefly, the OSCI is a coding system based on a series of three-minute scans of on-going activity. It requires that two trained observers be present to provide adequate coverage in classrooms where simultaneous activity occurs in different areas, or where some children may be playing outdoors while others are inside. During each three-minute scan, the largest group is located, and four major codes recorded for this group: group size, context of the activity, content of the activity, and locus of control. The context of the activity is the overall setting or situation, such as eating or building; the content code describes the quality of the input taking place within the context. Thus, eating could be a routine, mechanical affair, with children required to sit quietly and eat, or it could be an active learning experience with verbal communication and both sensory experience and content. For example, feeling textures, naming colors, counting pieces of vegetables, talking about food values of vegetables, how they grow, etc. Thus the same context could conceivably have considerably different input value.

All context codes are indicated by single capital letters and content codes by two lower case letters. While the system requires a training period and reliability checks over observers, the coding is closely related to the code meanings, e.g., "B" stands for Building, "la" for language.

The materials used in the activity, whether the child is active or passive, and where the activity is located, either indoors or outdoors, are also coded. Within that same three-minute period, the observer then locates the next group, makes the same records, and proceeds in the same manner until the last individual child unit possible in the time permitted has been recorded. A three-minute record could potentially consist of from one unit (indicating all children were occupied in the same activity) to as many units as there are children, presuming that each child is doing his own thing.

These three-minute scans are repeated on a schedule of seven scans each half-hour, followed by a nine-minute rest period for the observers, then another series of seven scans, until five half-hour periods have been completed. Each daily observation covers approximately the total day for most Head Start classes. To assure sampling across days of the week as well as some seasonal variation, five observation days, each on a different day of the week and approximately four weeks apart, are scheduled. This provides a total of 175 three-minute classroom scans or records for each of the sample classes.

Observers from all the 14 E & R Centers attended a three-day training session conducted by the UCLA staff, using the facilities of Boston University. Reliability of each observer, obtained by simultaneous observations involving a trainer and a trainee focusing on the same episode, ranged from .70 to .90. No trainee was accepted for observation assignments if the minimum of .70 reliability was not attained. In addition, during the course of the year a written test was administered immediately prior to three of the five scheduled observations.

The raw data tape, keypunched from the observation protocols, contains a wealth of information about the various sites which were not included in the present analyses. Also, other instruments, administered as part of the national evaluation, collected data which should be coordinated with that obtained from the OSCI. For instance, Staff Characteristics, Class Resources and Facilities, as well as the Post Interview with the teacher, all contain material which should be correlated with that of the OSCI. These analyses were conceived as the function of the national evaluation staff, which was also responsible for relating program description to measures of changes in children.

Although the OSCI was to have been administered to all classes in the national sample, problems of logistics at various levels considerably reduced the expected volume of data. When all the tapes were finally cleaned, there were 136 classes with complete information and 157 with usable but incomplete records. These were subjected to a variety of analyses which are reported in the next section.

ANALYSIS OF DATA

Never having attempted an analysis of this formidable magnitude before, none of the team planning the data reduction procedures had any basis for predicting the infinite forms in which human frailty can be manifested. With the brashness of the innocent, it had been assumed that all of the Evaluation and Research Centers would collect the prescribed number of observations and would key punch IBM cards according to a standard codebook manual; that this data would then be transferred to magnetic tape using a common language and format; and that these tapes would be sent to UCLA where a simple process of compilation would ensue.

The first intimation that these expectations were pure fantasy came when the tapes began to arrive without labels. The imagination of the programmers was taxed to the utmost as tapes were put through over and over again, trying to get some clue as to how to retrieve the data. In some cases, tapes turned out to be blocked on an 84- and even 88-column line. Internal difficulties such as excessive or insufficient records or record length, inaccurate number of observations per unit, and failure to provide matched teams of observers, were but a few of the unanticipated problems.

It had been expected that there would be key punch errors, and the tape-cleaning program, which had been based on sample UCLA data, was written to pick up this type of error. However, the program was unable to cope with the ingenious innovations introduced by the other centers.

The original plan for handling corrections was to obtain a print-out of the error messages, send this back to the appropriate E & R

Center, and have the corrections made from the original protocols. This proved an expensive and time-devouring procedure. After over six months of aggravation and frustration, it was decided to go ahead with the data analysis using only those classes on whom data were available for at least 140 of the 175 required observation records. For these classes the necessary corrections were made at UCLA after telephone consultations with the local evaluation coordinators.

A major source of error was the failure to specify illegal combinations of context and content codes. In routines such as toileting (T) or rest (R) content codes referring to structured lessons are completely incompatible. However, as is evidenced in the frequency tables, there were many notations of qu, sc, ss, and la, all of which are codes representing structured cognitive lessons, with T (toileting). Music, drama, and art content in a Toileting context are also combinations which are hard to conceive.[1]

Another major source of error was the fact that the tape cleaning program did not include a check on the number of records entered per unit. It was expected that there would be 175 units per class derived from five days of observations with 35 units per day. Each unit was to be sequentially ordered by record numbers within a unit. The clean-up program had not anticipated that one of these numbers might be mispunched so that a series of records could appear to belong to several units whereas they actually belonged to the same unit. Conversely, the

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[1]Incompatible coding errors of this type reflect serious observer misconceptions and indicate the need for more extensive training as well as reliability checks on observers over the evaluation period. The lessons learned from the first year provided important guidelines when the OSCI was used during 1968-69.

same code number could have been erroneously assigned to several units, again resulting in an incorrect count. This type of error had to be picked up by a special program which printed out the sequence of unit codes per record from each class. By inspection, it was then possible to spot sequencing errors; these were subsequently corrected and another special program was required to place the revised data in the correct place on the tape. Many disasters occurred in this process, with weeks spent locating data which had been misplaced.

During the 1967-1968 evaluation, the OSCI was used by the 14 Head Start E & R Centers. From 12 of these Centers, the tapes from 152 classes were cleaned in time to be considered for the major analysis, but only 136 had at least 140 complete units per class. Only these classes were used in obtaining the reliability estimates and the first factor analyses programs; data from the two other E & R Centers came in later in the year and were included in the second set of analyses.

Frequency Distribution Programs

The first and basic program calculated 175 unit scores for each class for each variable. These included 15 basic context codes, 17 content codes (see Table 1), and the combination of each context code with each content code, comprising the first 287 variables (see Table 2). Variables 288-298 are as follows:

Variable	
288	Average group size.
289	Average frequency of individual activity.
290	Presence of whole group activity.
291	% of outdoor activity.

Table 1

Description of Context and Content Variables, by Number

Row Variables (Context)		Column Variables (Content)	
1.	Performing (P)	16.	Motor (mo)
2.	Building (B)	32.	Visual Discrimination (vd)
3.	Large Muscle Activity (L)	48.	Auditory Discrimination (ad)
4.	Small Muscle Activity (S)	64.	Perceptual--Other (pe)
5.	Clean-up (C)	80.	Mechanical (me)
6.	Rest (R)	96.	Quantitative (qu)
7.	Arrival (A)	112.	Science (sc)
8.	Toileting (T)	128.	Social Studies (ss)
9.	Eating (E)	144.	Language (la)
10.	Dressing (D)	160.	Verbal Communication--Conversation (vc)
11.	Interval (I)	176.	Social Interaction (si)
12.	Verbal Lesson (V)	192.	Rules (ru)
13.	Watching/Listening (W)	208.	Music (mu)
14.	Interactive (N)	224.	Drama (dr)
15.	Undifferentiated (U)	240.	Dance (da)
288.	Group Size (GS)	256.	Art (ar)
289.	Individual Activity (IA)	272.	Not Applicable (na)
290.	Whole Group (WG)		
298.	Materials (M)		

Table 2

Context x Content Variable Matrix[a]

Context Variables	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241	257	273
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242	258	274
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	259	275
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	260	276
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	261	277
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	262	278
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	263	279
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	264	280
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	266	282
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	267	283
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	268	284
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	271	287

[a]See Table 1 for description of Context and Content Codes. Variables 1-15 are contexts alone; the top row (16-272) are content alone. The variables within the matrix are the combination of a context with a content code. Thus 17-31 are context variables 1-15 with content variable 16; 33-47 are context variables 1-15 with content variable 32; etc.

292 Location of class: 0 = I or D (Indoors)
100 = O or E (Outdoors)
50 = B or F (Both)
for single or combined class respectively.

293 Group mixing: 0 = Single class (Indoor, Outdoors, or Both)
100 = Combined classes (Indoor, Outdoors, or Both)

294 Child involvement: Average of unit, with 0-100 representing range of active to passive.

295 Locus of control: Average of unit, with 1-100% representing range of child to teacher.

296 Changes in locus of control (teacher to child).

297 Changes in locus of control (child to teacher).

298 Average number of materials used per unit.

Only four of these variables (288, 289, 290, and 298) were interpretable for use in the factor analyses.

In principle, the frequency distribution program produces a 130-class x 175-unit matrix for each variable. There are potentially 298 of these huge matrixes, but they were not computed; they remained implicit in the raw data stored on a tape disc and accessible when needed. The day total and class total scores were computed directly from them.

The second analysis program computed average percent of frequency daily, as well as across-day averages and variances for each variable for each class. The table obtained (available on computer printouts but not included here) represent data summaries which could be consulted in the subsequent computations. In addition, a listing and frequency count for the materials used with each record were obtained.

Reliability Programs

Two reliability programs were written. The first calculated six reliability coefficients for each variable, one for each of the five days, and one across all five days. It used as input the percentage of students observed for each of 298 variables, calculated from the raw classroom data. This value was obtained by multiplying the time by the number of children and dividing by the number of units. Each variable has a value for each of 175 such observation periods, or 35 units per day over five days, for each of the 136 classes. The format for the matrixes for each of the 298 variables would appear as follows:

Units (j)

Classes (i)	1	2	3	...	175
1	x_{11}	x_{12}	x_{13}		
2	x_{21}	x_{22}	x_{23}		
3	x_{31}	x_{32}	x_{33}		
...				X_{ij}	
136					

$= X = [x]_{ij}$

This program calculates the average variance by class for each variable for each day separately as well as over all five days; it also considers the total variance for all classes over the 175 units for the five-day period. The reliability coefficient is $1 - \frac{S_w^2}{S_b^2}$ where S_w^2 = the average (across 130 classes) within-class variance, across one day or five, and S_b^2 = the between-class variance (across 130 classes), across one day or five, of the class average.

Thus, if $X = x_{ij}$ is the matrix of values for a given variable, then its average value for class i on day j is $\left(\sum_{j=36}^{70} x_{i2}\right)/35$; its average value for that class over all five days is $\left(\sum_{j=1}^{175} x_{ij}\right)/175$; its variance is $\left[175 \times \sum_{j=1}^{175}(x_{ij})^2 - \left(\sum_{j=1}^{175} x_{ij}\right)^2\right]/175^2$; and its reliability is

$$1 - \frac{S_w^2}{S_b^2}, \text{ where } S_w^2 = \sum_{i=1}^{130} \left[175 \times \sum_{j=1}^{175} (x_{ij})^2 - \left(\sum_{j=1}^{175} x_{ij} \right)^2 \right] / 130 \times 175 \times 175$$

$$\text{and } S_b^2 = 130 \times \sum_{i=1}^{130} \left(\sum_{j=1}^{175} x_{ij} \right)^2 - \left(\sum_{i=1}^{130} \sum_{j=1}^{175} x_{ij} \right)^2 / 130 \times 130 \times 130.$$

For the derivation of these formulae see McNemar (1954), pp. 296-301. Thus, this program obtains all information necessary for judging the reliabilities of the variables in question. The matrix of reliabilities produced by this program are presented in Table 3.

