

DOCUMENT RESUME

ED 276 719

SP 028 395

AUTHOR Dalton, Michael; Dodd, Jennifer
TITLE Teacher Thinking: The Development of Skill in Using Two Models of Teaching and Model-Relevant Thinking.
PUB DATE Apr 86
NOTE 28p.; Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Processes; *Creative Thinking; *Decision Making; Teacher Behavior; *Teachers; Teaching Methods; *Transfer of Training
IDENTIFIERS *Concept Attainment Strategy; *Synectics

ABSTRACT

The purpose of this study was to learn about teachers' thinking processes as they attempted to implement in their classrooms two recently acquired models of teaching. The first, the concept attainment strategy, focused on having students categorize people, places, or events into classes according to certain cues provided by positive or negative exemplars. The second, the synectics strategy, had the teacher lead students through a series of direct analogies, personal analogies, and compressed conflicts activities that were designed to induce metaphoric thinking and increase the likelihood of inducing creative thinking. The subjects were 10 teachers attending an intensive 4-week training program on the models; the training paradigm was theory, demonstration, practice, feedback and coaching. Data gathered through classroom observation and a stimulated-recall process were analyzed and discussed according to the four questions that guided the study: (1) As a result of the training program, did the teachers regularly use each new model of teaching and did they maintain or improve their skill in using each new model of teaching? (2) Are there differences in the cognitive productivity by the teachers when using the two models of teaching? (3) Are there differences in how the teachers were thinking when using the concept attainment strategy as compared to the synectics strategy? and (4) Are there differences in what the teachers were thinking when using the concept attainment as compared to the synectics strategy? Data from the study are presented on attached tables. (JD)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

TEACHER THINKING: THE DEVELOPMENT OF SKILL IN USING TWO MODELS OF
TEACHING AND MODEL-RELEVANT THINKING

ED276719

Michael Dalton
College of Education
University of Oregon
Eugene, Oregon

and

Jennifer Dodd
College of Education
Memorial University
Newfoundland, Canada

Paper presented at the annual meeting of the American Educational
Research Association

San Francisco
1986

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

M. Dalton

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- This document has been reproduced as received from the person or organization originating it.
- Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Purpose of the Study

The purpose of this study was to learn about teachers' thinking processes as they attempted to implement in their classrooms two recently acquired models of teaching, and to investigate the relationship of those thinking processes to their success in transferring the new models of teaching to their active teaching repertoire.

Studying teachers via their thinking assumes that teachers are rational professionals guided by their thoughts and decisions in the complex environment of the classroom. In order to manage the vast array of stimuli with which they are continuously confronted, teachers develop a "problem frame" that affects the stimuli to which they are receptive and their interpretation of the stimuli. Through this "problem frame" teachers develop routines by which they process information and which serve to guide their behavior. Through a stimulated recall procedure this study attempted to gain insight into what stimuli teachers are sensitive to, their interpretations of the stimuli and the resulting routines that they developed.

Background

This study is at the intersection of two important lines of inquiry, transfer of training and teacher's thinking. The visible acts of teaching have been the subject of countless studies over the past few decades with over a hundred different instruments presently available for categorizing teacher and student behavior. The thought processes of teachers, however, have been studied less frequently.

Prior to the South Bay Study (Joyce, 1978-79) only a handful of studies had been done on teacher thinking. Results of the South Bay Study and others suggested that: (1) much of the planning of teachers centers on creating tasks and the act of teaching centers on the implementation of these tasks; (2) teaching tasks are made up of content, materials, and activities; (3) once a plan has been created it operates as a script and is not altered unless serious difficulties arise in implementing the script; (4) planning decisions made early in the year are a strong influence on the planning done the rest of the year; (5) teacher thinking is more detailed than is apparent from the teacher's written plans; (6) teacher thinking is central to linking of knowledge of teaching strategies, curriculum and management; and (7) teacher thinking is concentrated on "fine tuning" existing skills and activities rather than extending one's repertoire.

If one assumes that teachers are rational professionals making judgments and decisions, then the teachers' behavior must be guided by their thoughts, judgments and decisions. Research that focuses exclusively on behavior addresses only the overt portion of an equation that also includes covert process. Until we examine the thinking behind the behavior, we know very little about the causes of the behavior. Some lines of inquiry assume that teacher behavior is stable over time and any deviations are treated as errors of measurement. Teachers may in fact behave differently in different situations for different purposes. Thus, in order to understand the behavior of teachers it is essential to understand the relationship among several variables: teachers' goals, the nature of the classroom environment, teachers' information processing and the teachers' ability or skill to produce various teaching behaviors.

