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ABSTRACT

The purpose of this study was to extend previous research by observing how two types of teachers, novice and experienced, find and solve problems in a classroom setting and how problem finding behavior differs between them. The results indicate that experienced teachers (N=10) and student teachers (N=10) appear to use the same cognitive strategies at the problem formulation stage on most of the problem finding variables. Pre-student teaching subjects (N=10) varied significantly from experienced teachers and student teachers on most problem finding variables except those involving time. At the problem solution stage, experienced teachers differed from novices in the number of questions asked, solutions generated, and on the nature of the questions asked. (Author/JD)

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Abstract

What is it that good teachers do, and how do they do it? Teachers handle a multitude and a variety of problems daily, ranging from planning a complex lesson to collecting lunch money. While most teachers can solve problems, good teachers are often said to sense problems before they arise, yet researchers in teacher training claim that teacher training courses typically focus on academic subject matter rather than on instructional skills. Critics of teacher training programs also maintain that new teachers are given problems to solve rather than encouraged to find and solve problems.

Knowledge of how experienced and inexperienced teachers find and solve problems in the classroom may provide additional training direction for training new teachers and for developing in service programs for experienced teachers.

The purpose of this study was to extend my previous research by observing how two types of teachers, novice and experienced, find and solve problems in a classroom setting and how problem finding behavior differs between them. The results indicate that experienced teachers and student teachers appear to use the same cognitive strategies at the problem formulation stage on most of the problem finding variables. Pre-student- teaching subjects varied significantly from experienced teachers and student-teachers on most problem finding variables except those involving time. At the problem solution stage, experienced teachers differed from novices in the number of questions asked, solutions generated, and on the nature of the questions asked as measured using the Guildford Structure of the Intellect Model Product Categories.

Problem Finding and Teacher Experience

Background I am interested in how experienced, good teachers go about planning. Leinhardt and Greeno (1986) write, "...a skilled teacher has a complex knowledge structure composed of interrelated sets of organized actions." The environment for these decisions is constantly in flux with little imposed structure.

I wanted to study how good teachers use their complex knowledge structure to find and solve problems in the classroom. I hypothesized that experienced teachers impose an experiential structure to the content of a lesson; whereas, novice teachers have mastered the content aspect of a lesson but not its structure. If this "structuring" can be observed and perhaps characterized, then we may know more about how to prepare teachers for the classroom.

Teacher training has traditionally focused on solving what Jacob Getzels (1982) has termed "presented," curriculum related problems where the problem, process and solution are all known. However, many classroom problems are not curriculum related, and many new teachers complain of problems that they were not trained to handle.

Previous research has led me to hypothesize that experienced teachers may sense fewer problems but will focus on significant problems around which other problems may cluster. Experienced teachers impose a "structure" based on routines developed by experience. This study may provide a window into the strategies teachers use to find and solve problems. Understanding the cognitive strategies of experienced and new teachers will allow us to better train teachers for all aspects of classroom instruction.

Teachers handle a multitude of problems each day in every class, problems ranging from efficiently collecting lunch money to explaining a complex, multi-staged process. Teachers must be able to determine how well they handled these problems, and they must be aware when new problems occur. A student's anxious expression, for instance, may alert a teacher to a comprehension problem or make the teacher aware that she has stated something unclearly.

While most teachers can solve problems, good teachers are often said to sense problems before they arise. Thus, by sensing the emerging problem, the teacher can find the real problem and solve it before it develops into a classroom disturbance.

In previous problem solving research, problems or problem sets were presented to a subject, and the solutions were then categorized according to the nature of the structured problem. Problems in a "real life" situation rarely conform to this model. Such problems do not arise in a predetermined order but are raised by the individual's perception of the problematic situation which I believe is also influenced by experience, training, and time. (Moore, 1985).

Veenman (1984) claims that teacher training tends to focus on academic subject matter knowledge rather than instructional skills. Teacher training classes as well as most graduate training tend to focus on problems that have been raised and posed by others. Critics also cite the teaching of isolated bits of information and the restricted student teaching experience as additional evidence of the focus of such training on "presented" problems. "Knowing how is a different kind of knowing than knowing that. (Berliner, 1986). Housner and Griffey (1985) suggest that experienced teachers have contingency plans in anticipation of problems they are likely to encounter. Few of the novice teachers have the same plans. Teachers supervising student teachers often voice the same complaint. These problems often occur when a teacher first walks into a classroom. Indeed, curricular problems are often secondary to finding and solving behavior/discipline problems stemming from an unfamiliar environment and unfamiliar students.