The second reliability program was designed to calculate inter-observer reliabilities when two teams observed on two different days. The daily averages for two days for a given observer team would be summed, as would those from another observation team, for a given variable for a given class. A 130 x 2 (classes by two-day summations) matrix would then be obtained and the correlation computed.

Obviously, this procedure could not possibly produce as meaningful a reliability coefficient as two simultaneous records of the same observation, since the classroom events themselves vary from one period or one day to the next. This problem has been discussed at length by Medley & Mitzel (1963) and more recently by Masling & Stern (1969). However, it was felt that comparisons of enough pairs of observers over a wide range of classes would provide a useful index of consistency. Unfortunately, the instructions were not closely followed, and only 82 paired observations were obtained for the 136 complete classes. For the data available, observer reliability was computed for each of the 298 variables. These data showed a high correlation with the item reliability: that is, whenever the variable reliability was high, the observer reliability was also high.

Table 3

Reliability of Observations

(Cumulative Over 5 Days)

Context Codes		Content Codes 16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272
		.95	.93	.91	.91	.95	.87	.88	.87	.92	.98	.97	.95	.89	.92	.81	.92	.92
1	.91	.86	.73	.79	.74	.54	.81	.43	.81	.75	.90	.90	.78	.87	.93	.79	.73	.81
2	.91	.89	.83	.22	.72	.69	.80	.24	.83	.75	.89	.87	.70	.20	.86	--	.21	.57
3	.93	.93	.61	.83	.27	.77	.53	.40	.85	.70	.92	92	.84	.70	.80	.64	.20	.67
4	.93	93	95	.65	.93	.76	.86	.79	.82	.81	.95	.94	.82	.75	.83	--	.92	.60
5	.81	.85	.65	.32	.44	.84	.21	.36	.36	.84	.79	.79	.75	.45	.58	.22	.81	.66
6	.95	.75	.90	.84	.22	.94	.36	.79	.78	.82	.91	.94	.89	.94	.44	--	.58	.92
7	.83	.70	.68	.54	.22	.83	.21	.53	.62	62	.81	.82	.73	.58	.78	.22	--	.46
8	.74	.70	.47	.22	.22	.75	.35	.21	.22	.75	.58	.72	.79	.22	.45	--	.22	.20
9	.83	.81	.61	.54	.74	.89	.59	.62	.61	.81	.87	.86	.84	.80	.52	--	.71	.73
10	.70	.47	.40	--	.21	.73	.24	.22	.22	.38	.55	.62	.52	.56	.57	--	.81	.27
11	.84	.72	.50	.32	.13	.89	.33	.48	.21	.59	.89	.86	.80	.70	.71	.55	.40	.91
12	.92	.72	.88	.77	.75	.29	.84	.85	.82	.93	.87	.90	.77	.81	.60	.52	.54	.68
13	.89	.79	.90	.89	.75	.67	.78	.80	.86	.87	.86	.87	.78	.82	.79	.53	.73	.90
14	.89	.66	.26	.22	.22	.43	--	.21	.22	.50	.74	.91	.57	.24	.18	--	.22	.66
15	.93	.66	.29	.66	.20	.40	.21	.21	.22	.44	.74	.80	.71	.36	.34	.22	.88	.93

The Factor Analytic Studies and Interpretations

The next step involved the use of factor analytic techniques to gain information about the characteristics of various classes, which could then be related to changes in children. Two separate approaches were explored: the first in consultation with Dr. Peter Bentler, and the second with Mrs. Willa Gupta.

Since there is no factor analysis program which can handle the large number of variables generated by the input matrix, the first step was to determine a rationale for selection of variables. Inspection of the frequency distribution tables as well as the reliability estimates for each of the variables indicated that the single context and content codes had considerably greater reliability and generally greater frequency than any combination. Thus the decision was made to use only these single-dimension variables. However, six of these showed low reliability as well as low frequency of occurrence, and were hence not included. These were: arrival, interaction, perceptual (other than visual or auditory), science, social studies, and dance. The assumption was made that an unreliable variable would be of little use as a descriptor.

In addition to the 26 context and content variables, four other types of input were included: Average group size, average frequency of individual activity, presence of whole groups, and average number of materials.

The first factor analysis performed used average scores for each of these 30 variables. This average score represented the percentage of time children of that class were engaged in that activity throughout the observation period. Since the means for each of these variables were different, the test vectors in the factor analysis would be of different lengths. This made interpretation of these variables rather difficult. Therefore a second set of factor analytic studies were run using normalized or "Z" scores for each of the variables. It was then easy to spot whether a class was high or low on that particular variable by noting its degree of distance from the total class average on that variable.

The method used in analyzing the output from the factor analytic studies was to collect all of the classes identified under one factor and obtain means on each of the 30 variables used in the intercorrelation matrix. If the mean for any variable was close to zero, it would be assumed that a particular cluster of classes was average in terms of this variable. However, if the mean was high, either positive or negative, then it would be assumed that the variable distinguished this cluster from other clusters of classes. Any variables with means over one (plus or minus) were listed. Occasionally a cluster had very few such identifying variables and means of .8 and .9 were used. Each cluster of classes was identified by a unique collection or combination of variables.

<u>Cluster Analysis 1</u>. The first cluster analysis program used the total scores on these variables for all classes. It then calculated a matrix of interclass similarities, which represented the average cross product of the input matrix. This 130 x 130 (class-by-class) matrix was then factored by the principal components method. A final solution was obtained by transformation, using an explicit clustering criterion which, although somewhat complex, can be loosely said to define the similarity of a given class to all other classes. Those which were

most similar to one another were clustered together; classes whose scores were orthogonal were put into a different cluster. As many clusters as final variables were obtained.

This analysis produced a graph in which classes were grouped together on a dimension of similarity. As the criteria became less and less stringent, more dissimilar classes combined into a single group. A decision to use 10 clusters was arbitrarily made and a line drawn across the graph at this level. One cluster (#5) was very large and included 59 of the 136 classes. This may be identified as the average preschool class. Other clusters were small, sometimes composed of only three or four members. For classes belonging to the very large or average group, the means of most of the variables defining the cluster were also average. Table 4 presents the results of Cluster Analysis 1, including the high positive and negative mean scores on the variables which characterize the ten clusters, and the classes which have high positive or high negative scores on these variables.

Cluster Analysis 2. This program took the same input as the previous program, similarly calculated the principal components solution, and finally transformed the solution by a successive-factor varimax procedure. It may be considered a representative and standard transpose, or inverse factor analysis solution, in which class clusters are identified as dimensions and variables grouped into clusters in accord with their dimemsion scores, As the final step in the clustering procedure, each class was unambiguously assigned to a given cluster, based on the varimax matrix. As a result of this process 20 clusters were identified (see Table 5a). In this second cluster analysis, the large group broke down into somewhat smaller groups and were identified more distinctively. Table 5b lists the class members of each of the 20 clus rs.

Table 4

Cluster Analysis 1: Class Members and High Positive and Negative Mean Score Values for the Descriptive Variables for 10 Clusters

Cluster Number	Variables: Positive	Variables: Negative	Class Members
1	U 2.66 IA 1.94 D 1.28 C 1.18 na 1.10	GS -1.48 si -1.19 mu -1.07	K171 I021 I033 I041 I092
2	ru 2.01 E 1.15 GS 1.14 L 1.09 si .94	me -2.02 S - .83	B011 B022 B041 B042 B043 B061 B071
3	V 1.09 vc .95 la .88 I .83 mu .58	M - .49 IA - .47 B - .46	G011 G012 G021 G022 G031 G032 G041 F022 F051 F061 F081 F091 F111 L021 L081 L102 M051 M081 D021 D031 K231 A041
4	mo 1.81 M 1.40 IA 1.11 V 1.05 L 1.05	me -1.66 E - .98 T - .90	B051 B052 B053 B061 D011 D051 D061 G042 I031
5	na .35 M .32 dr .31	WG - .54 la - .47 GS - .47 ad - .39 qu - .39 V - .36 ru - .31	K011 K012 K181 K191 K201 K202 K211 L012 L031 L032 L041 L042 L051 L061 L071 J021 J022 J023 J033 J036 J041 J042 J043 E011 E031 E061 E101 E102 F011 F012 F021 F031 F041 H011 H013 H014 H031 M061 M071 M091 M101 I011 I061 I081 G051 G052 D041 D042 B021 A011 A012 A021 A031 A042 A051 A052 A061 A062 K221
6	P 3.64 dr 2.77 mu 1.81	W - .88 na - .86 mo - .79 E - .69	L022 L091 H021

38

Table 4 (cont'd.)

Cluster Number	Variables		Class Members
	Positive	Negative	
7	R 1.16 mu .95 W .90 B .65 me .65	S -1.10 T - .69	E021 E041 E062 E071 E081 E091 E092 J031 J032 K212 M041
8	GS 1.64 WG 1.27 me 1.47 ru 1.16 E 1.12	IA -1.42 na -1.33 M -1.10 U -1.01	H022 H041 H042 H043 J011 J012 J013 M011 M021
9	qu 2.87 vd 1.54 la 1.36 T 1.24 W .96	na -1.07 L - .89 M - .88	H032 H033 H034 F071 F072 F101 A101
10	S 1.91 WG 1.89 ar 1.74 vc 1.45 GS 1.36 E 1.27 B 1.02	dr -1.67 I -1.42 IA -1.41 L -1.30 P -1.42	A111 A112 E052 M031

Table 5a

Cluster Analysis 2: Class Members and High Positive and Negative Mean Score Values for the Descriptive Variables for 20 Clusters

Cluster Number	Variables: Positive	Variables: Negative	Class Members
1	mo 1.22 L .84 M .82	me -1.03	B051 B052 B053 B054 I031 I061 K012 G042 F061 M051
2	E .76 ru .74	me - .96 vd - .56	B011 B021 B022 B042 B043 B071 L012 L051 A011 A062
3	na 1.50 D 1.23	vc -1.32 mo - .93	J021 J022 J023 J033 J041 J042 J043 F021
4	ar 1.61 vd 1.36 dr 1.31 P 1.20 S 1.13	vc -1.11	H011 H013 H021 G051
5	la 1.04 qu .98 ad .75 W .56		F071 F072 F101 E011 E021 K191 K202 A101 J031 D042
6	I .67 vc .61 C .56	U - .76	F011 F081 F091 F111 E031 E101 E102
7	E 2.37 B 1.99 me 1.36 W 1.05	D -1.03 dr - .97	E051 E062 M041
8	ar .76 S .64	qu - .80 B - .67	F022 F051 M031 I011 A021
9	qu 1.40 T 1.40 vd .80	na - .86	H032 H033 H034 L022 L091 A012
10	I .41	C - .66 ru - .55 qu - .49	G012 G021 G022 G052 L081 K011 J036 F012 D021

40

Table 5a (cont'd.)

