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ABSTRACT

The Beginning Teacher Evaluation Study, Phase II, was a research project on effective teaching behavior--what teachers do that significantly affects what and how pupils learn. The purposes of Phase II were to (1) develop an assessment system for measuring teacher and student behaviors and other factors which could influence each of them and their interrelationships and (2) generate hypotheses about the interrelationships among teacher and pupil behaviors and related factors. Subjects were 41 second grade and 54 fifth grade experienced teachers in eight school districts in California. A battery of tests measuring verbal, reasoning, memory, and divergent production aptitudes, knowledge of teaching, knowledge of the skills required in reading and mathematics, attitudes toward teaching, expectations of and satisfaction with teaching as a career, and the cognitive style of field dependence-independence were administered to the teachers. Teaching behaviors were obtained from work diaries and two different classroom observation systems. Correlational and path analyses are presented showing the relationship between these variables and specific teacher behaviors during reading and mathematics instruction. (RC)

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# TEACHER APTITUDES, KNOWLEDGE, ATTITUDES, AND COGNITIVE STYLE AS PREDICTORS OF TEACHING BEHAVIOR

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This study explores the relationship between certain cognitive and attitudinal characteristics and the instructional behavior of elementary school teachers. The basic premise of this work is that differences in these characteristics are an important component of the variations in observable teaching behaviors.

Research has shown that certain aptitudes are related to skill in communicating and instructing (Taylor et al, 1967). Of these, verbal aptitude seems to be especially important. People with high verbal ability communicate more ideas in a given period of time. Associational and expressional fluency is directly related to skill in instructing others but individuals who score in the mid-range on tests of ideational fluency are more effective communicators than those with very high or very low scores. Good communicators also score higher on tests of flexibility than poor communicators.

In the area of cognitive styles, research by Witkin and his associates has shown that a match between pupil and teacher cognitive styles facilitates learning. There is also evidence that teachers at different grade levels or teaching different subjects may also differ in cognitive style.



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Although there was no prior research evidence, we theorized that reasoning and memory might also be related to teaching performance. We also hypothesized that the aptitudes could affect instructional behavior either directly or indirectly by producing differences in knowledge of teaching techniques or subject matter and that, in addition, attitudes about teaching might also affect teaching behavior.

Method. The subjects in this study were the 42 second grade teachers and the 55 fifth grade teachers who had agreed to participate in the larger study investigating teacher characteristics and pupil learning. All of the subjects took a battery of tests which included measures of aptitude, knowledge, cognitive style and attitude.

The aptitude battery consisted of 15 unifactor tests measuring the cognitive factors known as verbal comprehension; general, inductive, and logical reasoning; associative and meaningful memory; associational, expressional, and ideational fluency; semantic originality; semantic redefinition; sensitivity to problems; and spontaneous semantic flexibility. We also included in this battery the teacher verbal ability test from the Coleman study.

The complexity of the experimental design made it desirable to reduce the number of scores obtained from the aptitude test battery and the other teacher tests. The final derived scores and their composition are indicated in Table 1 of the handout. I'd like to spend a minute discussing the aptitude scores, since obtaining these factors presented an interesting problem.

While there was no reason to expect different aptitude patterns at the two grade levels, it was decided that the analyses for the two groups of teachers should be kept separate until it could be demonstrated that

these aptitude factors were essentially congruent. At both grade levels there were four aptitude factors with roots greater than one and, at each grade, these factors accounted for 63% of the variance. However, the factors were distinctly different in structure regardless of the methodology used to derive or rotate the factors. While it would have been interesting to continue exploring the relationships using these different aptitude factors, we were more concerned at this stage of our research in exploring the similarities in the aptitude-performance relationship across the two grade levels. Consequently, a target matrix based on the hypothesized structure of the aptitude test battery was used and the obtained solutions were rotated to this target. The resulting factors, indicated as the aptitude scores on your handout, all had coefficients of congruence over .90 with the target.

The teaching behaviors, which are described in Table 2 of your handout, were derived from three different sources of data on teachers classroom behavior. Two of these are direct observational techniques, APPLE (Anecdotal Process for Promoting the Learning Experience), which was developed by Nadine Lambert, and RAMOS (Reading and Mathematics Observation System), developed by Robert Calfee. The third method was a work diary which provided indirect information on the teachers' activities. These three sources provided 136 scores for each teacher. These were reduced by grouping to 22 scores which can, in turn, be considered to belong to six distinct categories.