Research on teachers' thinking, then, is important because the behavioral model is incomplete in accounting for differences in teachers'

goals, judgments and decisions. Furthermore, linking teachers' intentions to their behavior can provide a basis for both educating teachers and implementing innovations (Shavelson & Stern, 1981). Research by Berman and McLaughlin (1976) and Fullan and Pomfret (1977) also suggests that implementing new teaching strategies and curricula requires teachers to think about these issues in new ways. Fullan (1982) further argues that a thorough understanding is necessary for both the proper use of new teaching skills and for the long-term integration of the new skills into one's active repertoire.

The Research Problem

Many teacher education activities have been based on the assumption that training will result in changes in the teachers' classroom behavior. In a review of the research on the transfer of teacher training to classroom practice, Joyce and Showers (1981) concluded that a fully elaborated training program including theory, demonstration, practice and feedback would enable teachers to acquire the new skill and to exhibit horizontal transfer. Showers (1982) found and Baker (1983) confirmed that by adding the additional element of coaching, teachers used the new teaching strategies "more frequently, more appropriately and with greater skill than did uncoached teachers" (Showers, 1982). However, even with coaching, some teachers have failed to transfer the new strategies into their classroom situations.

Previous studies of teacher thinking have focused on the relationship of teachers' thinking to their "natural" (recitation) teaching behavior. Because the recitation method is so ubiquitous (Goodlad, 1984), with its familiar routines and associated behaviors, previous studies of teacher thinking may have encountered a natural "ceiling" on teacher thinking in relation to both planning and interactive teaching, e.g., teachers may not

...page 3

have to think very extensively or divergently in order to implement the recitation. The present study investigated teachers' thinking in relation to the implementation of complex and recently-learned models of teaching that were unique in the context of the teachers' existing repertoires and required extensive "new learning."

Definition of Terms

1. Target Skills of the Joyce and Showers' training coaching model.
 - i. Jerome Bruner's Concept Attainment strategy (Joyce & Weil, 1980, focuses on having students categorize people, places, or events into classes according to certain cues provided by positive or negative exemplars; the teacher tests the students' attainment of the concepts by providing additional unlabeled data and assists them in recalling and analyzing the thinking strategies they employ.
 - ii. William Gordon's Synectics strategy (Joyce & Weil, 1980) has the teacher lead the students through a series of direct analogies, personal analogies and compressed conflicts activities that are designed to induce metaphoric thinking and increase the likelihood of inducing creative thinking.
2. The nature of the thinking of teachers.
 - i. Cognition is an utterance representing an ideational thought that is identified by a pause, by intonation, by a clear change of thought or by punctuation.
 - ii. Fragment is an incomplete utterance or cognition.
 - iii. Retroactive Cognition is a cognition generated while viewing the videotape of the lesson and describes or explains events on the videotape to the interviewer.
 - iv. Interactive Cognition is a cognition generated while the lesson was on-going and is characterized by the inclusion of introductory

phrases such as, I remember thinking . . . or at that point I was thinking . . . etc.

- v. Goal Objective Cognition is a cognition referring to one's theoretical understanding of the model of teaching, its rationale or related information provided during the training.
- vi. Procedural Cognition is a cognition referring to the specific procedures, tasks and behaviors of teachers or students outlined by the model of teaching.

Methodology

The present research was a descriptive, multivariate study examining the interrelationship among teacher interactive thinking and teaching behavior. The sample was drawn from participants of an intensive, four-week summer training program in alternative models of teaching and school improvement activities. Classroom performance data were collected through observations, and data on teacher thinking were gathered in a stimulated-recall process.

The purpose of the study was to obtain the cognitions of ten teachers as they practiced two models of teaching and to examine the long-term relationship(s) of the variables. The subjects were first observed during the training program and later in their own classroom on two subsequent occasions. The design is illustrated in the model below.

	July	September	October	November	December	January	February
Learning Experiences	XXXX	PPPP	PPPP	PPPP	PPPP	PPPP	PPPP
Observation	0 0		00				00

X - Training Period (Group Investigation, Concept Attainment, Inquiry Training, Synectics)
 P - Potential Practice
 O - Observation and Interview

Subjects

The sample consisted of ten volunteers from the 45 educators who attended a four-week summer institute, "School Improvement Through Staff Development," held at the University of Oregon in July 1984. Registrants for the summer institute were strongly encouraged to come as teams. A team was defined to be three or more individuals with at least one teacher, at least one trainer (staff development specialist) and at least one central office person.