Cluster Number	Variables		Class Members
	Positive	Negative	
11	V 2.63 la 1.81 vc .69	L - .64	G011 G031 G032 L021 L102 D031
12	U 1.30 IA 1.05 C .98	GS - .89	I021 I033 I041 I092 K231 K171 L061 G041 A031
13	R 2.97 si .71 L .68	S - .91	E041 E071 E091 A042 A052 B061 K212
14	ad 2.81 D 2.06 me 1.84 I 1.62 R 1.15 E 1.09	S -1.58 vc -1.46 IA -1.28 na -1.26 U -1.10 mo -1.08	J011 J012 J013 J032
15	vc 1.03 S 1.02 ar .92	P -1.09 dr - .95 IA - .93	A041 A111 A112 K211
16	B 1.21 U .73 la .71	E - .86	D011 H031
17	V 2.14 S 1.40 ar 1.07	E -1.27 W -1.06 ru -1.02	D051 D061 L041
18	vc .36	R - .46 ad - .42 qu - .40	L031 L042 L071 K181 K201 M011 M021 I081 H042 B041 D041 A061
19	W .68 vd .46	L - .84 mo - .55	H022 H041 H043 E061 E092 F031 F041 L032 M081
20	L 1.05	E - .79 ad - .60 qu - .55	M061 M071 M091 M101 H014 K221 A051 E081

41

Table 5b

Class Members of each of the 20 Clusters in Cluster Analysis 2
(Ranked according to the relative loading on variables in each cluster)

Cluster Number									
1	2	3	4	5	6	7	8	9	10
I031	B011	J041	H013	F071	E102	M041	M031	H032	D021
B051	B043	J023	H021	F072	E101	E052	I011	H034	G022
B054	B071	J033	H011	F101	F091	E062	F051	H033	K011
G042	B022	J043	G051	J031	F081		F022	L091	L081
B052	L051	J042		A101	E031		A021	L022	G021
B053	B042	J021		E011	F011			A012	G012
K012	L012	J022		D042	F111				G052
F061	A062	F021		K191					J036
M051	B021			E021					F012
I061	A011			K202					

Cluster Number									
11	12	13	14	15	16	17	18	19	20
G032	I092	E091	J011	A112	D011	D051	H042	H041	M071
G031	I033	E041	J012	A111	A031	D061	M011	H043	H014
L021	I041	E071	J013	K211		L041	M021	H022	M061
L102	I021	K212	J032	A041			I081	M081	E081
B011	K171	B061					B041	L032	M091
D031	A031	A042					L042	F031	A051
	L231	A052					L181	F041	K221
	L061						L071	E092	M101
	B041						K201	E061	
							D041		
							L031		
							A061		

42

The 30 variables did appear as identifiers in one cluster or another. Not surprisingly, the variable "building" was not unique to any particular cluster. Obviously, this is the most common activity across all types of preschool classes.

Cluster Analysis 3. This program used the total score input matrix, as above, but instead of calculating a class-by-class similarity matrix according to the matrix product notion, it produced a distance measure which calculated the similarity of the profile of scores between two classes. Again, a 130 x 130 matrix was obtained, and this distance matrix was input into the Johnson (1967 Psychometrika) hierarchical clustering procedure. This program clustered classes in a sequential fashion, so that a tree structure of clustering was obtained, rather than an all-or-none clustering. In other words, each class was initially considered to be unique, so that there were 130 individual clusters. Then, according to the distance measure, classes which were similar were clustered together at a given "level" of similarity. This procedure was repeated several times until all 130 classes fell into one overall cluster. These procedures are very similar to hierarchical factor analysis solutions, but they have the interesting feature of remaining invariant under any monotonic transformation of the distance measure.

This procedure generated the "Row" and "Com" clusters presented in Table 6. "Row" was obtained from the row normalized simple structure matrix; "Com" from the communality scaled successive factor matrix. Twenty factors were isolated in both cases and rotated using the varimax criteria. Very few classes had high positive mean scores on the variables which defined clusters 16 to 20, so these factors were not

Table 6

Cluster Analysis 3: Class Members in both Positive and Negative Groupings in 15 Clusters, with Values for the Descriptive Variables

Variables: Code	Row	Com	Cluster Members
			Cluster +1
GS	1.56	1.35	Row + Com:
WG	1.40	1.33	H022 H041 H042
me	1.01	.89	H043 J012 J013
IA	-1.37	-2.66	J031 M011 M021
M	-1.11	-1.07	M081 A101 F071
mo	-.94	-.80	E041
U	-.85	-.87	Com Only:
la	1.05	.85	H032 J011 A111
ru	.99		F072 E052 B041
ad	.90	.80	
vd	.87		
E		.81	
na	-1.11	-1.01	
			Cluster -1
GS	-1.09	-1.24	Row + Com:
WG	-1.08	-1.23	L032 L071 B051
me	-.95	-.92	B052 B054 I031
IA	1.03	1.22	I081 K011 K012
M	1.00	1.30	K171 K181 K191
mo	.84	.94	K201 E011
U		.91	Row Only:
s		.93	L042 B053 K202
mu		-.87	K211 A042 D041
qu		-.82	
			Cluster +2
ru	1.57	1.78	Row + Com:
si	1.10	1.04	B011 B022 B041
L	1.04	1.26	B043 B053 B061
me	-1.98	-2.12	B071
E		.86	Row Only:
S		-.86	B021 B042 K202
			Com Only:
			B052
			Cluster -2
ru	-1.05		Row + Com:
si	-1.39		L051
L	-1.05		Row Only:
me	.94		L012 L041
vc	1.37		Com Only:
mo	-.84		A111
WG	-.80		

Variables: Code	Row	Com	Cluster Members
			Cluster +3
D	-1.11		Row + Com:
vc	1.45		L081
V	1.68		Row Only:
la	1.13		L102 G022
M	-1.14		Com Only:
E	-.81		D051
			Cluster -3
D	1.29	1.56	Row + Com:
vc	-1.53	-1.63	J023 J031 J033
R		.85	J041 J042 J043
na	.96	.80	Row Only:
mo	-.83	-.99	J021 J022 G052
qu		-.80	Com Only:
			J013
			Cluster +4
vd	1.89	1.49	Row + Com:
ar	1.71	1.40	H011 H013 H014
P	1.70	1.21	H012
dr	1.56	1.08	Row Only:
si	1.26	1.09	M061
S	1.16	1.19	
C	.99	1.06	
U	.94		
ru	.83	.82	
E	-1.58	-1.55	
vc	-1.43	-1.24	
W	-1.31	-1.27	
V	-.88		
			Cluster -4
			Row + Com:
			E081
			Com Only:
			E052
			Cluster +5
P	1.76	1.47	Row + Com:
la	1.44	1.69	F071 F072 F101
dr	1.41	1.19	H021 K221
W	1.02	1.41	Row Only:
ar	.82	.92	F021
L	-1.07	-.90	

Table 6 (cont'd.)

Code	Row	Com	Cluster Members
			Cluster +5 (cont'd.)
L	-1.07	- .90	Com Only:
mo	- .81		H041
qu	1.74	1.75	
vd	1.20	1.54	
ad		.88	
mu		.80	
E	- .93		
na		- .93	
			Cluster -5
P		-1.02	Row + Com:
la	-1.22	-1.05	A012 A031
dr		- .82	Row Only:
W	-1.01		A051 D042 M071
ar		- .82	Com Only:
L	.97		J011 I033
mo	1.16		
C		2.01	
D		1.13	
T		.90	
			Cluster +6
			Row + Com:
			F091
			Row Only:
			I061
			Cluster -6
C	1.99	2.16	Row + Com:
mu		1.72	E101 E102
GS	1.50	2.17	Row Only:
ar	1.34	1.15	E031
si	1.23	1.21	Com Only:
WG	1.17	1.18	E091
M	1.04	1.68	
R		.95	
mo	.92		
V	-1.02	-1.70	
ru	-1.13		
I		- .95	
U	- .91		
D		- .80	

Code	Row	Com	Cluster Members
			Cluster +7
E	1.70		Row + Com:
B	1.22		J036 M041
I	-1.06		Row Only:
C	- .92		F011 A011
M	- .91		
si	- .89		
vc	- .86		
			Cluster -7
			Com Only:
			G021
			Cluster +8
ar	2.43	2.34	Row + Com:
S	1.60	1.79	A112 F051 G012
vc	1.36	1.40	M031
WG	.96	1.20	Com Only:
GS		.80	A111
P	-1.17	-1.24	
dr	-1.07	-1.30	
L	- .89	-1.92	
IA	- .99	-1.27	
M	- .98	-1.10	
			Cluster -8
			Row Only:
			A021 I011
			Com Only:
			G021
			Cluster +9
vd	2.14	2.14	Row + Com:
W	.92	.92	H032 H033 H034
P	-1.45	-1.45	
mu	-1.42	-1.42	
dr	-1.23	-1.23	
vc	- .98	- .98	
qu	3.24	3.24	
T	1.86	1.86	
me	1.05	1.05	
S	.84	.84	
na	-1.34	-1.34	
L	- .96	- .91	

Table 6 (cont'd.)

Variables			
Code	Row	Com	Cluster Members
			Cluster -9
vd	-1.06		Row + Com:
W	- .95		L022 L091
P	1.88		Row Only:
mu	1.43		K231 F051
dr	1.38		
vc	1.21		
			Cluster +10
ad		3.55	Row + Com:
vd		1.26	D021
na		- .99	Row Only:
T		- .90	A052
U		- .85	Com Only:
			J012 G042
			Cluster -10
			Com Only:
			E052
			Cluster +11
			Row Only:
			B021
			Cluster -11
V	2.20	2.27	Row + Com:
la	1.72	1.75	G012 G031 G032
na	.99	1.28	Row Only:
WG	.86	.92	G011
si	.95	.97	
P	-1.08	-1.22	
C	- .99	-1.10	
W		-1.01	
			Cluster -12
U	2.86	2.48	Row + Com:
IA	2.09	1.32	I041 I092
D	1.75	1.43	Row Only:
C	1.31	1.40	I021 I033
na	1.10		Com Only:
si	-1.60	-1.74	I061 A101
vd	- .92	- .99	
GS	-1.48		
mu	- .98		
vc	- .89		
M		- .81	

Variables			
Code	Row	Com	Cluster Members
			Cluster -13
R	3.19	3.62	Row + Com:
GS	.71	.89	E041 E071 E091
M		1.14	E092 B061
S	-1.03	- .91	Row Only:
I		-1.01	M051 K212
V		- .89	
			Cluster +15
D	1.56		Row + Com:
B	1.24		M091 A112
S	1.02		Row Only:
ar	.95		G051
na	-1.23		
vd	-1.12		
mu	-1.11		
si	-1.06		
P	- .93		
dr	- .90		
I	- .88		
			Cluster -15
			Row + Com:
			F041

included. For the "Row" and "Com" analysis, each cluster has both a positive and a negative component: those classes having high positive loadings on certain variables and those with high negative loadings on the same variables. A unique method was used to express the value of a variable in the cluster to which it belonged. Rather than report factor loadings, the mean standardized score of the variable for the group of classes in that cluster is presented. In this way the position of a group of classes on each variable can easily be identified.

"Super" Clusters. Although there was a slight tendency for the same classes to fall together, none of the three cluster analyses provided definitive descriptors for groups of classes. By inspection and cross referencing to the variables in each of the cluster analyses shown in Tables 4, 5, and 6, a fourth type of grouping, consisting of 10 "super" clusters, was obtained. This set of clusters is presented in Table 7. Here considerable correspondence of the variables across clusters can be found. Finally, Table 8 provides a listing of the 136 classes and their cluster membership for all four analyses.

For convenience, all clusters having high mean scores on the 30 variables used in the factor analysis are listed on Table 9; the high positive scores are in Table 9a and the high negative scores in Table 9b. Clusters which reflect high presence or absence of a particular variable can thus be easily located, within all four cluster analyses.