Although there is much literature on the types of problems teachers face (cf, Veenman, 1984), there is little on how teachers raise or discover problems to be solved. For many years, investigators have noticed the importance of discovering the problem. Einstein and Infield (1938) wrote:

> The formulation of a problem is often more important than its solution, which may be merely a matter of mathematical or experimental skill. To raise new questions, new possibilities, to regard old problems from a new angle, requires imagination and marks real advance in science. (p.92)

And a decade earlier, Dewey (1929) referred to the act of problem discovery as the first step in knowing. More recently, Mary Henle has challenged: "Why have psychologists paid so little attention to the nature of the problem or the question? or to what preceded the problem, doubt, uneasiness, wonder?" (Henle, 1975, 798,799).

Often teachers are faced with problems that differ from day to day. Getzels (1982) distinguished between types of problems and has referred to the type of problems that teachers often face as "discovered" problems. "Discovered" problems have no formulation and no consistent or recognized method of solution. Early "problem discovery" behavior by the teacher may lead to a previously unimagined or untried solution. "Putting the productive question is often more important, often a greater achievement than the solution of a set question." (Wertheimer, 1945)

Only a few studies (Shulman, 1964: Allender, 1969; Getzels and Csikszentmihalyi, 1976; Subotnik, 1984; Moore, 1985) have attempted to examine how problems are raised and what the relationship may be between the problems raised and their solutions.

Shulman's (1964) study with 21 teacher trainees who raised potential problems from a teacher's in basket established that problem sensing can be observed and quantified, and that problem sensing ability is related to observable cognitive behavior.

In a similar study, Allender (1969) gave the contents of a mayor's in-basket to 51 children in grades 4-6. In both studies, the focus was on the subjects' abilities to detect, not solve, the problems from the problem context before them. Although these problems did not have to be solved, Allender (1969) suggests that "problem sensing generates problem formulating which in turn generates search behavior."

Getzels and Csikszentmihalyi (1976) and Moore (1985) studied artists and student writers respectively. Both studies made use of a table with many common objects that somehow had to be worked into the solution of the drawn or written product. Subjects were encouraged to manipulate or otherwise examine the objects prior to painting or writing, and the relationships between their "problem finding" behaviors and their final products were studied. The Getzels/Csikszentmihalyi (1976) study established a realistic and reasonable method for studying problem finding as a behavior preceeding problem solving.

Moore (1985), using the same procedure, found a similar relationship with student writers who remarkably resembled art students in problem finding behavior. He suggests that the objects used in both studies and the way subjects were observed examining them may be a manifestation of the way writers and artists synthesize life experiences and analyze feelings, which, in turn, may provide a glimpse at the unobservable ways people analyze and synthesize.

As with artists and writers, teachers must "discover" and formulate problems as well as solve them. The purpose of this study was to extend the research of Shulman (1965), Allender (1969), Getzels and Csikszentmihalyi (1976) and Moore (1985, 1987a, 1987b) by observing how two types of teachers, novice and experienced, find and solve some classroom problems in a classroom setting and how problem finding behavior differs between them. This study considers problem finding at the problem formulation and problem solution stages.

Subjects. The subjects participating in this study were thirty teachers and teacher trainees from South Georgia. Ten subjects were teacher trainees who have completed their academic course work. Ten subjects were teacher trainees who were completing their student teaching experience. Ten subjects were teachers who had five or more years of experience with a mean of fifteen years of experience.

Materials. The classroom simulated for this study was based on a real classroom. The simulated classroom was created to look exactly like the real classroom did at the end of a school day. Each subject came to the simulated classroom singly and was given material for writing and these instructions.

> Many times teachers are asked to take over or substitute for colleagues often without being able to talk to the teachers they replace. This exercise is designed to see how well you can identify problems facing teachers before ever seeing the students.
>
> Pretend that this is a classroom in which you are replacing the teacher in grade 3. You have no idea how long your assignment will be. Students will be arriving soon.
>
> Identify any problems you feel you may encounter.
>
> Pretend that I am your principal, and that I will return when you press the buzzer on the desk which connects with my office. I will then try to answer the problems you may raise about your assignment. The entire session will be considered over when you indicate you are ready for students to arrive. Paper and pen have been provided for your use if you care to use them.