The sample was identified during the first week of the institute with individuals selected in part because of their role in their district's team and in part because of their proximity to the researchers.

As for all participants in the institute, each member of the sample attended the institute with the financial support of their school district. While not receiving a salary, the participants in the institute did have their registration fees paid and their summer school tuition paid by their local school districts. All the participants in the institute, upon returning to their district, were expected to practice the models of teaching and to serve as resource people for staff development programs and to form peer coaching teams.

The two administrators in the sample, as well as all the other administrators participating in the institute, were required to make arrangements to regularly "borrow" classrooms in order to practice using the new models of teaching and to hone their skills in using the new models.

For purposes of this study the sample will be referred to as teachers.

Training During the Institute

The training paradigm for the institute was: theory, demonstration, practice, feedback, and coaching (Joyce & Showers, 1983). The morning sessions of the four-week institute focused on issues related to staff development, school improvement and change while the afternoon sessions were training sessions related to learning four models of teaching. One model was presented each week; group investigation the first week, concept attainment the second week, inquiry the third week and synectics the fourth. Monday and Tuesday of each week were generally reserved for training related to the theory of the model of teaching and demonstrations. Wednesday and Thursday were reserved for practicing the model in small group sessions and for receiving feedback on the lesson from the other members of the small group.

Participants were given paperback books and other materials from which they were to select concepts to teach using the new models of teaching. While studying concept attainment books were provided which related to the theme, "The U. S. Space Program," with detective novels being the theme for synectics lessons.

This study focuses on only two of the models of teaching, concept attainment and synectics.

Measures

The measurement of the dependent variables was based on observations and interviews. The observations of the teachers using concept attainment and synectics were conducted using a clinical rating form, while the stimulated recall interviews utilized a semi-structured format.

This study examines three variables: the teachers's skill in using each model of teaching, the amount of practice with the model of teaching, and the teacher's thinking (cognitions).

Teachers' thinking was recorded via a stimulated recall procedure

during the training sessions and again twice in their classrooms. The amount of practice is a self-report measure recorded in "teaching logs" and was verbally confirmed/obtained at the time of the stimulated recall. The skill measure developed was based on the essential aspects of each model of teaching as described in Models of Teaching (Joyce & Weil, 1980), and in the materials used during the training to provide technical feedback to the teachers on their performance of the model of teaching.

Clinical Rating Forms

The clinical rating forms were designed to provide a measure of the degree of fidelity with which the teachers perform each model of teaching. The clinical rating forms measure the extent to which the teacher adheres to each phase of the model of teaching.

The ratings yield a percentage score that indicates the percentage of agreement with the ideal performance of the model of teaching and detailed information about how the teacher performs the major tasks of the model of teaching.

Stimulated Recall Interview

Data was collected via a stimulated recall interview whereby the teachers viewed a videotape of their lesson and were asked to recall their thoughts while teaching the lesson. These thoughts were audio taped, transcribed and then coded.

The stimulated recall interview was conducted as soon as possible after the lesson. Because this procedure was conducted while school was in session, the stimulated recall interview was conducted later in the day (planning period, lunch, or after school). All stimulated recall interviews of the lesson were completed within 24 hours of its occurrence.

...page 8

Each teacher viewed the entire videotape of each lesson. In a few instances due to technical difficulties with the videotaping equipment, some lessons were not properly recorded. In this event, the teachers created a new lesson, the videotaping was rescheduled and the stimulated recall interview was repeated.

While viewing the videotape of the lesson the teacher was instructed to stop the tape at any point where he recalled his thoughts or recalled consciously making a decision and was asked to verbalize those thoughts. On occasion the researcher would stop the tape and would ask the teacher to recall his thoughts at that point. At the conclusion of the lesson the teacher was asked to express any final thoughts or observations regarding the lesson.

The unit of analysis for this study was a cognition (Larkin & Rainard, 1984). The cognitions were initially coded as interactive (cognitions generated while the lesson was on-going) and retroactive (cognitions that describe or explain events on the videotape to the interviewer, i.e., cognitions generated while viewing the videotape of the lesson). The cognitions were divided into categories related to the goal/objective of that particular strategy/lesson and into categories related to the specific instructional procedures of that particular model.

