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the Degree Doctor of Philosophy in the Graduate
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By
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The Ohio State University
1966

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CHAPTER I

INTRODUCTION

Beginning teachers reflecting upon their undergraduate education, people engaged in the pre-service education of teachers, and outspoken critics of our undergraduate teacher education programs seem to be in agreement on one point; student teaching is one of the most important experiences in the undergraduate program. The purpose of this study is to explore several ways in which the student teaching experience might be made more worthwhile.

The 1964 Yearbook of The Association for Student Teaching suggests that student teaching could be improved by providing the student teacher with additional "feedback," i.e., specific information as to how well he is teaching at a given time.

In our opinion, it is the information received by the student (teacher) through the feedback process which is going to make the difference in the development of a teacher. The behavior of a teacher is a continuous function of the informational feedback from both external and internal sources (1:94).

Traditionally, this feedback has been provided by the college supervisor and the cooperating teacher and, to some extent, by the student teacher and his pupils. If one
accepts the premise that "the information received . . . through the feedback process . . . is going to make the difference in the development of a teacher," it would seem to follow that providing additional feedback and different types of feedback should increase the value of student teaching. This is the specific problem investigated in this study.

What are the possible sources of additional feedback? It seems unlikely that the college supervisor can be counted on for much more help since, for the most part, his load is already a heavy one. Also, even if it were possible to double or triple the time the supervisor spent with each student teacher, the amount of feedback which he could provide would not approach that of the other sources which we shall discuss since each of the others has daily contact with the student teacher.

The cooperating teacher often teaches six or seven classes a day. Even though the student teacher assumes responsibility for the teaching of one or more of these classes, the cooperating teacher's load is still heavy. Also, many cooperating teachers feel that they are not really well-equipped to criticize the efforts of the student teacher. Then too, they often enjoy a friendly relationship with the student teachers and are reluctant to criticize them.
It would seem likely then that neither the college supervisor nor the cooperating teacher can be counted on to provide a substantial amount of additional feedback. Among the other possible sources are the student teacher himself, his fellow student teachers, and his pupils. This investigator has done some exploratory work to determine if any of these three groups can provide the student teacher with useful feedback. Three experimental schemes were employed.

A scheme that called for the student teacher to make regular, systematic self-evaluations was used to determine whether he could help provide his own feedback. To accomplish this, he taught two sections of the same subject. These two classes were kept slightly "out of phase" so that the mathematical topics discussed in the first class did not normally come up in the second class until several days later. In the meantime, he had time to reflect on his performance and, in the light of it, modify his lesson. To be sure that the self-evaluation occurred regularly, the student teacher was asked to keep written records of his original lesson plans, his comments on these lessons, his modified lesson plans, and his final evaluations of the lessons. This particular part of the study will be referred to as the staggered experiment.

To determine if the student teacher could make use of his fellow student teachers as a source of feedback, the
following scheme was employed. Two student teachers were assigned to the same cooperating teacher. They each assumed responsibility for one of his classes in the usual manner. In addition to this, however, they shared the responsibility for teaching a third class. Their work with this shared class provided the feedback. While student teacher A was teaching the class, student teacher B observed and took notes. Every day, after each had had time to record his comments as to what went on in his shared class, they met and discussed the lesson. B offered his criticism, A his rebuttal, and between them they tried to resolve any differences of opinion. They switched roles periodically so that each had a chance to act as teacher and each had a chance to act as critic. The periods of teaching varied between one and two weeks depending on the topics being taught. Written records were kept of lesson plans, criticisms, and the results of their discussions. This phase of the study will be called the dual experiment.

The student teacher's pupils provided a third source of feedback. Sometimes they were asked to write whatever comments they felt would be helpful—annonymously of course. In addition, rating sheets were constructed to poll student opinion on points raised by the student teacher, the cooperating teacher, the college supervisor, or by the pupils themselves. These comments and ratings were left in the
hands of the student teacher for several days so that he might tabulate them, take notes on them, and reflect on the pupil opinions they contained. This part of the study will be called the questionnaire experiment.

The entire study was evaluated by means of two rating sheets. The first is a thirty-item rating sheet prepared by the investigator which was completed by three different people, the cooperating teacher, the college supervisor, and the student teacher himself. The second was a slightly modified version of a standard form entitled Pupil Rating of Student Teachers found in Guiding Your Student Teacher by Curtis and Andrews (2:303).