In considering the meaningfulness of these cluster analyses, two questions came to mind. The first concerned the intercorrelations among the 30 variables used in the matrix. For instance, three of these were related to group structure. Whereas it seemed important to consider separately the frequency with which children were engaged in

Table 7

"Super Cluster" Analysis: Combination of Class Groupings from Analyses 1, 2, & 3, with Values for Positive & Negative Descriptive Variables for 10 Clusters

Cluster Number	Variable				Cluster Members
	Code	Value on Analysis 1	2	3	
1	V	1.09	2.63	1.68	K231 L021 L081 L102 D011 D021
	la	.88	1.81	1.13	D031 D051 M051 M081 G011 G012
	vc	.95	.69	1.45	G021 G022 G031 G032 G041 F022
	M	-.49	-.02	-1.14	F051 F061 F081 F091 F111 A041
2	ad	.85	2.81	.90	M011 M021 M081 B041 J011 J012
	E	1.12	1.09	.81	J013 J031 J032 H022 H031 H041
	me	1.47	1.84	1.01	H042 H043 F071 F072 E041 E052
	U	-1.01	-1.10	-.87	A101 A111
	na	-1.33	-1.26	-1.11	
	IA	-1.42	-1.28	-2.66	
	M	-1.10	-.88	-1.11	
3	qu	2.87	1.40	3.24	L022 L091 H032 H033 H034 F071
	vd	1.54	.80	2.14	F072 F101 A012 A101
	T	1.24	1.40	1.86	
	W	.96	.00	.92	
	na	-1.07	-.86	-1.34	
	M	-.88	-.55	-.56	
	L	-.89	-.59	-.96	
4	P	3.64	1.20	1.78	K221 K231 L022 L091 M061 H011
	dr	2.77	1.31	1.45	H013 H014 H021 H041 G051 F021
	ar	.25	1.61	1.03	F051 F071 F072 F101
	E	-.69	-.87	-.81	
5	S	1.91	1.02	1.79	K211 M031 G012 F051 E052 A041
	ar	1.74	.92	2.43	A111 A112
	vc	1.45	1.03	1.40	
	GS	1.36	.51	.80	
	WG	1.89	.80	1.20	
	dr	-1.67	-.95	-1.30	
	IA	-1.41	-.93	-1.27	
	P	-1.42	-1.09	-1.24	
	L	-1.30	-.33	-1.92	

Table 7 (cont'd.)

Cluster Number	Variable Code	Value on Analysis 1	2	3	Cluster Members
6	L	1.09	.68	1.04	K202 K202 B011 B021 B022 B041
	si	.94	.71	1.10	B042 B043 B052 B061 B071 E041
	ru	2.01	.21	1.57	E071 E091 A042 A052'
	GS	1.14	.53	.77	
	E	1.15	.08	.86	
	S	- .83	- .91	- .86	
7	U	2.66	1.30	2.86	K171 K231 L061 G041 I021 I033
	IA	1.94	1.05	2.09	I041 I061 I092 A031 A101
	C	1.18	.98	1.40	
	D	1.28	.98	1.75	
	na	1.10	.73	1.10	
	si	-1.19	- .54	-1.74	
	mu	-1.07	- .66	- .98	
	GS	-1.48	- .89	-1.48	
8	R	1.66		2.29	K212 M041 M051 B061 J031 J032
	mu	.95		1.17	E021 E031 E041 E062 E071 E081
	me	.65		.56	E102 E091 E092 E101
	I	- .55		- .98	
	V	- .59		- .98	
9	mo		1.22	.94	K011 K012 K171 K181 K191 K201
	IA		.78	1.22	K202 K211 L032 L042 L071 D041
	M		.82	1.30	D061 M051 B051 B052 B053 B054
	me		-1.03	- .95	G042 I031 I061 I081 F061 E011
	qu		- .32	- .82	A042
	GS		- .54	-1.24	
	WG		- .35	-1.23	
10	na	.35			L012 L031 L041 L051 D042 M071
	M	.32			M091 M101 J021 J022 J023 J033
	dr	.31			J036 J041 J042 J043 H031 G052
	WG	- .54			I011 F011 F012 F031 F041 E061
	la	- .47			A011 A021 A051 A061 A062
	GS	- .47			
	ad	- .39			
	qu	- .39			
	V	- .36			
	ru	- .31			

Table 8

Classes in Each of the Cluster Analyses by E & R Center

Class	Cluster Analysis Number 1	2	3	4
K011	5	10	-1	9
K012	5	1	-1	9
K171	1	12	-1	7, 9
K181	5	18	-1	9
K191	5	5	-1	9
K201	5	18	-1	9
K202	5	5	-1, 2	6, 9
K211	5	15	-1	5, 9
K212	7	13	-13	6, 8
K221	5	20	5	4
K231	3	12	-9	1, 4, 7
L012	5	2	-2	10
L021	3	11		1
L022	6	9	-9	3, 4
L031	5	18		10
L032	5	19	-1	9
L041	5	17	-2	10
L042	5	18	-1	9
L051	5	2	-2	10
L061	5	12		7
L071	5	18	-1	9
L081	3	10	3	1
L091	6	9	-9	3, 4
L102	3	11	3	1
D011	4	16	-16	1
D021	3	10	10	1
D031	3	11		1
D041	5	18	-1	9
D042	5	5	-5	10
D051	4	17	3, 17	1
D061	4	17		9
M011	8	18	1	2
M021	8	18	1	2
M031	10	8	8	5
M041	7	7	7	8
M051	3	1	-13	1, 8, 9
M061	5	20	4	4
M071	5	20	-5, 20	10
M081	3	19	1	1, 2
M091	5	20	15	10
M101	5	20		10

Table 8 (cont'd)

Class	Cluster Analysis Number 1	2	3	4
B011	2	2	2	6
B021	5	2	2, 11	6
B022	2	2	2	6
B041	2	18	1, 2	2, 6
B042	2	2	2	6
B043	2	2	2	6
B051	4	1	-1	9
B052	4	1	-1, 2	9
B053	4	1	-1, 2	6, 9
B054	4	1	-1	9
B061	2	13	2, -13	6, 8
B071	2		2	6
J011	8	14	1, -5, -14	2
J012	8	14	1, 10	2
J013	8	14	1, -3	2
J021	5	3	-3	10
J022	5	3	-3	10
J023	5	3	-3	10
J031	7	5	1	2, 8
J032	7	14	-3	2, 9
J033	5	3	-3	10
J036	5	10	-7	10
J041	5	3	-3	10
J042	5	3	-3	10
J043	5	3	-3	10
H011	5	4	4	4
H013	5	4	4	4
H014	5	20	4	4
H021	6	4	5, 4	4
H022	8	19	1	2
H031	5	16		10
H032	9	9	1, 9	2, 3
H033	9	9	9	3
H034	9	9	9	3
H041	8	19	1, 5, -19	2, 4
H042	8	18	1	2
H043	8	19	1	2
G011	3	11	-11	1
G012	3	10	8, -11	1, 5
G021	3	10	-7, -8	1
G022	3	10	3	1
G031	3	11	-11	1
G032	3	11	-11	1

Table 8 (cont'd)

Class	Cluster Analysis Number 1	2	3	4
G041	3			1, 7
G042	4		10	9
G051	5		15	4
G052	5			10
I011	5	8	-8	10
I021	1	12	-12	7
I031	4	1	-1	9
I033	1	12	-5, -12	7
I041	1	12	-12	7
I061	5	1	6, -12, 17	7, 9
I081	5	18	-1	9
I092	1	12	-12	7
F011	5	6	7	10
F012	5	10		10
F021	5	3	5	4
F022	3	8		1
F031	5	19		10
F041	5	19	-15	10
F051	3	8	8, -9	1, 4, 5
F061	3	1		1, 9
F071	9	5	15	2, 3, 4
F072	9	5	1, 5	2, 3, 4
F081	3	6		1
F091	3	6	6	1
F101	9	5	5	3, 4
F111	3	6		1
E011	5	5	-1	9
E021	7	5		8
E031	5	6	-6	8
E041	7	13	1, -13	2, 6, 8
E052	10	7	1, -4, -10	2, 5
E061	5	19		10
E062	7	7		8
E071	7	13	-13	6, 8
E081	7	20	-4	8
E091	7	13	-6, -13	6, 8
E092	7	19	13	8
E101	5	6	-6	8
E102	5	6	-6	8
A011	5	2	7, 14	10
A012	5	9	-5	3
A021	5	8	-8, 14	10
A031	5	12	-5	7

Table 8 (cont'd)

Class	Cluster Analysis Number 1	2	3	4
A041	3	15		1, 5
A042	5	13	-1	6, 9
A051	5	20	-5	10
A052	5	13	10	6
A061	5	18		10
A062	5	2		10
A101	9	5	1, -12	2, 3, 7
A111	10	15	1, -2, 8	2, 5
A112	10	15	8, 15	5

Table 9a

Listing of 30 Variables Used in Factor Analysis Program, with Clusters Having High Positive Values on Each Variable, for All Cluster Analysis Tables

Variable	Table 4	Table 5	Table 6	Table 7
P	6	4	4,5,-9	4
B	7,10	7,16	7,15	--
L	2,4	1,13,20	2,-5	6
S	10	4,8,15,17	-1,4,8,9,15	5
C	1	6,12	4,-5,-6,-12	7
R	7	13,14	-3,-6,-13	8
T	9	9	-5,9	3
E	2,8,10	2,7,14	1,217	2,6
D	1	3,14	-3,-5,-12,15	7
I	3	6,10,14	--	--
V	3,4	11,17	3,-11	1
W	7,9	5,7,19	9	3
U	1	12,16	-1,4,-12	7
mo	4	1	-1,-5,-6	9
vd	9	4,9,19	1,4,5,9,10	3
ad	--	5,14	1,5,10	2
me	7,8	7,14	1,-2,9	2,8
qu	9	5,9	5,9	3
la	3,9	5,11,16	1,3,5,-11	1
vc	2,10	6,11,15,18	-2,3,8	1,5
si	2	13	2,4,-6,-11	6
ru	2,8	2	1,2,4	6
mu	3,6,7	--	5,-6,-9	8
dr	5,6	4	4,5,-9	4,10
ar	10	4,8,15,17	4,5,-6,8,15	4,5
na	1,5	3	-3,-11,-12	7,10
GS	2,8,10	--	1,-6,8,-13	5,6
IA	1,4	12	-1,-12	7,9
WG	8,10	--	1,-6,8,-11	5
M	4,5	1	-1,-6,-9,-13	9,10

Table 9b

Listing of Variables Used in Factor Analysis Program, with Clusters Having High Negative Values on Each Variable, for All Cluster Analysis Tables

Variable	Table 4	Table 5	Table 6	Table 7
P	--	15	-5,8,9,-11,15	5
B	3	8	--	--
L	9,10	11,19	-2,5,8,9	3,5
S	2,7	13,14	2,-3	6
C	--	10	7,-11	--
R	--	18	--	--
T	4,7	--	10	--
E	4,6	16,17,18,20	3,4,5	4
D	--	7	3,-6	--
I	10	--	-6,7,-13,15	8
V	5	--	4,-6,-13	8,10
W	6	17	4,-9,-11	--
U	8	6,14	1,-6,10	2
mo	6	3,14,19	1,-2,-3,5	--
vd	--	2	-9,-12,15	--
ad	5	18,20	--	10
me	2,4	1,2	-1,2	9
qu	5	8,10,20	-1,-3	9,10
la	5	--	4,-5	10
vc	--	3,4,14	-3,4,7,-12	--
si	1	--	-2,7,-12,15	7
ru	5	10,17	-2,-6	10
mu	1	--	-1,9,-12,15	7
dr	10	7,15	-5,8,9,15	5
ar	--	--	-5	--
na	6,8,9	9,14	1,5,9,10,15	2,3
GS	1,5	12	-1,-12	7,9,10
IA	3,8,10	14,15	1,8	2,5
WG	5	--	-1,-2	9,10
M	3,8,9	--	1,3,7,8,9,-12	1,2,3

individual activities compared to whole group activities, and both of these separately from group size, it seemed that too much weight would be given the class structure dimension if all three of these were considered as independent dimensions. To determine the relationship among the 30 variables used in the cluster analyses, a computer correlation program was run and a 30 x 30 matrix obtained. Table 10 presents a listing of the 12 significant (.40 or better) correlations.

The second question was related to the fact that all the variables used in the first factor analysis were given equal weight, even though some of the content and context variables showed very low frequency of occurrence, with very poor distribution. Many of these had zero frequency for a majority of the classes, but high frequency in a few. The frequency distribution tables were carefully reviewed and only variables having meaningful distribution over classes as well as some evidence of regular occurrence were recorded and are presented in Table 11.