RESULTS

The data analyses presented will be organized according to the four research questions that guided this study.

QUESTION 1

As a result of the training program did the teachers regularly use each new model of teaching and did they maintain or improve their skill in using each new model of teaching?

Table 1 and Table 2 illustrate the extent to which the teachers used each of the models of teaching over the ensuing eight months following the initial training and the extent to which the teachers improved their skill level with each model of teaching. The extent to which the teachers used each model of teaching was a self-report measure. Following the initial training the teachers were asked to complete and to return to the researchers a "teaching log" which among other things included data on the extent to which the teachers used each model of teaching. Since several of the teachers did not faithfully and regularly return the "teaching log", this data was confirmed and/or obtained from each teacher at each data collection point.

Table 1 shows that three of the teachers used the concept attainment strategy extensively (more than 70 times) while two others used the strategy frequently (15 - 27 times) and five other teachers used concept attainment seldom or not at all (less than 7 times) except as requested for data collection related to this study. Table 2 indicates that the teachers used the synectics strategy much less frequently than concept attainment but did exhibit a similar pattern of usage across the entire sample with the amount of practice ranging between 25 practices and none.

To determine the skill level of the sample with each model of teaching the researchers viewed the videotape of the lesson with each model of teaching at each data collection point to determine the extent to which each teacher had successfully and faithfully completed the lesson. Each teacher was rated on the extent to which he/she had completed each of the tasks and phases of each model of teachings outlined during the training program and as provided in written form (Joyce and Weil, 1980) during the training. The teachers were given a percent fidelity score

based on the degree to which they faithfully completed the tasks and phases of each strategy as compared to the prescribed tasks and phases of each strategy.

Table 1 reports that the sample showed a slight decline in performance from the training period to each subsequent data collection point for the concept attainment strategy. The four teachers who regularly used this strategy maintained their skill level or showed a slight increase in skill level while the teachers who seldom used the strategy showed varying degrees of decline in their skill.

On the contrary, Table 2 shows that with the synectics strategy the teachers showed a slight overall increase in their ability to successfully complete the strategy. Similar to the concept attainment data Table 2 shows a relationship between regular use of the synectics strategy and successfully performing the lesson, though the pattern is less pronounced with synectics.

These two strategies are new to these teachers and are quite complex. Clearly, the teachers have not reached a high level of skill with these strategies but there are clear qualitative differences in the skill levels of the teachers in this sample.

QUESTION 2

Are there differences in the cognitive productivity by the teachers when using the two models of teaching?

Table 3 and Table 4 show the number of cognitions from each stimulated recall interview for each concept attainment lesson and for each synectics lesson at each data collection point. In addition, Table 3 and Table 4 report the length of each lesson. Since the lengths of the lessons vary

...page 11

considerably, particularly between strategies, Table 3 and Table 4 also report the number of cognitions per ten minutes of lesson. This is a better measure across lessons and across strategies of the density of cognitive productivity.

Table 3 and Table 4 show surprising stability of the mean number of cognitions for both the concept attainment and for the synectics models of teaching, but the mean values for the synectics lessons were substantially larger than for the concept attainment lessons. Approximately 52 cognitions per lesson were generated for the concept attainment strategy while over 70 cognitions per lesson were generated for the synectics lessons. The synectics strategy entails more specific tasks in order for the teacher to complete the strategy and thus generally results in longer lessons. When adjusted for the length of the lessons the mean values are much more comparable between the strategies and show a similar pattern of decline in the number of cognitions over the period of the study with the mean values ranging between 25 and 38 cognitions per ten minutes of lesson, but show no clear pattern for individual teachers.

QUESTION 3

Are there differences in how the teachers were thinking when using the concept attainment strategy as compared to the synectics strategy?

Table 5 and Table 6 show that the manner in which the teachers report their thinking is remarkably stable, consistent and comparable across instructional strategies. Approximately 30% of the cognitions appear to be generated while teaching the lesson (interactive cognitions) while the remaining 70% of the cognitions were generated while viewing the videotape of the lesson (retroactive cognitions).

QUESTION 4

Are there differences in what the teachers were thinking when using the concept attainment strategy as compared to the synectics strategy?