Each subject was videotaped during the problem situation and a voice recording was made of each meeting with the "principal." A post hoc interview session was held immediately following.

Measures. Two sets of measures were used: measures of problem formulation and of problem solution. All the measures have been used in previous research (Getzels and Csikszentmihalyi, 1976;

Arlin, 1976; and Moore, 1985) and have been found to be valid and reliable indicators of problem finding ability.

I. Problem Formulation. Six measures of problem formulation were used. Three of these measure involved objects touched and/or manipulated.

(1) Number of Objects Inspected. This was a count of how many of the objects in the classroom were examined during the session.
2) Uniqueness of Objects Examined. This was based on an analysis of all objects chosen and arranged by all the subjects. The most common object examined received a value of 1, the second most common a 2, and so on. These values were then summed.
(3) Exploratory Behavior During Planning. A score of 1 was given if objects were picked up or moved, a score of 2 if the subject was observed holding the object for closer examination, and a score of 3 if the subject indicated in the post hoc interview that the object aided in planning.

Three of the measures involved time. Previous research by Getzels and Csikszentmihalyi (1976) and Moore (1985) report high correlations between time variables and the originality of the drawn and written product. These results indicate the importance of examining such relationships.

(4) Planning Time. The total time spent from the time instructions are given until the subject presses the buzzer for the principal's return.

(5) Principal's Interview. The time spent from when the principal returned until the subject indicated closure by saying she was ready for students to arrive. See Appendix 1 for Principal interview questions.

(6) Total Time. The time from when instructions were given until the subject indicates closure.

All problem formulation scores were then combined.

(7) Total Problem Formulation Score. Each problem formulation variable score was converted to a common scale of five and then all five were summed.

II. Problem Solution Eight measures of the nature of the problem solution were used:

(1) Total Number of Problems Raised. This was a count of all the problems raised in the oral session with the principal and in the post hoc interview. See Appendix 2 for Post Hoc interview questions. Arlin (1974) found a high positive relationship between quantity and quality of the problems raised. Two trained, independent raters read and rated all problems raised. Inter-rater agreement was .91. All differences were resolved by the raters after their individual rating. Thus, there was total agreement on all problems.

(2) Total Number of Solutions Specified. This was a count of all the solutions specified by the teacher in the oral session. Solutions were not specifically asked for in the interview

sessions with the principal. Inter-rater reliability was .82. Raters again resolved all differences.

(3) Temporal Rank Ordering of Problems. The problems noted by each subject were rank ordered from first to last by the order in which they are raised. Subjects were specifically asked, "Which problems are the most important and which least important?" Rater agreement was .74 and, again, raters resolved all differences.

(4) Temporal Rank Ordering of Solutions. The solutions were noted by subjects as they rank ordered the problems. Solutions were not specifically asked for in the interview sessions. Rater reliability was .72 and differences were resolved.

(5) Fluency. Fluency refers to the number of words in the finished product. Many studies report a strong relationship between overall fluency and holistic evaluation of the transcribed oral session.

(6) Intellectual Product Categories (IPC). Questions raised were categorized according to the six categories of the intellectual products in Guilford's Structure of the Intellect Model (SOI) (1956). Two independent raters rated each question from the total problems raised variable according to the SOI model. Rater agreement was .41. Raters then resolved all differences on the category scores. (See Appendix III for examples from each category.) The numbers were then summed across categories to produce an Intellectual Products Category score. The categories represent ways in which informational

output is structured. Under the problem-finding rubric, subjects are given a problematic situation and an opportunity to specify problems to meet this third requirement of categorizing the problems specified. The categories in Guilford's model (1968) suggest the manner in which informational output is structured. Previous research (Arlin, 1976) reports inter-rater reliabilities for these classifications of .80. The six categories for this variable are:

Category	Definition
(a) units	Basic units of information
(b) classes	Class can be embodied using different sets of particulars
(c) relations	Connections between objects or units such as opposition, part-whole, agent-action, etc.
(d) systems	To talk about rules, principles, orders, orientations, and structures is to speak of the psychological product of the system
(e) Transformations	A transformation is any kind of change such as expanding, reversal, interchange, and so on.
(f) Implications	A connection between two units of information. Relations are definable kinds of connections... comes nearest to the traditional notion of association.