Using this type of information, and after consultation with early childhood specialists, a new set of 25 variables was selected. Examination of the various context codes revealed that there were two general types or categories: routines and non-routines. In the former category are such activities as Rest, Cleanup, Arrival, Toileting, Eating, Dressing, and Interval. The non-routine contexts include more substantive learning activities such as Performing, Building, and Large or Small Muscle Activity, Verbal (structured lessons), Watching, and Interactive. These categories describe those occasions when the child is using materials which can be expected to facilitate cognitive growth.

The two types of contexts were paralleled by two kinds of content; one category can be roughly described as socialization experiences such

Table 10

Variables with Significant Correlations (.40 or above)
Based on 30 x 30 Variable Matrix

Variable	Correlation
P, dr	.79
L, W	-.41
L, mo	.62
V, la	.55
U, GS	-.45
U, IA	.53
qu, la	.41
la, WG	.40
GS, IA	-.72
GS, WG	.85
IA, WG	-.62
IA, M	.64

Table 11

Variables Having Good Frequency Distributions
(Listed Under Highest Observed Occurrence)

Range of Scores								
7-19					20-39		40-59	60+
17:Pmo	196:Sru	167:Avc	283:Tna	61:Wad	1:P	6:R	4:S	
97:Pqu	5:C	183:Asi	44:Vvd	125:Wsc	113:Psi	9:E		
161:Pvc	85:Cme	8:T	108:Vqu	141:Wss	225:Pdr	89:Eme		
193:Pru	165:Cvc	88:Tme	124:Vsc	157:Wla	3:L	169:Evc		
209:Pmu	181:Csi	184:Tsi	140:Vss	173:Wvc	19:Lmo	185:Esi		
225:Pda	86:Rme	153:Ela	172:Vvc	189:Wsi	179:Lsi	11:I		
2:B	166:Rvc	201:Eru	188:Vsi	205:Wru	20:Smo	187:Isi		
114:Bsi	182:Rsi	91:Ime	204:Vru	221:Wmu	164:Svc	12:V		
163:Lvc	7:A	171:Ivc	29:Wmo	285:Wna	180:Ssi	156:Vla		160:vc
68:Spe	87:Ame	203:Iru	45:Wvd	15:U	260:Sar	13:W		176:si
				287:Una				

as verbal communication, social interaction, or imparting rules of behavior; the other category is again the cognitive one, e.g., quantitative, science, or social studies. The combinations of context and content variables were then re-examined and only those combinations having acceptable reliability and frequency were included in the new set of 25 variables (see Table 12).

Eight variables were identical with those used in the 30-variable analysis. These were visual discrimination, auditory discrimination, perceptual-other, drama, art, individual activity, whole group activity, and materials. Two of the new variables were context-content combinations (Lmo and Smo) and one was a combination of two content codes (da and mu). Apart from the context-content inputs, two new variables, Child Involvement (CI) and Locus of Control (LC), were added, and Group Size (GS) was dropped.

Certain variables were felt to be important, but did not appear with sufficient frequency to establish reliability. These low-frequency variables were summed to form 12 complex variables, which could be grouped into the following subsets:

A. Activities with Cognitive Input (9: Pqu, Pss, Pla, Bss, Lsc, Lss, Lla, Squ, Ssc, Sss, and Sla; 10: Vqu, Vsc, Vss, and Vla; and 11: Wqu, Wsc, Wss, and Wla);

B. Activities with Social or Verbal Interactions (13: vc and 15: si, each with P, B, L, S, V, W, and I);

C. Routines Performed Mechanically, with No Cognitive Input (6: C, R, A, T, E, D, and I, each with me);

D. Routines Accompanied by Cognitive Input (7: Equ, Ess, Esc, and Ela; and 8: Cla, Rsc, Rss, Rla, Asc, Ass, Ala, Tla, D, Iqu, Isc, and Ila);

Table 12

Description of 25 Variables, with High Positive and Negative Mean Scores, on 14-Cluster Q-Analysis

Variable	Description	Variable Code	Positive Cluster	Positive Score	Negative Cluster	Negative Score
1	Large muscle motor activity	Lmo	6 12 3	1.58 1.21 1.06	-2 4 -12 -6	-.77 -.74 -.74 -.62
2	Small muscle motor activity	Smo	3 5 -10 1[illegible]	1.[illegible]5 .99 .95 .82	-3 -5 -11	-.76 -.52 -.51
3	Visual discrimination	vd	5 1 14	1.33 1.09 1.00	3	-.69
4	Auditory discrimination	ad	-3 12 7	1.26 1.22 .76	6 -12	-.57 -.55
5	Perceptual (other)	pe	-8 5 12 -7 1	1.52 1.45 1.26 .76 .73	-12	-.72
6	Mechanical performance of routines	me/rt	-3 -13 6 -12	1.18 .9[illegible] .78 .5[illegible]	2 12 3	-1.64 -1.59 -1.10
7	Cognitive input during eating	cog/eat	9 -10 -7 2	1.72 1.47 1.06 .94	-5 -2	-.72 -.71
8	Cognitive input during routines	cog/rt	-11 -12 7 -5 -6	2.84 1.05 1.02 .60 .59	11 6	-.67 -.56

59

Table 12 (cont'd.)

Variable	Description	Variable Code	Positive Cluster	Positive Score	Negative Cluster	Negative Score
9	Cognitive input during learning activities	cog/act	1	1.25		
10	Cognitive input with informal verbal communication	cog/vc	9	2.86	-6	-.68
11	Cognitive input during watching or listening	cog/wa	14 1 5 -3	1.83 1.30 .80 .71	-1	-.65
12	Verbal instruction during routines	V/rt	4 -10 -6 -12 -5 -2	1.35 .83 .81 .81 .66 .58	-4 5 12 -3	-1.18 -.99 -.86 -.78
13	Verbal instruction during learning activities	V/act	-8 4 -5 -2	.93 .74 .59 .50	-3 -11 -13 -4 5	-1.21 -1.00 -.96 -.92 -.68
14	Social interaction during learning activities	si/rt	-3 2 -10	1.27 1.05 1.02	7 6 -2	-.73 -.62 -.61
15	Social interaction during learning activities	si/act	12 3 -4 14 2	1.47 1.33 1.03 .73 .72	-12 -11 -13 -3 -2	-.95 -.92 -.82 -.79 -.65
16	Rules emphasized during routines	ru/rt	2 -7 -13	1.28 1.16 .87	-2 7	-.79 -.70
17	Rules emphasized during learning activities	ru/act	2 11 1	1.28 1.10 .88	-10 -2 -1	-1.10 -.69 -.59

60

Table 12 (cont'd.)

Variable	Description	Variable Code	Positive Cluster	Positive Score	Negative Cluster	Negative Score
18	Music and dance	mu/da	-5	1.56	5	-1.60
			7	1.55	-1	-.67
			14	1.26	-7	-.50
			1	1.25		
			-13	1.05		
19	Drama	dr	-5	1.34	5	-1.09
			-4	1.04	7	-.84
					-12	-.80
					-8	-.70
					4	-.54
20	Art	ar	-8	1.83	-7	-.83
			-12	.85	6	-.76
			7	.75	-3	-.71
			1	.64		
21	Individual Activity	IA	-6	1.34	-12	-1.14
			-1	1.21	-3	-1.06
			3	1.12	1	-.95
			12	1.03	6	-.75
22	Whole Group	WG	4	1.13	3	-1.24
			-10	.96	-2	-.80
			14	.83	-1	-.76
			9	.71		
			-3	.50		
23	Child Involvement	CI	4	1.45	-4	-1.15
			11	1.22	3	-1.14
			-6	.93	-11	-.91
			-5	.89	5	-.87
			14	.77		
24	Locus of Control	LC	-12	1.20	-1	-.95
			1	1.13	-4	-.68
			4	.94	12	-.60
			9	.74		
25	Average materials	M	3	1.75	1	-.93
			7	1.38	-12	-.87
			-6	1.19	-3	-.76
			12	1.01	-7	-.71
			-1	.76	-8	-.71

E: Routines Accompanied by Socialization (12: vc and 14: si, each with C, R, A, T, E, D, and I);

F. Emphasis on Rules, with Cognitive or Non-Cognitive Input (16: P, L, S, V, and W; and 17: C, R, A, T, E, D, and I, with ru).

These 25 variables were then subjected to the same type of factor analysis as was carried out with the 30 variable matrix. This procedure produced the 14 bi-polar clusters which are presented in Table 13. Using the same Q-analysis technique, a more condensed set of clusters was obtained. Table 14 presents a listing of the 136 classes, with positive and negative values for each class on each of the six clusters. In a sense, these values can be used as profiles for the individual classes.

From this matrix, a class was assigned to a particular cluster if it had a value of .35 or better. Some classes were assigned to as many as four of the six clusters. In several cases (K191, M091, J012, H031, I092, F022, and A032), classes were assigned if they loaded between .30 and .35 on a single cluster and had no other values above .30. Certain classes did not reach this criterion in any cluster and remained unassigned. These were L061, D021, M061, M101, J033, G011, G051, I061, F011, F012, E062, A011, and A021.

The six bi-polar clusters resulting from the final Q-analysis are presented in Table 15, together with the mean scores for the variables in the positive and negative groupings.

The basic rationale of the Cluster-Analysis approach is one of obtaining groups of classes which fall together in terms of certain criteria: the particular variables fed into the analysis program. This procedure has some value if the objective is to obtain a gross

Table 13

Cluster Analysis 5: 14 Bi-Polar Clusters, Based on 25 Variables (With Values for Descriptive Variables for Positive and Negative Groups Within Each Cluster)

Cluster Number	Variable			Cluster Members	
	Code	+ Value	- Value	Positive Members	Negative Members
1	vd	1.09	-.74	M021 M041	K171 K191
	pe	.73	-.42	M081 H021	L031 L032
	cog/act	1.25	-.41	H022 H041	L071 D041
	cog/wa	1.30	-.65	H043 G022	M071 B054
	ru/act	.88	-.59	G041 F061	J032 G051
	mu/da	1.25	-.67	F071 F072	G052 I011
	ar	.64	-.19	F101 F111	I021 I031
	IA	-.95	1.21	E021	I033 I041
	WG	.83	-.76		I081 F031
	LC	1.13	-.95		E011 E071
	M	-.93	.76		E092 A031
2	L/mo	1.06	-.77	K202 K211	L012 L031
	vd	-.69	-.09	K212 K231	L032 L041
	me/rt	-1.64	.36	B011 B021	L042 L051
	cog/eat	.94	-.71	B022 B041	L071 L102
	v/rt	.36	.58	B042 B043	D031 J033
	V/act	-.20	.50	B052 B053	J036 F011
	si/rt	1.05	-.61	B061 B071	F012 F041
	si/act	.72	-.65		F081
	ru/rt	1.28	-.79		
	ru/act	1.28	-.69		
	WG	.23	-.80		
3	S/mo	1.15	-.76	K012 K181	M011 J011
	ad	-.48	1.26	K201 D011	J012 J013
	me/rt	-1.10	1.18	D041 B054	J031 J032
	cog/wa	-.41	.71	I031 K081	J036 J043
	v/rt	-.04	-.78		H042 E041
	V/act	.49	-1.21		A012 A052
	si/rt	-.33	1.27		
	si/act	1.33	-.79		
	IA	1.12	-1.06		
	WG	-1.24	.50		
	CI	-1.14	.26		
	ar	.21	-.71		
	M	1.75	-.76		

63

Table 13 (cont'd.)