In order to minimize the differences arising from different schools, different supervisors, and different initial abilities of the student teachers, the differences between scores made during the fifth week and the tenth week of student teaching (roughly the middle and last weeks of the quarter of student teaching) were used as the final measure of the effectiveness of the experiments.

The subjects for this study were those people engaged in student teaching of secondary school mathematics in the Autumn Quarter of 1965 and the Winter Quarter of 1966. Those people who were taking student teaching for a second time or who had had previous formal teaching experience were not included in the study.
The first phase, which took place during the Autumn Quarter, involved ten student teachers. Six of them were placed and supervised in the usual manner. The remaining four provided single instances of the three experiments described previously, namely, the staggered experiment (self-evaluation), the dual experiment (evaluation by a fellow student teacher), and the questionnaire experiment (pupil evaluation).

The second phase of the study took place during the Winter Quarter and involved nineteen student teachers. Seven of them were used as part of the control group, four participated in the staggered experiment, two in the dual experiment, and six in the questionnaire experiment.

Since the control group and each of the three experimental groups were rated by four different sets of evaluators, there were twelve comparisons of an experimental groups vs. a control group to be made. Nine of these twelve comparisons favored the experimental groups at the 5 per cent level of significance or better. The other three comparisons indicated no significant difference. These results seem to suggest that all three experimental schemes should be more thoroughly investigated.

The second chapter of this dissertation contains a more detailed description of the experiments including samples of the student teachers' work, the pupil comments
and rating sheets, and the evaluation instruments used in the study.

The third chapter contains the data derived from the experiments and a discussion of the data that includes a graphic presentation and some statistical analysis.

The fourth chapter is devoted to a summary and suggestions for further experimentation.
CHAPTER II

THE EXPERIMENTS

Arranging for the Experiments

The experiments took place during the Autumn Quarter of 1965 and the Winter Quarter of 1966. Because of the novel nature of some of the student teacher activities, it was considered necessary to visit the various cooperating schools prior to the actual placement of the student teachers. Therefore, the investigator arranged for interviews with each of the principals of schools in which he hoped to place a student teacher for one of the experimental groups. A list of these schools, principals, and cooperating teachers can be found in the Appendix.

Every principal who was contacted was willing to participate in the study and most showed considerable interest in the outcome. At their suggestion, the investigator requested and received clearance from the offices of the superintendents of the school systems involved.

In those cases where the normal routine of the cooperating teacher's classes would be disturbed, namely, the dual experiment and the staggered experiment, the investigator spoke to the potential cooperating teachers to secure
their approval also. The principals felt that they could approve on behalf of the cooperating teachers taking part in the questionnaire experiment.

It is normal procedure at the Ohio State University for a college supervisor of student teachers to visit the cooperating schools and introduce himself to the principals and cooperating teachers before he first observes the student teachers in the classroom. During this visit, one of the things discussed was the study. In the cases of those student teachers who were in one of the experimental groups, the college supervisor reviewed the nature of the experiment and the evaluation devices that would be employed. With the cooperating teachers of those student teachers who were in the control group, the supervisor described and requested permission to use the evaluation devices, explaining that the student teacher in question would be part of the control group for a study being conducted that quarter.

There were a few cases in the Autumn Quarter in which the cooperating teachers of student teachers in the control group did not fully understand what we were asking of them and subsequently did not permit their pupils to fill out the Pupil Rating of Student Teachers a second time or did not get their own evaluations in on time. It was necessary to remove the student teachers in question from the control group. As a result of this experience the college supervisors
made it a point to be sure that the cooperating teachers for the Winter Quarter fully understood what was being asked of them. There was no such trouble this second quarter.

Selection of Experimental and Control Groups

A student teacher at the Ohio State University may register for nine, twelve, or fifteen quarter hours of student teaching. A student teacher with a nine quarter hour assignment assumes the responsibility for teaching one class a day, a student teacher with a twelve quarter hour assignment teaches two classes a day, and a student teacher with a fifteen quarter hour assignment teaches three classes a day.

Both the staggered and dual experiments required that the student teacher teach two classes a day and therefore only student teachers with a twelve or fifteen quarter hour assignment were available for those experiments. This presented no problem during the Autumn Quarter since only four people took part in the experimental program, but during the Winter Quarter it was necessary to place all but two of the people with twelve or fifteen quarter hour assignments in the dual or staggered experimental groups. The people with a nine quarter hour assignment were all placed in the questionnaire or control groups.