(7) Quality of Response. This measure was based on the assumption that a higher order category problem more closely approaches the general problem than a lower order question (Arlin, 1974) Therefore, the quality is the weighted average of the problems raised according to the intellectual products

category divided by the total number of problems raised by the subject.

$$\text{Quality} = \frac{1(\text{cat}1)+2(\text{cat}2)+3(\text{cat}3)+4(\text{cat}4)+5(\text{cat}5)+6(\text{cat}6)}{\text{Total number of problems raised by the subject.}}$$

(8) Total Problem Solution Score. Scores from the problem-solution variables were converted to a common scale and a total problem-solutions score derived.

Procedure. Each teacher participated in one session. The subjects could go anywhere in the classroom. The subjects were videotaped and were aware of the videotaping.

The subjects were asked to submit any writing prior to the oral sessions. In addition to the question session with the principal, each subject was interviewed immediately following the session. One aspect of the post hoc interview focused on questions or problems raised on paper but not orally. Questions for the interview were be adapted from the Getzels and Csikszentmihalyi (1976) and Moore (1985) studies with problem finders.

Analysis of Data. The results from the three groups were compared using t-tests for correlated means and a Multiple Analysis cf Variance. The same means of analysis used by Getzels and Csikszentmihalyi (1976) and Moore (1985) were used to allow comparisons.

Results and Discussion. The data on problem finding at the problem formulation stage for both experienced teachers and student teachers are presented in Table 1. The results indicate no significant differences between experienced teachers and student-teachers on any of the problem finding variables at the problem formulation stage. Between experienced teachers and pre-student-teaching subjects (Table 2), significant differences were noted on the number of objects touched and the uniqueness of the objects touched. In other words, experienced teachers used more objects and different objects in their planning than pre-student teachers. Although not significant, the exploratory behavior scores and the total problem finding scores are in a direction one might predict from the correlative research of Getzels and Csikszentmihalyi (1976) and Moore (1985). No differences are noted on any of the time variables.

No significant differences were found between student-teachers and pre-student-teachers (Table 3). However, scores between groups on number of items touched, uniqueness of the items chosen, manipulation of items chosen and planning time are in a direction one might expect from the correlative research by Getzels and Csiksentmihalyi (1976) and Moore (1985).

Uniqueness scores varied widely between student teachers and prestudent teaching subjects. It is unknown whether the "unique" objects were randomly or capriciously chosen and whether these objects have any bearing on the quantity or quality of the problems raised or the solutions specified.

The item manipulation score may appear to be a more reliable indicator as to whether items touched and examined actually had any bearing on the problems raised and solutions specified. For example, all five of the subjects who found the folder with the schedule inside indicated during the interview that the folder solved some problems and allowed them to focus on other problems. No subjects indicated that either the poster or the drinking cup was helpful.

Planning time revealed no differences between the groups. Although Getzels and Csikszentmihalyi (1976) and Moore (1985) report a strong relationship between planning time and problem solution variables, experienced teachers, student teachers and prestudent teaching subjects were very consistent on both planning time and time spent with the principal.

The data on problem finding at the problem solution stage between experienced and student teachers are presented in Table 4. The results indicate that student teachers raised significantly more problems and rank ordered more problems than experienced teachers, but suggested significantly fewer solutions. No differences were noted on rank ordered solutions, fluency or total problem solution score. The Intellectual Products Categories scores revealed that experienced teachers asked significantly more higher order IPC questions than did student teachers. Experienced teachers asked fewer questions but tended to ask far more questions in product categories four through six, the more complex categories of systems, transformations and implications. Forty-five percent of the questions generated by experienced teachers were from categories four through six, whereas only six percent of the student teachers' questions were from these categories. These results are consistent with Arlin's (1976) results in which she found that subjects who scored high on problem finding asked fewer questions and asked questions from the higher product categories.