Table 7 and Table 8 report the percentage of cognitions that focus on the goals/objectives of the lesson/strategy and the percentage of cognitions that focus on specific instructional procedures of each strategy. During the training period the percentage of cognitions for the synectics strategy focusing on the goals/objectives of the lesson/strategy were twice that for the concept attainment strategy but the percentage of cognitions were quite similar for the next two data collection periods. Between 12% and 30% of the cognitions fall in this category. The percentage of cognitions that focus on instructional procedures on the other hand show a similar pattern across strategies with between 30% and 50% of the cognitions falling in this category. The percentage of cognitions found in this study related to goals/objectives and instructional procedures is substantially larger than has been found in previous research in this area.

DISCUSSION

These data show surprising consistency across instructional strategies in terms of the quantity of cognitions produced per ten minutes of lesson as well as consistency in how the teachers report their cognitions. There is also consistency across instructional strategies in terms of the quantity of cognitions that are related to instructional procedures and with the exception of the data collected during the training period there are also similar results across instructional strategies in terms of the quantity of cognitions related to the goals/objectives of the lesson/strategy.

The concept attainment strategy is a teacher centered strategy while synectics is a student centered strategy. Given the ubiquitous nature of the recitation model of instruction, the teachers may be more likely to better understand the goals/objectives of the teacher centered strategy than they are the more unfamiliar student centered strategy. This may account for the initial differences in the quantity of cognitions between the two strategies in this category. As the teachers become acquainted with the student centered model of teaching they may think about goals/objectives in a more customary manner.

Teachers attending the training sessions were expected to return to their schools and school districts to become "trainers." They were expected to conduct workshops and classes for other teachers in how to use these strategies and to form peer-coaching teams. Between the second and third data collection points many of the teachers began conducting workshops and classes with some teachers meeting with other teachers in peer-coaching teams. This may in part explain the large increase in the percentage of cognitions related to goals/objectives from the second to the third data collection point. The percentage of cognitions related to instructional procedures shows a slight decline for both instructional strategies. It may be that as the teachers were attempting to learn and to implement both of these new strategies that they were initially more focused on the instructional procedures and as they became more familiar and comfortable with the new strategies they then turn more of their attention to the goals/objectives of these strategies.

In the most recent review of the literature on teacher thinking, Clark and Peterson (1986) have found two consistent results that bear on this

study. First, they find that "teachers mentioned objectives only 14% or less of the time across the four studies that used objectives as a category" (page 269). In this review they have not included any discussion related to the instructional strategy used by the teachers in the studies they reviewed. Given the well documented ubiquitous nature of the recitation instructional strategy these findings are likely to apply only to this instructional strategy.

The present study has found a substantially larger percentage of cognitions related to goals/objectives for both concept attainment and for synectics than did the studies cited in Clark and Peterson's (1986) review where the instructional strategy used by the teacher was not identified as a variable. The present study found between 12% and 27% of teachers' cognitions related to goals/objectives when using the concept attainment strategy, while between 15% and 30% of the teachers' cognitions related to goals/objective when using the synectics strategy. A second finding by Clark and Peterson (1986) was that 20% to 30% of the teachers interactive thoughts dealt with instructional strategies). Once again, the present study has found a substantially larger percentage of cognitions to be focused on instructional procedures than did the studies cited in Clark and Peterson's (1986) review. The present study found 27% to 46% of the teacher's cognitions while using concept attainment related to instructional procedures and found 31% to 50% of the teacher's cognitions while using the synectics strategy related to instructional procedures.

The differences in the results between the studies cited in Clark and Peterson's (1986) review and the data from the present study may be the result of two factors. First, the larger percentages of cognitions found for each model of teaching related to goals/objectives and the

instructional procedures may be a result of the training program. The teachers in this sample were attempting to learn and to implement new teaching strategies into their repertoire. As a result they may be abnormally preoccupied with these two aspects of their teaching and the phenomena found in this study may dissipate over time as the teachers internalize each strategy. A second possibility is that different instructional strategies vary in the complexity and thus place different mental burdens on the teacher to not only determine appropriate instructional goals/objectives congruent with the strategy, but also place different burdens on the teacher to operationalize the instructional procedures of each instructional strategy.

Much of the research on teacher's thought processes has been undertaken only recently with most of the research being conducted in the last ten years. This study has highlighted the need for additional research on the extent to which teacher thinking modulates with the instructional strategy used by the teacher and to what extent to which there is a linkage between teacher thinking with transfer of training.