Cluster Number	Variable			Cluster Members			
	Code	+ Value	- Value	Positive Members		Negative Members	
4	me/rt	.78	-.10	L021	L061	K011	K012
	V/rt	1.35	-1.18	L081	G012	K201	J021
	V/act	.74	-.92	G021	G022	J022	J023
	si/act	-.22	1.03	E041	D052	J041	H011
	dr	-.54	1.04	E-62	E071	H013	H014
	WG	1.13	-.79			H021	A051
	CI	1.45	-1.15				
	LC	.94	-.68				
5	S/mo	.99	-.52	B051	H031	L022	L091
	vd	1.13	-.34	H032	H033	F012	F031
	pe	1.45	-.47	H034	I092	F051	E021
	cog/eat	.39	-.72			E081	E091
	cog/rt	-.23	.60			A041	A042
	cog/wa	.80	.18				
	v/rt	-.99	.66				
	V/act	-.68	.59				
	mu/da	-1.60	1.56				
	dr	-1.09	1.34				
	CI	-.87	.89				
6	L/mo	1.58	-.62	D042	M091	F021	F022
	ad	-.57	.27	M101	A021	F041	
	cog/rt	-.56	.59	A051			
	cog/vc	-.47	.68				
	V/rt	-.32	.81				
	si/rt	-.62	.28				
	mu/da	-.59	.02				
	ar	-.76	-.01				
	IA	-.75	1.34				
	CI	-.42	.93				
	M	-.13	1.19				
7	ad	.76	-.40	D021	D051	L061	B061
	pe	-.27	.76	D061	E091	H042	F091
	cog/eat	-.39	1.06			A011	A012
	cog/rt	1.02	-.44			A061	
	si/rt	-.73	.08				
	ru/rt	-.70	1.16				
	mu/da	1.55	-.50				
	dr	-.84	.28				
	ar	.75	-.83				
	M	1.38	-.71				

Table 13 (cont'd.)

Cluster Number	Variable			Cluster Members	
	Code	+ Value	- Value	Positive Members	Negative Members
8	pe		1.52		M031 M071
	V/act		.93		J033 F111
	dr		-.70		A112
	ar		1.83		
	M		-.71		
9	cog/eat	1.72		L021 G011	
	cog/vc	2.86		G031 G032	
	WG	.71			
	LC	.74			
10	S/mo		.95		E031 E052
	ru/act		1.47		E061 E071
	V/rt		.83		E101 E102
	si/rt		1.02		
	rt/act		-1.10		
	WG		.96		
11	S/mo	.82	-.51	L081 M051	J042 J043
	cog/rt	-.67	2.84	M061 B021	I092 A101
	V/act	.06	-1.00	A051	
	si/act	.27	-.92		
	ru/act	1.10	-.37		
	CI	1.22	-.91		
12	L/mo	1.21	-.74	K221 B051	M011 G012
	ad	1.22	-.55	B052 B053	I061 F051
	pe	1.26	-.72	B054 G042	
	me/rt	-1.59	.51	A052	
	cog/rt	-.36	1.05		
	V/rt	-.86	.81		
	si/act	1.47	-.95		
	dr	.49	-.80		
	ar	.36	-.85		
	IA	1.03	-1.14		
	WG	-.20	.93		
	LC	-.60	1.20		
	M	1.01	-.87		
13	cog/eat		.91		M021 M041
	V/act		-.96		H042 I011
	si/act		-.82		A062
	ru/rt		.87		
	mu/da		1.05		
14	vd	1.00		K221 H041	
	cog/wa	1.83		H043 E021	
	si/act	.73		E062 E081	
	mu/da	1.26		E092	
	CI	.77			

Table 14

Class Profiles Based on 6-Cluster Q-Analysis

Class No.	Factor 1	2	3	4	5	6
K011	-.42	-.60	.28	-.25	-.24	.27
K012	.00	-.56	.38	-.42	-.24	.35
K171	.34	-.31	.34	-.42	-.15	.03
K181	.07	-.54	.12	-.01	-.41	.10
K191	.03	-.30	.27	-.28	-.18	-.10
K201	.01	-.46	.27	-.22	-.16	.30
K202	.12	-.26	.53	-.02	-.19	.14
K211	.02	-.08	.52	-.04	.11	.08
K212	.48	.46	.72	-.01	.41	-.00
K221	-.43	-.33	.11	-.11	-.06	-.09
K231	.15	-.24	.53	.53	-.19	.20
L012	.37	.05	-.38	-.16	.36	-.22
L021	-.03	-.25	-.23	.28	.53	-.62
L022	.04	-.17	-.13	.07	.66	-.16
L031	.21	-.33	-.25	-.16	.01	-.21
L032	.30	-.48	-.41	-.47	.05	-.10
L041	.03	-.34	-.53	.16	.17	-.15
L042	.32	-.61	-.60	-.12	-.00	-.25
L051	.16	-.01	-.44	-.13	.47	-.23
L061	.09	-.21	-.18	-.23	.28	-.25
L071	.24	-.40	-.34	-.26	-.01	-.03
L081	.19	.14	-.41	.39	.33	-.43
L091	.21	-.05	-.11	-.10	.73	.07
L102	-.15	-.12	-.47	.18	.19	-.32
D011	-.15	-.40	.11	-.08	.09	.09
D021	-.04	-.03	-.18	-.00	-.20	.05
D031	-.06	.05	-.37	.27	.23	-.14
D041	.23	-.41	-.05	-.17	-.06	.05
D042	.42	-.21	.12	-.03	-.06	-.16
D051	-.09	-.76	-.23	-.03	-.03	-.11
D061	.09	-.57	-.02	.22	.08	-.01
M011	.27	.88	.20	.33	.09	-.07
M021	-.08	.39	.07	.90	-.23	-.18
M031	.03	.04	-.06	.41	-.47	-.64
M041	-.36	.30	-.11	.30	-.14	.04
M051	.11	.28	.04	.10	.13	-.50

Table 14 (cont'd.)

Class No.	Factor 1	2	3	4	5	6
M061	.12	-.18	.09	-.14	-.25	-.01
M071	.33	-.01	.05	-.06	.12	-.03
M081	-.19	-.01	-.08	.95	.16	-.21
M091	.12	-.34	.07	.07	-.05	.16
M101	.11	-.03	.10	.04	.02	-.05
B011	.12	.40	1.09	-.20	-.23	-.15
B021	-.02	-.11	.40	-.19	.01	-.20
B022	-.38	-.11	.66	.06	-.13	-.53
B041	-.06	.18	.89	.40	.21	-.26
B042	.09	-.16	.57	.10	-.04	.16
B043	.27	-.07	.74	.18	-.41	-.14
B051	-.24	-.57	.25	-.30	-.62	.02
B052	-.24	-.31	.42	-.38	-.39	-.10
B053	-.21	-.26	.53	-.33	-.36	-.01
B054	-.12	-.81	.36	-.57	-.43	.26
B061	-.14	.20	.69	.00	-.30	-.69
B071	.15	.17	.63	.03	-.29	-.19
J011	.06	.98	-.14	-.21	-.16	.21
J012	-.26	1.28	-.30	-.01	-.03	.13
J013	.04	.97	-.01	-.02	-.07	.16
J021	-.10	.06	-.10	-.22	-.05	.40
J022	-.03	.16	.01	-.08	-.07	.25
J023	-.06	.09	-.05	-.27	.03	.35
J031	-.47	.73	-.16	.17	.19	.45
J032	-.15	.46	.00	-.18	-.06	.45
J033	.05	.13	-.24	.07	.02	.17
J036	-.42	.08	-.27	-.23	.06	.27
J041	.07	.07	.18	-.05	.01	.47
J042	.04	-.06	.02	-.10	.04	.69
J043	.17	.22	.21	-.09	.08	.50
H011	-.18	-.23	-.07	.07	-.78	.53
H013	-.37	.05	.13	.06	-.48	.58
H014	-.15	-.07	.27	-.03	-.27	-.56
H021	-.67	-.29	-.15	.57	.04	.90
H022	-.23	.49	-.48	1.01	-.03	.43
H031	-.29	.26	.08	-.10	-.33	-.08

Table 14 (cont'd.)

Class No.	Factor 1	2	3	4	5	6
H032	-.46	.59	-.35	.02	-.44	-.04
H033	-.26	.04	-.46	.18	-.88	-.16
H034	-.37	.29	-.42	-.20	-.46	.13
H041	-.79	.32	-.06	.41	-.21	-.06
H042	-.23	.71	.13	.22	-.27	-.03
H043	-.44	.55	-.07	.38	-.19	.09
G011	.09	.00	.04	.11	.06	-.22
G012	.74	.18	.06	.28	-.01	-.17
G021	.69	.38	.14	.53	.24	-.28
G022	.23	.13	-.26	.43	.22	-.23
G031	.10	.11	-.05	-.09	-.25	-.38
G032	.05	.11	.17	-.06	-.10	-.49
G041	-.66	.22	-.08	.14	-.29	-.11
G042	-.78	-.48	-.10	-.17	-.55	.36
G051	.21	.07	.01	-.26	-.06	-.04
G052	.01	.05	-.04	-.37	.16	-.01
I011	-.16	-.28	.07	-.43	.08	.28
I021	-.04	-.06	-.07	-.55	-.13	.00
I031	.07	-.94	-.08	-.60	-.39	.18
I033	-.03	-.22	.04	-.45	-.21	-.32
I041	.02	-.26	.23	-.62	.02	.18
I061	-.07	.05	-.16	.17	.08	-.04
I081	.13	-.69	-.33	-.33	-.30	-.03
I092	-.03	.05	.09	-.11	-.16	-.30
F011	.19	-.03	-.16	-.19	.18	-.05
F012	.03	-.23	-.12	-.17	.35	.02
F021	-.07	-.16	-.05	-.24	.25	.07
F022	.32	.13	-.03	.03	.20	-.16
F031	.16	-.06	.03	-.39	.44	.08
F041	-.13	-.27	-.29	-.58	.23	.17
F051	.37	-.33	-.09	.50	.38	.06

Table 14 (cont'd.)

Class No.	Factor 1	2	3	4	5	6
F061	-.04	.25	.12	.49	.58	-.25
F071	-.81	.09	-.57	.71	.20	-.19
F072	-.59	.04	-.56	.58	.13	-.25
F081	-.13	-.06	-.28	-.01	.35	.01
F091	-.21	.29	.02	.13	.34	-.55
F101	-.51	-.16	-.22	.60	.38	.03
F111	-.26	-.28	-.02	.31	.01	-.39
E011	.26	-.13	-.10	-.73	-.09	.14
E021	-.11	.10	-.10	.35	.65	.20
E031	.36	-.09	.07	.04	-.08	.38
E041	.43	.83	.07	.12	.33	-.14
E052	.67	.84	-.15	.00	.09	-.59
E061	.45	-.25	-.16	-.31	.02	.30
E062	.19	.22	-.17	-.20	.10	-.18
E071	.69	.13	.06	-.38	.20	-.03
E081	.02	.08	-.20	-.05	.46	-.04
E091	.19	.02	.15	.02	.65	.54
E092	.17	-.03	-.08	-.50	.31	.17
E101	.42	-.04	-.16	-.03	-.14	.24
E102	.62	-.19	-.23	-.01	-.08	.41
A011	-.16	.14	-.03	.02	.06	-.21
A012	.02	.45	.03	-.09	-.24	-.07
A021	-.22	.06	-.18	-.09	.04	-.17
A031	.05	.08	-.15	-.37	-.11	-.17
A041	.03	.19	-.09	.01	.56	.09
A042	.00	-.38	.06	-.23	.27	.28
A051	-.06	-.01	.09	.03	-.32	.08
A052	-.31	.26	.15	-.12	-.14	.02
A061	-.09	.36	.17	-.21	.18	-.26
A062	-.07	.05	-.09	-.32	.14	.06
A101	-.11	.42	.46	.33	.41	.17
A111	.36	.04	-.58	.98	-.07	-.28
A112	.36	-.24	-.55	.94	-.32	-.28

Table 15

Cluster Analysis 6: 6 Bi-Polar Clusters, Based on 25 Variables (With Values for Descriptive Variables for Positive and Negative Groups within Each Cluster)