The data on problem finding at the problem solution stage between experienced teachers and prestudent teaching students are presented in Table 5. Prestudent teaching subjects tended to raise more problems and more rank ordered problems than experienced teachers, but significantly fewer solutions and rank ordered solutions. There were no differences in fluency and total score. On the Intellectual Products Categories scores, experienced teachers asked significantly more higher order category questions than novice teachers. Seven percent of the questions generated by prestudent teaching subjects were from categories four through six. This, again, corresponds to correlative research by Arlin (1976) who found that subjects who asked a larger number of questions consistently asked those questions in the intellectual products categories of one to three while subjects who asked a few questions consistently asked those questions from categories four through six.

Problem finding at the problem solution stage data between student teachers and prestudent teaching students are presented in Table 6. Student teachers tenoed to raise more questions, more solutions, more rank ordered problems and significantly more rank ordered solutions than prestudent teaching subjects. Student teachers tended to be more fluent and differed on the total problem solution score. The total problem solution score reflects student teachers abilities to generate both more questions and solutions than prestudent teaching subjects. Although student teachers had fewer questions than did prestudent teaching subjects, there were no significant differences on the IPC scores. Student teachers and prestudent teaching subjects were remarkably similar in the type of questions raised as determined by IPC scores.

Conclusions. Four conclusions are suggested from these data: First, experience in teaching affected the way the subjects attempted to plan and define a discovered problem in teaching. During problem discovery, experienced teachers and student teachers may share similarities in problem discovery cognitive strategies.

Second, the extremely high variances indicate more individual differences rather than group differences for both student teachers and pre-student-teaching subjects. For example, although encouraged to explore the items on the desk, six of the ten pre-student-teaching subjects chose not to touch anything, whereas three student teachers and two experienced teachers also chose not to touch any items. Future research should focus on whether this problem formulation variable affects the problem solution variables, the problems actually raised and the solutions drawn.

Third, novices and student teachers tended to raise many more problems than experienced teachers. As in the Arlin (1974) study of college seniors, experienced teachers tended to elaborate more around general points. Perhaps in the way novices and novice teachers structure knowledge, they are enacting student schema; that is, what they perceive as the teacher's role is based on sixteen or so years of observations from their perspectives as students. Student teachers seemed to know more about how to act as a teacher (cf. Moore, 1987b) than how experienced teachers structure knowledge about teaching. Those prestudent teaching subjects tended to only partly know how to act like an experienced teacher suggesting only partial or incomplete "agendas." Over ninety-two percent of all questions raised by student teachers and prestudent teaching teachers were towards the informational or units levels of Guilford's model. These questions tended to be questions of procedures, methods and discipline. Often asked questions by prestudent teaching and student teaching subjects tended to be about who handles punishment, where the schedule was, lunch reports, etc. Experienced teachers were concerned about grouping, classroom structure, teacher duties, especially if other professionals were counting on them to be at a certain place or time, and structure of the day.

Experienced teachers were concerned with accomplishing teaching goals and ways of combining and separating classroom activities. Moore (1987a) reports that experienced teachers tended to examine more items on the desk and in the desk in the problem context than did either student teachers or prestudent teaching teachers. Moore further reports that in the problem context, a simulation of an actual classroom, the center desk drawer contained a detailed timetable of the typical class day and structure in a folder mislabeled "assertive discipline." None of the prestudent teaching subjects found the folder, one of the student teachers found it, and five experienced teachers found the folder. Knowing the daily schedule indeed changed the nature of the problems raised. In fact, one experienced teacher indicated that finding the schedule solved her first problem, and she continued to solve several more problems through knowledge of the class day's structure. The post hoc interview revealed that of those who found the folder all were looking for some type of daily structure and felt that one should exist somewhere in the problem context. These teachers then tended to ask more content loaded questions and felt free to improvise on both the schedule and content. This may be because they knew the schedule. The questions reflecting improvisation of content and schedule resulted in more higher order category scores on Guilford's SOI model.

Finally, experienced teachers tended to raise far more solutions than novice teachers even though none of the subjects were asked for solutions to solve any of the problems. Perhaps this difference can be attributed to more complete "agendas" based on practice and familiarity with similar problems.

On the second measure of problem finding, rank ordering to the prompt: "What are the most important problems?" novice teachers again raised far more problems than did experienced teachers. This is no surprise since this variable is a subset of the first or total problems raised variable. In an ill-structured problem setting, numerous questions might be seen as gaps on schema producing ability.