Table 1

Comparison of the teachers' skill level and quantity of practice with the CONCEPT ATTAINMENT strategy between each data collection period

SUBJECT	SKILL LEVEL			AMOUNT OF PRACTICE		
	Training	October	February	Prior to Training	October	February
103	33	40	46	0	30	40
104	40	38	42	0	30	50
105	38	46	48	0	20	50
106	48	42	48	0	7	20
107	35	37	19	0	8	7
108	42	31	57	0	0	0
109	33	29	25	0	2	5
110	54	42	33	0	2	1
111	42	31	23	0	4	4
112	48	27	13	0	0	0
Mean	41.3	36.3	35.4	0	10.3	17.7
Std. Deviation	7.0	6.4	14.8	0	11.9	21.0

Table 2

Comparison of the teachers' skill level and quantity of practice with the SYNECTICS strategy between each data collection period

SUBJECT	SKILL LEVEL			AMOUNT OF PRACTICE		
	Training	October	February	Prior to Training	October	February
103	68	47	52	0	12	7
104	38	44	47	0	10	10
105	43	44	52	0	10	15
106	51	56	76	0	0	3
107	16	31	46	0	3	13
108	41	40	44	0	4	0
109	48	54	65	0	0	6
110	65	66	49	0	2	3
111	31	29	50	0	0	2
112	56	32	25	0	5	0
Mean	45.7	44.3	50.6	0	4.6	5.9
Std. Deviation	15.6	12.0	13.3	0	4.6	5.3

Table 3

Comparison of the teachers total production of cognitions per lesson, length of the lesson and the cognitive density (the number of cognitions per ten minutes of lesson) for the CONCEPT ATTAINMENT strategy for each data collection period

SUBJECT	TOTAL COGNITIONS			LESSON LENGTH			COGNITIVE DENSITY		
	Training	Oct	Feb	Training	Oct	Feb	Training	Oct	Feb
103	20	32	34	7	11	20	29	29	17
104	80	22	33	21	9	9	38	24	36
105	M	26	37	4	7	10	M	37	37
106	44	38	50	13	20	20	34	19	25
107	87	29	38	17	20	7	51	15	54
108	45	115	42	8	25	19	56	46	22
109	38	38	55	10	17	11	38	22	50
110	44	103	51	19	30	20	23	34	25
111	31	79	181	15	23	36	21	34	50
112	72	71	12	13	34	3	55	21	4
Mean	51.2	55.3	53.3	12.7	19.6	15.5	38.3	28.1	32.0
Std. Dev.	23.0	34.1	46.5	5.5	8.9	9.5	13.2	9.6	16.3

Table 4

Comparison of the teachers' total production of cognitions per lesson, length of the lesson and the cognitive density (the number of cognitions per ten minutes of lesson) for the SYNECTICS strategy for each data collection period

SUBJECT	TOTAL COGNITIONS			LESSON LENGTH			COGNITIVE DENSITY		
	Training	Oct	Feb	Training	Oct	Feb	Training	Oct	Feb
103	77	34	52	27	27	23	29	13	23
104	38	34	81	27	28	27	14	12	30
105	30	51	78	15	22	20	20	23	39
106	74	38	111	27	60	55	27	6	20
107	69	112	51	9	36	38	76	31	13
108	45	87	77	15	48	33	30	18	23
109	33	132	69	16	25	22	21	53	31
110	107	67	44	43	40	40	25	16	11
111	77	75	58	14	26	18	55	29	32
112	166	133	101	23	30	35	72	44	29
Mean	71.6	76.4	72.2	21.6	34.2	31.1	36.9	24.5	25.1
Std. Dev.	41.2	38.8	21.9	9.9	12.0	11.4	22.4	14.9	8.8

Table 5

Comparison of the teachers' percentage of interactive and retroactive cognitions per lesson with the CONCEPT ATTAINMENT strategy between each data collection period

SUBJECT	INTERACTIVE COGNITIONS			RETROACTIVE COGNITIONS		
	Training	October	February	Training	October	February
103	85	53	62	15	49	38
104	34	14	36	66	86	64
105	M	8	0	M	92	100
106	18	41	38	82	59	62
107	37	28	39	63	72	61
108	22	52	33	78	48	67
109	32	8	7	68	92	93
110	11	32	27	89	68	73
111	13	15	23	87	85	77
112	24	37	0	76	63	100
Mean	30.7	28.8	26.5	69.3	71.4	73.5
Std. Deviation	22.3	17.0	19.7	22.3	16.8	19.7