Cluster Number	Variable			Cluster Members			
	Code	+ Value	- Value	Positive Members		Negative Members	
1	L/mo	.55	-.62	K212	L012	K011	K221
	vd	-.42	1.41	D042	M071	M041	B022
	ad	-.46	.74	E031	E041	J031	J036
	pe	-.43	.92	E052	E061	H013	H034
	cog/act	-.51	.84	E071	E101	H021	H041
	cog/wa	-.69	.88	E102	G012	H032	H043
	V/rt	1.00	-1.03	G021	F022	G041	G042
	si/rt	.62	-.52	F051	A111	F071	F072
	si/act	-.32	.88	A112		F101	A052
	ru/act	-.66	1.20				
	dr	-.66	.84				
	ar	-.46	.72				
2	L/mo	-.42	.54	K212	M011	K011	K012
	S/mo	-.74	.91	M021	B011	K181	K191
	ad	1.01	-.42	J011	J012	K201	L031
	me/rt	1.26	-.66	J013	J031	L032	L042
	cog/wa	.71	-.73	J032	H022	L071	I031
	V/act	-.89	.41	H032	H042	I081	M091
	si/rt	1.08	-.49	H043	G021	B051	B054
	si/act	-.75	.79	E041	E052	D011	D041
	ru/rt	.88	-.38	A012	A061	D051	D061
	ar	-.70	.38	A101		G042	A042
	IA	-.86	.77				
	WG	.70	-.99				
	CI	.33	-.63				
	LC	.55	-1.04				
	M	-.86	1.04				
3	L/mo	1.10	-.95	K012	K202	L012	L032
	vd	-.71	.82	K211	K212	L041	L042
	pe	-.14	.76	K231	B011	L051	L081
	me/rt	-1.42	.38	B021	B022	L102	D031
	cog/eat	.48	-.62	B041	B042	J012	H022
	cog/vc	-.42	.63	B043	B052	H032	H033
	cog/wa	-.59	.65	B053	B054	H034	F071
	si/rt	.87	-.73	B061	B071	F072	A111
	si/act	.95	-.68			A112	
	ru/rt	.84	-.42				
	ru/act	1.06	-.31				
	M	.25	-.58				

Table 15 (cont'd.)

Cluster Number	Variable			Cluster Members			
	Code	+ Value	- Value	Positive Members		Negative Members	
4	L/mo	-.64	.19	K231	L021	K012	K171
	cog/act	.73	-.41	L081	M021	L032	B052
	cog/vc	1.15	-.41	M031	M081	B054	G052
	V/act	1.20	-.59	B041	H021	I011	I021
	mu/da	1.04	-.42	H022	H041	I031	I033
	ar	.84	-.39	H043	G021	I041	F031
	IA	-1.14	1.18	G022	F051	F041	F072
	WG	1.16	-.85	F061	F071	E011	E021
	LC	1.42	-.86	F072	F101	E071	E092
	M	-.99	.68	A111	A112	A031	A062
5	S/mo	-.41	.70	K212	L012	K181	B043
	vd	-.20	.67	L021	L022	B051	B052
	pe	-.45	1.02	L051	L091	B053	B054
	V/rt	.96	-.91	F012	F031	H011	H013
	V/act	.65	-.73	F051	F061	H031	H032
	mu/da	1.19	-.89	F081	F101	H033	H034
	dr	1.00	-.88	E021	E081	G042	I031
	CI	.99	-.54	E091	A041	A051	
				A111			
6	pe	-.66	.79	K012	J021	M031	M051
	cog/eat	-.18	.86	J023	J031	B022	B061
	cog/rt	.70	.30	J032	J041	F091	F111
	cog/vc	-.61	-.02	J042	J043	L021	L081
	V/rt	-.81	.43	H011	H013	G031	G032
	V/act	-.90	.26	H014	H021	E052	
	si/rt	.60	-.32	H022	G042		
	ru/rt	-.60	.81	E031	E091		
	ru/act	-.86	.91	E102			
	dr	.63	-.73				
	M	-.18	.86				

picture of average changes in children as related to classes with common typologies. However, it limits the usefulness of the OSCI to the 136 classes from which data was available when the first programs were run. When the data from the 21 remaining classes was ready for analysis and it was found that assignment to cluster membership was impossible without rerunning the entire program, the inadequacy of the clustering approach became apparent.

Factor Analysis[1]

A new factoring approach attempted to obtain a set of descriptive factors which could be used to describe individual classes. The first of these factor analytic solutions was obtained by using raw scores of the same 25 selected variables described in Table 12. Each score represents the average for a particular class over five observation days. The five factors obtained with eigenvalues greater than 1.0 were rotated orthogonally using the Kaiser Normalized Varimax technique. Table 16 presents the rotated factor matrix for the five-factor solution. In this particular solution, the fifth factor appeared to be a weak one. The highest variable loading was .50, with no other variable loaded greater than .40. Of the six variables loading greater than .35, three of them also appeared on another facto The intercorrelations of the six variables loading higher than .35 were low, with a mean intercorrelation of .16. Three variables (pe, dr, and ar) did not load on any factor.

A second solution was then obtained by rotating four factors (see Table 17). The first two factors were identical to those in the five

[1]Computations were carried out on the 360/91 at the Campus Computing Network, UCLA, using the BMDX72 program.

Table 16

Rotated Factor Matrix for the 5-Factor Solution

Variable	Factor 1	2	3	4	5
1	-.29	-.02	-.40	.23	.14
2	-.03	-.38	-.09	.27	.06
3	-.01	-.05	.60	.08	.25
4	-.10	.15	.41	.02	.08
5	-.03	.05	.01	-.05	.37
6	.05	-.00	.36	-.53	-.40
7	.00	.55	-.12	.00	.06
8	.05	.48	-.01	-.06	-.08
9	.01	-.02	.23	-.04	.40
10	.43	-.08	.12	-.05	.25
11	.14	-.02	.70	-.14	.05
12	.69	.13	-.33	-.07	-.30
13	.84	-.26	-.10	.09	.18
14	-.09	.61	.08	.11	-.39
15	-.06	.01	.05	.78	.21
16	-.20	.75	.06	-.07	.17
17	.03	.33	.16	.24	.50
18	.40	.13	.28	-.07	-.02
19	.05	-.10	.23	.31	-.19
20	.15	-.20	.06	.13	.34
21	-.16	-.38	-.39	.43	-.24
22	.29	.57	.27	-.33	.14
23	-.48	.23	.16	-.19	-.39
24	.44	.53	.37	-.20	.12
25	-.15	-.31	-.21	.62	-.23

73

factor solution, with a similar fourth factor in both cases. The four factor solution was therefore selected as being both more parsimonious and more useful as a basis for describing classroom typologies.

Following is a description of each of the four factors with a listing of the variables loading greater than .35 on each factor.

FACTOR I
(Cognitive-Low Structure)

V/act	.84
V/rt	.64
LC	.48
Cog/vc	.46
CI	.43
mu/da	.40

FACTOR II
(Routines and Rules)

ru/rt	.74
WG	.57
si/rt	.56
cog/eat	.56
LC	.50
cog/rt	.49
Smo	-.41
IA	-.39
M	-.36

FACTOR III
(Cognitive-High Structure)

vd	.60
cog/wa	.59
IA	-.52
V/rt	-.49
cog/act	.41
ad	.39
ru/act	.39
LC	.39
M	-.38
WG	.35

FACTOR IV
(Child-centered, Unstructured)

rt/me	-.74
si/act	.64
ru/act	.47
CI	-.41
Lmo	.38

A profile for each of the 157 classes, based on the four-factor solution, is presented in Table 18.

74

Table 17

Rotated Factor Matrix for the 4-Factor Solution

Variable	Factor 1	2	3	4
1	-.29	-.03	-.26	.38
2	-.04	-.41	-.10	.22
3	.03	-.12	.60	.03
4	-.07	.11	.39	-.04
5	.02	.04	.22	.19
6	.03	.07	.14	-.74
7	.02	.56	-.03	.14
8	.06	.49	-.01	-.03
9	.07	-.05	.41	.14
10	.46	-.10	.20	.05
11	.16	-.05	.59	-.28
12	.64	.16	-.49	-.15
13	.84	-.30	-.09	.13
14	-.12	.56	-.10	-.10
15	-.07	-.14	.05	.64
16	-.14	.74	.21	.14
17	.10	.25	.39	.47
18	.40	.11	.19	-.15
19	.01	-.15	.02	.03
20	.19	-.24	.20	.25
21	-.23	-.39	-.52	.25
22	.34	.57	.35	-.19
23	.43	.25	-.09	-.41
24	.48	.50	.39	-.15
25	-.22	-.36	-.38	.34

75

Table 18

Class Profiles Based on 4-Factor Solution

Class No.	Factor 1	Factor 2	Factor 3	Factor 4
A011	0.28	0.22	0.18	-0.08
A012	-0.79	0.58	-0.06	-0.72
A021	0.20	-0.68	0.30	-0.43
A031	-0.57	-0.37	-0.55	-0.76
A041	0.96	0.09	-0.16	-0.64
A042	0.33	-0.69	-0.48	0.46
A051	-1.10	0.01	0.52	0.10
A052	-1.16	0.55	0.63	-0.24
A061	0.00	0.63	0.29	-0.67
A062	-0.84	-0.34	-0.22	-0.69
A101	0.27	1.72	0.38	-0.32
A111	1.97	-0.53	0.85	-0.81
A112	2.14	-1.03	0.89	0.17
B011	-0.64	2.84	-1.02	1.43
B021	-0.24	0.52	-0.67	0.89
B022	0.48	0.94	0.24	1.81
B041	1.06	2.14	-0.23	1.64
B042	-0.06	0.53	-0.25	1.31
B043	-0.16	1.34	-0.60	1.56
B051	-0.97	-0.39	0.10	1.87
B052	-0.83	0.27	-0.27	1.54
B053	-0.71	0.49	-0.40	1.66
B054	-0.99	-0.38	-0.79	2.16
B061	0.76	2.26	-0.33	1.64
B071	0.01	1.77	-0.48	1.27
D011	0.56	-0.73	0.09	1.08
D021	0.06	-0.69	0.42	0.18
D031	0.65	-0.32	0.45	0.79
D041	0.47	-0.91	-0.82	0.50
D042	0.67	-0.22	-1.01	0.25
D051	0.03	-1.25	-0.26	0.69
D061	0.68	-0.92	0.25	0.92
E011	-1.40	-0.46	-1.25	-0.85
E021	0.68	0.30	0.81	-0.64
E031	-0.35	0.12	-0.25	0.05
E041	0.57	1.32	-0.11	-1.66
E052	1.27	1.29	-0.83	-1.72
E061	-0.08	-0.58	-0.93	-0.26
E062	0.48	-0.24	-0.31	-0.72
E071	0.15	0.62	-1.74	-0.98
E081	0.76	-0.60	0.06	-0.71

Table 18 (cont'd.)