The four teacher aptitude scores, the cognitive style score, the two knowledge scores, and the three attitude scores were entered into a

path analysis to determine their effect on the teaching behaviors. These data are presented in Tables 3 and 4 of the handout. The path coefficients can be thought of as being comparable to partial correlation coefficients.

Results. As can be seen from these tables, very few of the teacher scores showed a consistent relationship to any teaching behavior at both grade levels and for both reading and mathematics instruction.

The two teacher scores which did show consistent relationships with instructional behavior were cognitive style, which was negatively related to the social control and management of pupil behavior, and aspirations, which was negatively related to having pupils working independently of the teacher. Thus, the field dependent teachers were more concerned with maintaining behavioral control in the classroom than were the field independent teachers. Teachers with low aspirations were more likely to use a classroom structure in which the pupils worked independently of the teacher.

With these two exceptions, the analysis did not show any other teacher score which was consistently related to a teaching behavior across both grade levels and both subjects. However, there is a strong suggestion of interaction between specific teacher characteristics, especially the aptitude scores, and instructional behavior. These data suggest that teachers perceive the demands of these grades and subjects differentially and do not regard teaching as a homogeneous task. Thus, it can be hypothesized that teachers may select different teaching styles according to their perceptions of the demands of the instructional task.

One of the most dramatic of the aptitude-behavior interactions is that between the flexibility factor and instructional organization at the second grade level. The more flexible teachers utilized a more complex classroom organization (WD-4), which implies they were more likely to have sole responsibility for instruction. These more flexible teachers tend to teach the whole class (AP-7), do less independent pupil work (AP-5) and do less instruction in groups (AP-6). This is interpreted to indicate that more flexible teachers are better able to respond differentially to pupils without having to resort to using various organizational strategies (aides, groups, etc.) to produce this individualization.

Verbal fluency shows a relationship to the quality of teaching methodology while reasoning ability, as defined by these measures, seems to be negatively related to the quality of teaching behavior.

These data suggest that further research exploring the predictability of instructional behaviors from teacher aptitudes, knowledge, cognitive style, and attitudes would be promising.

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HANDOUT

# Teacher Aptitudes, Knowledge, Attitudes and Cognitive Style as Predictors of Teaching Behavior

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Table 1 - Teacher Test Scores

Table 2 - Teaching Behaviors

Table 3 - Path Coefficients from 2nd Grade Teachers' Aptitudes, Cognitive Style, Knowledge, and Attitudes to Classroom Behaviors in Teaching Reading and/or Mathematics

Table 4 - Path Coefficients from 5th Grade Teachers' Aptitudes, Cognitive Style, Knowledge, and Attitudes to Classroom Behaviors in Teaching Reading and/or Mathematics

Table 1

TEACHER TEST SCORES

I. Aptitude Scores

A. Verbal Fluency - A composite score, derived from a factor having its major loadings on:

1) Verbal Facility. The verbal ability test used in the Coleman study. The subject is asked to select, from among five options, the best word to be used to complete a sentence.

2) Vocabulary (V-4). The subject is asked to select, from five options, the best synonym for a stimulus word.

3) Topics (FI-1). An ideational fluency test. The subject is asked to write as many ideas as possible about a given topic.

4) Controlled Associations (FA-1). An associational fluency test. The subject is asked to write as many synonyms as possible for each of several stimulus words.

5) Making Sentences (FE-1). An expressional fluency test. The subject is asked to write sentences of a designated length when the first letter of most of the words is specified.

B. Memory - A score derived from a doublet factor with loadings on:

1) Picture-Number (MA-1). An associative memory test which asks the subject to recall the two-digit numbers paired with each of several pictures previously studied.

2) Sentence Completion. A meaningful memory test in which the subject is asked to recall the one word which has been deleted from each of several previously studied sentences.

C. Reasoning - A composite score derived from a factor having its major loadings on:

1) Picture Grouping (I-3). A figure classification test. The subject is asked to determine the rule or reason which determines the assignment of a simple figure to one of two or three groups and then to indicate to which group additional figures should be assigned.