Table 6

Comparison of the teachers percentage of interactive and retroactive cognitions per lesson with the SYNECTICS strategy between each data collection period

SUBJECT	INTERACTIVE COGNITIONS			RETROACTIVE COGNITIONS		
	Training	October	February	Training	October	February
103	64	58	71	36	42	29
104	16	21	43	84	79	57
105	33	12	31	67	88	69
106	49	55	30	51	45	70
107	48	22	18	52	78	82
108	29	26	16	71	74	84
109	30	11	2	70	89	98
110	10	19	27	90	81	73
111	9	11	38	91	89	62
112	19	8	12	81	92	88
Mean	30.7	24.3	28.8	69.3	75.7	71.2
Std. Deviation	18.3	17.9	19.3	18.3	17.9	19.3

Table 7

Comparison of the teachers percentage of cognitions per lesson focusing on goals/objective of the lesson/strategy and cognitions focusing on instructional procedures with the CONCEPT ATTAINMENT strategy between each data collection period

SUBJECT	GOALS/OBJECTIVES			INSTRUCTIONAL PROCEDURES		
	Training	October	February	Training	October	February
103	15	6	35	65	53	29
104	14	27	18	55	36	12
105	M	12	27	M	8	41
106	23	11	14	30	50	34
107	5	0	24	31	48	45
108	0	14	21	51	51	31
109	11	26	35	37	47	18
110	11	11	37	45	43	33
111	0	3	15	39	61	19
112	25	13	42	50	66	16
Mean	11.6	12.3	26.8	44.8	46.3	27.8
Std. Deviation	8.9	8.7	10.0	11.6	15.9	11.1

Table 8

Comparison of the teachers percentage of cognitions per lesson focusing on goals/objective of the lesson/strategy and cognitions focusing on instructional procedures with the SYNECTICS strategy between each data collection period

SUBJECT	GOALS/OBJECTIVES			INSTRUCTIONAL PROCEDURES		
	Training	October	February	Training	October	February
103	30	38	35	44	54	50
104	29	6	25	34	94	26
105	43	14	27	17	16	41
106	35	5	22	42	84	17
107	20	8	22	38	31	31
108	15	5	44	69	32	27
109	0	9	26	55	32	38
110	30	16	43	52	67	23
111	30	32	41	21	29	33
112	31	12	9	55	68	28
Mean	26.3	14.5	29.4	42.7	50.7	31.4
Std. Deviation	11.9	11.5	11.1	16.0	26.5	9.6

Table 9

INTER-RATER RELIABILITY COEFFICIENTS

Concept Attainment Skill Level	.93
Synecotics Skill Level	.94
Cognitions	.95
Interactive Cognition	.91
Retroactive Cognition	.97
Goal/Objective Cognition	.84
Procedural Cognition	.86

BIBLIOGRAPHY

- Baker, R. (1983). The contribution of coaching to transfer of training: An extension study. Unpublished doctoral dissertation, University of Oregon.
- Berman, P. & McLaughlin, M. (1976). Implementation of educational innovations. Educational Forum, LX (3), 347-370.
- Clark, C. & Peterson, P. (1986). Teachers' thought processes. In M.C. Whittrock, (Ed.), Handbook of research on teaching (pp. 255-296). NY: MacMillan.
- Fullan, M. (1982). The meaning of educational change. NY: Teacher College Press.
- Fullan, M. & Pomfret, A. (1977). Research on curriculum and instruction implementation. Review of Educational Research, 45 (1), 335-397.
- Goodlad, J. (1984). A place called school. NY: McGraw-Hill.
- Joyce, B. (1978-79). Towards a theory of information processing in teaching. Educational Research Quarterly, 3, 66-77.
- Joyce, B. & Showers (1981). Teacher training research: Working hypotheses for program design and directions for future study. Paper presented at the annual meeting of the American Educational Research Association, Los Angeles.
- Joyce, B. & Weil, M. (1980). Models of teaching. Englewood Cliffs, NJ: Prentice-Hall.
- Shavelson, R. & Stern, P. (1981). Research on teachers' pedagogical thought, judgments, decisions and behavior. Review of Educational Research, 51 (4), 455-498.
- Showers, B. (1982). Transfer of training: The contribution of coaching. Eugene, OR: Center for Educational Policy and Management, University of Oregon.