Implications for Future Research. This report has dealt with only problem finding behavior between three groups varying on teaching experience. Moore (1985) writes: "If touching objects, manipulating objects or otherwise inspecting objects is a manifestation of the way writers ard artists analyze feelings and synthesize life experience, then touching and manipulating (the observables) may provide us a window for studying the unobservable ways students analyze and synthesize." (p 94) Experienced teachers and student teachers at this point differ from those subjects who have no teaching experience on the "observables." Future research should focus on whether, indeed, the "observables" do affect the solution to the problem, However, this study has also raised new research concerns: When do student teachers begin to resemble experienced teachers in their cognitive strategies on the approach to a problem? Is this change gradual or sudden? What role does observation play in this "change"? When student teachers are actually in front of children, do they shift cognitive strategies and activate different schema? What are the characteristics of students who possess these different "change patterns"? Are the behaviors of student teachers a function of experience, or observation or both?

Do students "change" faster if they teach sooner? How do student teachers activate behaviors which resemble experienced teachers? Why are student teachers seemingly so different from pre-student-teachers especially since the subjects were similar in both educational backgrounds and ages? What aspects of the student teaching experience cause such a cognitive shift?

Further research is necessary, especially in seeing whether others can identify the three groups of subjects by their responses to these problem solution variables. If, for instance, administrators and experienced teachers can differentiate between the three groups then perhaps there are aspects of experience and problem finding ability that could be further studied. Also, could novices differentiate between experienced teaches and other novices? If novices lack experience, then it seems reasonable that they would have greater difficulty in differentiating the groups.

If we accept that experience aids in the ability to successfully formulate ill structured problems, can these behaviors be taught? Frederiksen (1984) suggests that "We know little about how to teach students to develop representations of ill-structured problems, to develop plans for solving such problems, or to employ appropriate strategies or heuristic approaches." Perhaps there are processes and heuristics we learn from experience that we can teach, or perhaps these processes and techniques must be discovered. Thus, educational situations for our novice teachers could be enhanced so that such processes and heuristics be discovered more easily.

Finally, we need to determine when teachers become teachers. Student teachers differed from prestudent teachers although these two groups are similar in chronological age. Thus, it would seem that the student teaching experience does at least begin to prepare students to find and solve classroom problems. The student teachers in this study were all more than half way through their student teaching experience, and all reported they had "taken over" for their cooperating teacher. Further research focusing on first, second and third year teachers might help us gain insight on how experience influences problem finding behavior and how teachers continue to restructure knowledge and set agendas.

All of this research would help us determine whether we are adequately preparing education students for student teaching. It may help us determine whether content and methods courses help students structure knowledge about teaching.

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Table 1

Problem Finding Behavior at the Problem Formulation Stage Between Experienced Teachers and Student Teachers

	Group 1 Experienced Teachers M	SD	Group 2 Student Teachers M	SD	t for correlated Means (df=19)	t (1-tail)
Number of Objects	15.2	12.19	10	10.29	1.03	.158
Uniqueness of Objects	117.45	128.69	73.20	106	.85	.202
Manip. of Objects	26.45	18.73	23.9	19.87	.30	.378
Planning Time	451.55	521.54	569.1	298.7	-.62	.27
Principal Time	277.09	119.10	331.9	98.59	-1.14	.134
Total Time	731	592.32	890.8	332.18	-.75	.231
Total Score	13.45	4.48	13.6	5.06	-.07	.47

Table 2

Problem Finding Behavior at the Problem Formulation Stage Between Experienced Teachers and Pre-Student Teaching Students

	Group 1 Experienced Teachers M	SD	Group 3 Pre-Student Teachers M	SD	t for correlated Means (df=18)	t (1-tail)
Number of Objects	15.2	12.19	4.3	6.01	2.54	.01
Uniqueness of Objects	117.45	128.69	22.1	34.4	2.27	.017
Manip. of Objects	26.45	18.73	13.7	19.07	1.54	.069
Planning Time	451.55	521.54	357.9	576.63	.39	.35
Principal Time	277.09	119.10	292.7	194.12	-.22	.413
Total Time	731	592.32	658.40	573.41	.28	.389
Total Score	13.45	4.48	10.1	4.606	1.69	.053

Table 3

Problem Finding at the Problem Formulation Stage Between Student Teachers and Pre Student-Teaching Subjects