2) Nonsense Sayings (RL-1). A logical reasoning test. The subject is asked to indicate if the conclusion drawn from two preceding statements shows good or poor reasoning.

3) Inductive Reasoning (I-1). The subject is asked to determine the rule which relates four groups of four letters and to mark the fifth and unrelated group.

4) Mathematics Aptitude (RG-2). The subject is asked to select from five options the correct answer to simple word problems which stress reasoning and include some simple algebra.

D. Flexibility - A composite score based on a factor with its main loadings on:

1) Finding Useful Parts (RE-1). A test of redefinition ability. The subject is asked to select, from five options, the one object which could be used as a makeshift substitute for a specified purpose when the object usually used is unavailable.

2) Story Surprises (O-1). A test of semantic originality. The subject is asked to write two different and surprising endings for each of several short stories.

3) Listing Objects (XS-3). A test of semantic flexibility. The subject is asked to list as many things as possible which might be found in a specified setting.

4) Planning Test (Sep-1). A test of sensitivity to problems. The subject is asked to indicate what is wrong with each of several plans presented for solving a variety of practical problems.

II. Cognitive Style

Score on the Group Embedded Figures Test

III. Knowledge Scores

A. Teaching Methods - Scores derived from short tests of methods of teaching either reading or mathematics at the elementary school level. Some items include general theoretical background in the subject.

B. Subject Matter - Scores derived from teacher performance on tests of influential reading and decoding or of simple arithmatic computation.

IV. Attitude Scores

A. Aspirations - A composite score derived from 6 items relating to desire for leadership, recognition, and opportunities.

B. Satisfaction - A composite score derived from 10 items dealing with satisfaction with various aspects of the school, with teaching as an occupation, and with contacts with teachers and administration.

C. Perception of Student Characteristics - A composite score derived from 3 items about student educational background, socioeconomic level, and difficulty in controlling students.

Table 2

TEACHING BEHAVIORS

I. Instructional Time
- Work Diary 1 - Amount of time spent preparing for and teaching reading or mathematics
- RAMOS 1 - Variety of instructional roles (high score implies more time in instructional and facilitating roles)

II. Instructional Content
- Work Diary 2 - Variety of skills taught
- Work Diary 3 - Quality of teaching methodology
- RAMOS 2 - Variety of instructional aims or purposes

III. Instructional Materials
- Work Diary 5 - Number of materials used
- RAMOS 3 - Variety of materials used

IV. Instructional Organization
- Work Diary 4 - Complexity of managerial structure in the classroom
- APPLE 5 - Pupils work independently of teacher
- APPLE 6 - Teacher directs pupils working in groups
- APPLE 7 - Teacher works with whole class

V. Instructional Activity
- RAMOS 4 - Time spent in instructional activities
- APPLE 8 - Organizing and facilitating the instructional process
- APPLE 9 - Unsustained behaviors monitoring the progress of pupils
- APPLE 10 - Sustained behaviors to enhance pupil understanding
- APPLE 11 - Location of teacher in the classroom (high score implies greater mobility)

VI. Teacher-Pupil Interaction
- APPLE 12 - Instructional responsiveness to individual pupils
- APPLE 13 - Responses for social control or management of pupil behavior
- APPLE 14 - Nonresponsiveness to individual pupils

Table 3

PATH COEFFICIENTS FROM SECOND GRADE TEACHERS' APTITUDES, COGNITIVE STYLE, KNOWLEDGE, AND ATTITUDES TO THEIR CLASSROOM BEHAVIORS IN TEACHING READING AND/OR MATHEMATICS