Class No.	Factor 1	2	3	4
E091	0.57	0.22	-0.05	-0.23
E092	-0.43	-0.45	-0.81	-0.66
E101	0.40	0.18	-0.25	0.09
E102	-0.01	0.13	-0.91	-0.45
F011	0.12	-0.24	-0.65	-0.74
F012	0.67	-0.65	-0.52	-0.19
F021	0.40	-0.46	-0.40	0.23
F022	1.07	0.45	-0.65	-0.29
F031	0.08	-0.13	-1.17	-0.61
F041	0.05	-1.14	-0.60	-0.10
F051	1.36	-0.38	-0.60	-0.10
F061	1.75	0.76	0.42	-0.19
F071	2.00	-0.68	2.72	0.14
F072	1.60	-0.96	2.25	-0.07
F081	0.75	-0.54	0.18	-0.46
F091	1.11	0.19	0.25	-0.45
F101	1.53	-0.57	1.40	0.41
F111	1.62	-0.48	0.39	0.77
G011	0.66	0.30	-0.08	0.17
G012	0.98	0.82	-0.92	-0.43
G021	1.53	1.35	-0.80	-0.70
G022	1.98	-0.04	0.33	-0.19
G031	0.59	0.28	-0.11	0.42
G032	0.88	0.55	-0.25	0.51
G041	-0.11	0.01	1.82	0.52
G042	-0.23	-1.14	1.68	1.93
G051	-0.89	0.17	-0.73	-0.85
G052	-0.89	-0.05	-0.60	-0.93
H011	-1.21	-0.63	1.12	1.10
H012	-0.36	0.48	1.04	0.48
H013	-1.57	0.01	1.33	0.66
H014	-1.70	-0.29	0.44	0.39
H021	-0.01	-0.76	2.07	1.11
H022	0.74	-0.02	2.78	-0.79
H031	-0.95	0.13	0.80	-0.17
H032	-0.80	0.10	1.60	-0.97
H033	-0.45	-0.61	1.55	0.22
H034	-1.20	-0.58	1.14	-0.77
H041	-0.05	-0.02	2.68	0.43
H042	-0.79	1.31	1.23	-0.56
H043	-0.47	0.84	2.12	0.27

Table 18 (cont'd.)

Class No.	Factor 1	Factor 2	Factor 3	Factor 4
I011	-1.12	-0.52	-0.21	0.26
I021	-1.43	-0.51	-0.67	-0.48
I031	0.08	-1.62	-1.00	1.75
I033	-0.77	-0.46	-1.14	0.04
I041	-1.55	-0.39	-1.11	-0.04
I061	0.04	-0.07	0.24	-0.55
I071	-0.25	0.25	0.73	-0.08
I081	0.10	-1.23	-0.86	0.78
I092	-0.52	0.13	-0.30	-0.05
J011	-1.20	0.32	0.67	-2.01
J012	-0.87	0.50	1.68	-2.42
J013	-1.06	0.77	0.66	-1.72
J021	-1.70	-0.[illegible]8	0.28	-0.87
J022	-0.89	-0.12	0.26	-0.29
J023	-1.52	-0.43	-0.02	-0.78
J031	-0.51	0.11	1.74	-1.07
J032	-1.52	-0.08	0.66	-1.07
J033	-0.81	-0.68	0.33	-0.91
J036	-1.46	-1.15	0.74	-0.96
J041	-1.01	-0.00	-0.02	-0.24
J042	-1.56	-0.57	0.18	-0.63
J043	-1.50	0.13	-0.12	-0.84
K011	-0.58	-1.00	0.04	1.68
K012	-0.44	-0.54	-0.61	1.70
K171	-0.69	-0.24	-1.56	0.43
K181	0.07	-0.65	-0.36	1.57
K191	-0.73	-0.10	-0.58	0.89
K192	-1.15	-1.24	-0.08	0.84
K201	-0.51	-0.40	-0.58	1.26
K202	-0.37	0.73	-0.60	1.50
K211	-0.01	0.37	-0.32	0.84
K212	0.13	1.87	-1.05	-0.38
K221	0.30	-0.45	0.64	1.33
K231	0.95	0.69	0.28	1.70
L012	0.66	-0.59	-1.34	-1.57
L021	1.83	-0.55	-0.17	-0.17
L022	1.59	-0.57	-0.57	-0.32
L031	0.59	-0.83	-0.84	-0.09

Table 18 (cont'd.)

Class No.	Factor 1	Factor 2	Factor 3	Factor 4
L032	0.23	-1.25	-1.59	-0.45
L041	1.03	-1.19	-0.21	-0.39
L042	1.19	-1.65	-0.99	-0.13
L051	0.85	-0.78	-0.97	-1.48
L061	1.07	-0.74	-1.00	-0.34
L071	0.24	-1.23	-0.97	-0.26
L081	1.86	0.17	0.20	-0.75
L091	0.37	-0.11	-1.40	-1.44
L102	1.36	-0.82	0.23	-0.19
M011	0.42	2.12	0.65	-0.97
M021	0.53	1.28	1.30	-0.04
M031	1.07	0.23	-0.03	0.34
M041	-0.45	-0.12	1.34	-0.45
M051	0.95	0.64	-0.19	-0.31
M061	-0.55	-0.07	-0.28	0.44
M071	-0.12	-0.07	-0.79	-0.55
M081	1.92	-0.20	1.72	0.47
M091	0.31	-0.99	-0.11	0.53
M101	0.65	-0.19	-0.22	0.13
N061	-1.14	1.37	0.69	0.02
N062	-0.89	4.56	0.82	0.63
N012	-1.63	-0.41	0.31	-0.13
N021	-1.84	0.35	0.94	1.18
C011	-0.68	-0.64	-0.77	0.51
C021	-0.33	-0.21	-1.12	-0.14
C031	-0.61	-0.32	-1.21	0.25
C041	-0.28	-0.95	-0.60	0.24
C051	0.69	2.00	-0.62	-0.67
C052	-0.26	2.19	-0.45	-1.02
C061	-0.14	-0.62	-0.33	0.13
C062	-0.42	-0.84	-0.32	0.56
C071	0.29	2.51	0.52	-1.40
C072	-0.21	0.95	-0.18	-0.97
C081	-0.49	-0.38	-0.24	0.02
C082	-0.72	-0.68	-0.84	-0.93
C083	-1.18	-0.44	-0.48	0.30
C091	0.89	0.45	-0.45	0.25

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6	pe	-.66	.79	K012	J021	M031	M051
	cog/eat	-.18	.86	J023	J031	B022	B061
	cog/rt	.70	.30	J032	J041	F091	F111
	cog/vc	-.61	-.02	J042	J043	L021	L081
	V/rt	-.81	.43	H011	H013	G031	G032
	V/act	-.90	.26	H014	H021	E052	
	si/rt	.60	-.32	H022	G042		
	ru/rt	-.60	.81	E031	E091		
	ru/act	-.86	.91	E102			
	dr	.63	-.73				
	M	-.18	.86				

Table 16 presents the rotated factor matrix for the five-factor solution. In this particular solution, the fifth factor appeared to be a weak one. The highest variable loading was .50 [illegible]h no other variable loaded greater than .40. Of the six variables loading greater than .35, three of them also appeared on another factor. The intercorrelations of the six variables loading higher than .35 were low, with a mean intercorrelation of .16. Three variables (pe, dr, and ar) did not load on any factor.

A second solution was then obtained by rotating four factors (see Table 17). The first two factors were identical to those in the five

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[1]Computations were carried out on the 360/91 at the Campus Computing Network, UCLA, using the BMDX72 program.

14	-.09	.61	.08	[illegible]	-.39
15	-.06	.01	.05	.78	.21
16	-.20	.75	.06	-.07	.17
17	.03	.33	.16	.24	.50
18	.40	.13	.28	-.07	-.02
19	.05	-.10	.23	.31	-.19
20	.15	-.20	.06	.13	.34
21	-.16	-.38	-.39	.43	-.24
22	.29	.57	.27	-.33	.14
23	.48	.23	.16	-.19	-.39
24	.44	.53	.37	-.20	.12
25	-.15	-.31	-.21	.62	-.23

IA	-.52
V/rt	-.49
cog/act	.41
ad	.39
ru/act	.39
LC	.39
M	-.38
WG	.35

ru/act	.47
CI	-.41
Lmo	.38

A profile for each of the 157 classes, based on the four-factor solution, is presented in Table 18.

14	[illegible]	[illegible]	[illegible]	[illegible]
15	-.07	-.14	.05	.64
16	-.14	.74	.21	.14
17	.10	.25	.39	.47
18	.40	.11	.19	-.15
19	.01	-.15	.02	.03
20	.19	-.24	.20	.25
21	-.23	-.39	-.52	.25
22	.34	.57	.35	-.19
23	.43	.25	-.09	-.41
24	.48	.50	.39	-.15
25	-.22	-.36	-.38	.34

B052	-0.83	0.27	-0.27	1.54
B053	-0.71	0.49	-0.40	1.66
B054	-0.99	-0.38	-0.79	2.16
B061	0.76	2.26	-0.33	1.64
B071	0.01	1.77	-0.48	1.27
D011	0.56	-0.73	0.09	1.08
D021	0.06	-0.69	0.42	0.18
D031	0.65	-0.32	0.45	0.79
D041	0.47	-0.91	-0.82	0.50
D042	0.67	-0.22	-1.01	0.25
D051	0.03	-1.25	-0.26	0.69
D061	0.68	-0.92	0.25	0.92
E011	-1.40	-0.46	-1.25	-0.85
E021	0.68	0.30	0.81	-0.64
E031	-0.35	0.12	-0.25	0.05
E041	0.57	1.32	-0.11	-1.66
E052	1.27	1.29	-0.83	-1.72
E061	-0.08	-0.58	-0.93	-0.26
E062	0.48	-0.24	-0.31	-0.72
E071	0.15	0.62	-1.74	-0.98
E081	0.76	-0.60	0.06	-0.71

G021	[illegible]	[illegible]	0.33	-0.19
G022	1.98	-0.04		
G031	0.59	0.28	-0.11	0.42
G032	0.88	0.55	-0.25	0.51
G041	-0.11	0.01	1.82	0.52
G042	-0.23	-1.14	1.68	1.93
G051	-0.89	0.17	-0.73	-0.85
G052	-0.89	-0.05	-0.60	-0.93
H011	-1.21	-0.63	1.12	1.10
H012	-0.36	0.48	1.04	0.48
H013	-1.57	0.01	1.33	0.66
H014	-1.70	-0.29	0.44	0.39
H021	-0.01	-0.76	2.07	1.11
H022	0.74	-0.02	2.78	-0.79
H031	-0.95	0.13	0.80	-0.17
H032	-0.80	0.10	1.60	-0.97
H033	-0.45	-0.61	1.55	0.22
H034	-1.20	-0.58	1.14	-0.77
H041	-0.05	-0.02	2.68	0.43
H042	-0.79	1.31	1.23	-0.56
H043	-0.47	0.84	2.12	0.27

K011	-0.58	-1.00	0.04	1.68
K012	-0.44	-0.54	-0.61	1.70
K171	-0.69	-0.24	-1.56	0.43
K181	0.07	-0.65	-0.36	1.57
K191	-0.73	-0.10	-0.58	0.89
K192	-1.15	-1.24	-0.08	0.84
K201	-0.51	-0.40	-0.58	1.26
K202	-0.37	0.73	-0.60	1.50
K211	-0.01	0.37	-0.32	0.84
K212	0.13	1.87	-1.05	-0.38
K221	0.30	-0.45	0.64	1.33
K231	0.95	0.69	0.28	1.70
L012	0.66	-0.59	-1.34	-1.57
L021	1.83	-0.55	-0.17	-0.17
L022	1.59	-0.57	-0.57	-0.32
L031	0.59	-0.83	-0.84	-0.09

N021	-1.84	0.35	0.94	1.18
C011	-0.68	-0.64	-0.77	0.51
C021	-0.33	-0.21	-1.12	-0.14
C031	-0.61	-0.32	-1.21	0.25
C041	-0.28	-0.95	-0.60	0.24
C051	0.69	2.00	-0.62	-0.67
C052	-0.26	2.19	-0.45	-1.02
C061	-0.14	-0.62	-0.33	0.13
C062	-0.42	-0.84	-0.32	0.56
C071	0.29	2.51	0.52	-1.40
C072	-0.21	0.95	-0.18	-0.97
C081	-0.49	-0.38	-0.24	0.02
C082	-0.72	-0.68	-0.84	-0.93
C083	-1.18	-0.44	-0.48	0.30
C091	0.89	0.45	-0.45	0.25

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