	Group 2 Experienced Teachers M	SD	Group 3 Pre-Student Teachers M	SD	t for correlated Means (df=18)	t (1-tail)
Number of Objects	10	10.29	4.3	6.01	1.51	.074
Uniqueness of Objects	73.2	106.01	22.1	34.4	1.45	.08
Manip. of Objects	23.9	19.87	13.7	19.07	1.17	.12
Planning Time	569.1	298.23	357.9	576.63	1.03	.159
Principal Time	331.9	98.54	292.7	194.12	.57	.288
Total Time	890.8	332.18	658.40	573.41	1.11	.14
Total Score	13.6	5.06	10.1	4.606	1.62	.062

Table 4

Problem Finding Behavior at the Problem Solution Stage Between Experienced Teachers and Student Teachers

	Group 1 Experienced Teachers M	SD	Group 2 Student Teachers M	SD	t for correlated Means (df=18)	t (1-tail)
Total Problems Raised	5.9	2.51	10.9	5.55	-2.60	.009
Total Solutions Specified	4.4	3.71	2.0	2.26	1.74	.049
Rank Ordered Problems	2.4	1.07	3.9	1.10	-3.08	.003
Rank Ordered Solutions	1.1	1.20	1.4	1.08	-.59	.285
Fluency	305.6	193.5	357.9	160.	-.66	.259
Guilford SOI Product Scores added	.87	.34	1.69	.78	-3.02	.003
Guilford SOI Product Scores weighted	12.08	9.26	5.22	5.19	2.04	.028
Total Problem Solution Score	10.07	3.84	10.41	2.73	-.23	.40

Table 5

Problem Finding Behavior at the Problem Solution Stage Between Experienced Teachers and Pre Student Teaching Students

	Group 1 Experienced Teachers M	SD	Group 3 PreStudent Teachers M	SD	t for correlated Means (df=18)	t (1-tail)
Total Problems Raised	5.9	2.51	9	9.08	-1.04	.156
Total Solutions Specified	4.4	3.72	1	1.89	2.58	.009
Rank Ordered Problems	2.4	1.07	4.5	3.06	-2.05	.028
Rank Ordered Solutions	1.1	1.20	.5	7.07	1.36	.095
Fluency	305.6	193.5	283.7	339.51	.18	.431
Guilford SOI Product Scores weighted	12.07	9.25	3.59	2.03	2.83	.005
Guilford SOI Product Scores added	.87	.34	1.38	1.36	-1.13	.132
Total Problem Solution Score	10.067	7.82	3.84	5.5	1.06	.152

Table 6

Problem Finding Behavior at the Problem Solution Stage Between Student Teachers and Pre Student Teaching Students

	Group 2 Student Teachers M	SD	Group 3 Prestudent Teachers M	SD	t for correlated Means (df=18)	t (1-tail)
Total Problems Raised	10.9	5.55	9	9.08	.56	.290
Total Solutions Specified	2.	2.26	1	1.89	1.07	.149
Rank Ordered Problems	3.9	1.10	4.5	3.06	-.58	.283
Rank Ordered Solutions	1.4	1.08	.5	7.07	2.21	.02
Fluency	357.9	160.	283.7	339.51	.63	.27
Guilford SOI Product Scores weighted	5.22	5.19	3.59	2.03	.92	.18
Guilford SOI Product Scores added	1.69	.78	1.38	1.36	.63	.266
Total Problem Solution Score	10.41	2.71	7.82	5.49	1.34	.094

Appendix 1

Principal's Interview

1. Do you have any questions?

2. What are the problems that you feel you will have to solve and how will you solve them?

3. What are the most important problems? Least important?

4. Are you ready for the students to arrive?

Appendix 2

Post Hoc Interview Questions

1. Why did you write what you did?
   Why did you raise the problems that you did?

2. What were you thinking while you were planning? What were your major concerns?

3. How did you begin your planning?

4. As you were going through the desk, did you know what you were going to do?

5. What did you think about before you started planning/writing?

6. What did you choose on the desk that helped you formulate the problems?

7. How did subsequent problems arise? Were they from the first ones? Are they connected? How do you think they are connected?

8. How did you get your ideas?

9. Did you change your mind as you planned? How? When?

10. Did you revise any of your plans or writing?

11. Would the responses of others have any effect on your own problems or plans?

12. How did you know when you were done?