| | Instructional Behaviors | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | | Content | | | Materials | | Organization | | | | Activity | | | | | Interactio | |
| | WD1 | R1 | WD2 | WD3 | R2 | WD5 | R3 | WD4 | AP5 | AP6 | AP7 | R4 | AP8 | AP9 | AP10 | AP11 | AP12 | AP13 |
| **READING (n=40)** | | | | | | | | | | | | | | | | | | |
| Aptitudes | | | | | | | | | | | | | | | | | | |
| Verbal Fluency | -- | -- | .27 | .33 | -- | -- | .30 | -.55 | .36 | .48 | -- | -- | -.25 | -- | -- | -.28 | .49 | .25 |
| Memory | -- | -- | -- | .57 | -- | -- | .53 | -.28 | .27 | -- | -- | .39 | -- | -- | -- | -.37 | .33 | -- |
| Reasoning | -- | -- | -- | -- | .27 | -.77 | -- | -- | -- | -.29 | -- | -- | -- | .66 | -- | .26 | -- | -- |
| Flexibility | .25 | -- | .38 | -.43 | -- | .77 | -.46 | .52 | -.92 | -.49 | .34 | -- | -.48 | -- | -- | .34 | -.25 | .30 |
| Cognitive Style | -- | -.41 | -.44 | -- | -.37 | -.37 | -.54 | -- | -- | -- | -- | -.28 | .25 | -.60 | -.46 | -- | -.42 | -.32 |
| Knowledge of: | | | | | | | | | | | | | | | | | | |
| Teaching Methods | .36 | -- | -- | -.29 | -- | -.36 | -- | -- | -- | -.26 | -- | -- | -- | -.29 | -- | .44 | -- | -- |
| Subject Matter | -.27 | -- | -- | -.53 | -- | -- | -- | -- | -- | .30 | -.42 | -- | .39 | -.45 | -- | -- | -- | -- |
| Attitudes | | | | | | | | | | | | | | | | | | |
| Aspirations | -- | -- | -- | -.45 | -- | -- | -- | .60 | -.45 | -- | .49 | -- | -- | -- | -- | .31 | -- | .33 |
| Satisfaction | -- | -.31 | -.58 | .46 | -- | -- | -- | -- | -.28 | .36 | -- | -- | -- | -- | -- | -- | .38 | -- |
| Perception of Student Characteristics | -.38 | -- | -- | .31 | -- | .53 | -.29 | -- | -- | -- | -.40 | -- | -- | -- | -- | -.78 | -- | -- |
| **MATHEMATICS (n=41)** | | | | | | | | | | | | | | | | | | |
| Aptitudes | | | | | | | | | | | | | | | | | | |
| Verbal Fluency | -- | -- | -- | -- | -- | -- | -- | -.26 | -- | .32 | -- | -- | -- | -- | -.33 | -- | -- | .71 |
| Memory | -- | -- | -- | -- | -.26 | -.46 | -- | -.50 | -- | .51 | -.31 | .35 | -- | -- | .51 | .25 | .46 | -- |
| Reasoning | -- | .56 | .42 | -.99 | -- | -- | .46 | .41 | -- | -.27 | -- | -- | -- | .32 | -- | -- | -- | -- |
| Flexibility | .59 | -.30 | .36 | -- | -- | .40 | -.40 | .99 | -.65 | -.68 | .86 | -- | -.36 | -- | -- | -- | -.36 | -- |
| Cognitive Style | -- | -.37 | -- | .25 | -.33 | -- | -.31 | -.59 | -- | -- | -- | -- | -- | -.34 | -- | -- | -- | -.51 |
| Knowledge of: | | | | | | | | | | | | | | | | | | |
| Teaching Methods | -- | -- | -- | -- | -- | -.30 | -- | -- | -- | .79 | -.61 | -- | -- | -- | -- | -- | .29 | .27 |
| Subject Matter | -- | -.32 | -.50 | .38 | -- | .32 | -- | -- | .27 | -- | -- | -- | -- | -.57 | -- | -- | -.58 | -- |
| Attitudes | | | | | | | | | | | | | | | | | | |
| Aspirations | .33 | -- | -- | -- | -- | .57 | -- | .67 | -.36 | -.54 | .51 | -- | -- | -- | -- | -- | -.30 | -- |
| Satisfaction | -- | -- | -.30 | -- | -- | -- | -- | -.93 | -- | .46 | -- | .28 | -- | -- | -- | -- | -- | -- |
| Perception of Student Characteristics | -.28 | -- | -- | .67 | -- | -- | -- | -.27 | .44 | -- | -- | -- | .28 | -- | -- | -- | .31 | -- |

Table 4

PATH COEFFICIENTS FROM FIFTH GRADE TEACHERS' APTITUDES, COGNITIVE STYLE, KNOWLEDGE, AND ATTITUDES TO THEIR CLASSROOM BEHAVIORS IN TEACHING READING AND/OR MATHEMATICS

| | Instructional Behaviors | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Time | | Content | | | Materials | | Organization | | | | Activity | | | | | Interaction | | |
| | WD1 | R1 | WD2 | WD3 | R2 | WD5 | R3 | WD4 | AP5 | AP6 | AP7 | R4 | AP8 | AP9 | AP10 | AP11 | AP12 | AP13 | AP14 |
| **READING (n=53)** | | | | | | | | | | | | | | | | | | | |
| **Aptitudes** | | | | | | | | | | | | | | | | | | | |
| Verbal Fluency | -- | -.25 | .47 | .71 | -.44 | -.73 | -- | -- | .41 | -.29 | .25 | -- | .63 | .31 | -- | -.43 | -- | -- | -- |
| Memory | -.33 | -- | -.26 | -- | -- | -- | -- | -.34 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Reasoning | -.29 | -- | -.30 | -.40 | -- | -- | -- | -.54 | .30 | -- | -- | -- | -- | -.39 | -- | .28 | -- | .49 | -- |
| Flexibility | -- | -- | -- | -.58 | -- | -- | -- | .31 | -- | -- | -.37 | -- | -.50 | -- | -.29 | -- | -.52 | -- | -- |
| Cognitive Style | -.33 | -- | .26 | -- | .45 | -- | -- | -- | -.37 | -- | .31 | -- | -- | .25 | .45 | -- | .51 | -.25 | -- |
| Knowledge of: | | | | | | | | | | | | | | | | | | | |
| Teaching Methods | .38 | -- | -- | -- | -- | -- | -- | .34 | -- | .31 | -- | -- | .28 | -- | .44 | -.35 | .30 | -.31 | -- |
| Subject Matter | -- | -- | -- | .25 | -- | .72 | -- | -- | -.38 | .33 | -- | -- | -.27 | -- | -- | .37 | -- | -- | -.30 |
| Attitudes | | | | | | | | | | | | | | | | | | | |
| Aspirations | -- | -- | .32 | -- | -- | -- | -- | .48 | -.36 | -- | -- | -- | -- | .40 | .36 | -.48 | -- | -- | -- |
| Satisfaction | -.35 | -- | -- | -.29 | .40 | -- | .38 | -.32 | -- | -.46 | -- | -- | -- | -- | -.27 | .59 | .29 | -- | .28 |
| Perception of Student Characteristics | -- | -- | -- | -- | -.37 | -- | -.44 | -- | -- | -.39 | -- | -- | -.36 | -- | -- | -- | -- | .32 | -- |
| **MATHEMATICS (n=54)** | | | | | | | | | | | | | | | | | | | |
| **Aptitudes** | | | | | | | | | | | | | | | | | | | |
| Verbal Fluency | -- | -- | .53 | -- | -- | -.32 | -- | .45 | -- | -- | -- | -- | -- | -.25 | .28 | -- | -- | -.36 | -- |
| Memory | -- | -- | -- | -- | -- | -- | -- | -- | .28 | -- | -- | -.26 | -- | .42 | -- | -- | .34 | -.29 | .28 |
| Reasoning | -.35 | -- | -.36 | -.51 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | .47 | -- | .26 | -- |
| Flexibility | -- | -- | -- | -.38 | -- | .29 | -- | -- | -- | -- | -- | -- | -- | -.39 | -.25 | -- | -- | .71 | -.40 |
| Cognitive Style | -- | -- | -- | .42 | -- | -- | -- | -- | -- | -- | -- | .34 | -.33 | -- | .60 | -.25 | -- | -.33 | .31 |
| Knowledge of: | | | | | | | | | | | | | | | | | | | |
| Teaching Methods | -- | -.27 | -- | .52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | .43 | -.33 | -- | -- | -- | -- |
| Subject Matter | -- | -- | -- | .28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | .40 | -- | -- | .27 | -- | -- |
| Attitudes | | | | | | | | | | | | | | | | | | | |
| Aspirations | .27 | -- | -- | -- | -.27 | -- | -- | -- | -.25 | -- | .32 | -- | -- | -- | -- | -.37 | -- | -- | -- |
| Satisfaction | -- | -- | -- | -- | -- | -- | .26 | -- | -- | -.30 | -- | -- | -- | .39 | -- | -- | .33 | -- | .33 |
| Perception of Student Characteristics | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -.30 | -- | .43 | -- |

(Coefficients .25 or greater)