Because of this restriction, it was not possible to balance the experimental and control groups with respect to
test scores, average grades, or any other outside measure. However, the investigator does not feel that this is a crucial problem for two reasons.

First, a study of the literature related to the problem of predicting teaching success seems to indicate that such attempts have thus far not been successful. After years devoted to a study of this problem, A. S. Barr concluded:

There is a great need for valid, reliable, and practical means of measuring and predicting teacher success. Suitable devices and procedures are needed in recruiting and selecting candidates for training, in evaluating training programs, in certification, in choosing teachers for employment, and in ascertaining their efficiency in service. These needs have been generally recognized and very much effort has been expended in developing adequate theories of human ability and suitable instrumentation. Notwithstanding this effort, while progress has been made, the efforts in this area have met with only moderate success (12:695).

In a study devoted to the prediction of success in student teaching, John U. Michaelis said:

The discovery of valid measures of traits and abilities to use in the prediction of success in teaching has been a concern of educators for years. Many studies have been made to determine the relationship between teaching success and various measures of mental ability, achievement in academic and professional courses, language facility, personality traits, character, and physical fitness. It has been shown in most studies that none of the foregoing, when applied to individuals who have completed a collegiate program of teacher education, has high enough predictive value to screen out good and poor teachers. In some studies a combination of measures has been reported as having high predictive value for the
subjects that were studied, but failure to validate findings on a second group has been a typical limitation of the few studies of this type (7:415).

In a more recent study, Freehill states that "The quality of teaching beyond the crucial minimum of failure is related to ability, college entrance test scores and academic success. It is at least as closely related to records of social participation and attitude" (13:311). However, he concludes that, "Selection and prediction methods are currently naive and untested. . . . Better teacher selection depends at least in part on discovering more definitive criteria" (13:311).

A very recent paper by Hough and Duncan reporting on the use of their Teaching Situation Reaction Test (referred to as T.S.R.T.) suggests that on the basis of their experimentation, "the T.S.R.T. was assumed to have some potential for predicting student teaching grades" (18:4). However, they also state, "The T.S.R.T. is in its early developmental stage. The studies that have been done and are being done on the test are exploratory" (18:3).

Since there did not appear to be any accepted method of predicting success in student teaching, the investigator felt free to make arbitrary assignments to the various experimental groups within the limits imposed by the study itself.
Second, the purpose of this study was not to arrive at firm conclusions, but to explore areas which might prove worthy of further study. This purpose seemed, to the investigatator, to permit the use of such "unbalanced" groups.

The Staggered Experiment

The aim of this portion of the experiment, as has been mentioned previously, was to encourage the student teachers to engage in continual self-evaluation. As evidence of this, they were asked to submit lesson plans, comments on these plans, revised lesson plans, and final evaluations of the lessons.

Not all people are equally conscientious when it comes to tasks such as these. Of the five student teachers in this experimental group, one submitted plans for every lesson he taught, two submitted plans for about half their lessons, one submitted only eight pairs of lesson plans (these done in some detail), and one submitted only two pairs of lesson plans. All of them said they made a practice of modifying their presentations in the second class as a result of their experiences with the first class. The investigator felt that at least the first four had complied with the spirit of the experiment and that, on the basis of his discussions with and observations of the student teacher in question, the fifth probably had also.
During the Autumn Quarter, the student teacher involved in this experiment was able to keep his class about one week apart at all times. As a result of his experience, it was felt that a one day separation would be adequate. During the Winter Quarter, due to semester examinations, there were times when the cooperating teachers requested that the classes be kept together. Still it was possible to keep them one or two days out of phase for most of the quarter.

In the following pages the reader will find some of the lesson plans submitted by the student teachers. The investigator made no attempt to impose any particular form of lesson plan on the student teachers, nor did he assist in the writing of any lesson plans. Since all of these student teachers had taken education courses in which they discussed the writing of lesson plans, it was felt that they should be free to plan in the way they felt best. None of the plans that follow are fully adequate in the opinion of the investigator. However, it was felt that any attempt to give individual instruction in the writing of lesson plans would compromise the results of the study. The investigator has not edited these lesson plans other than to delete the names of student teachers. They appear here as the student teachers submitted them.

The lesson plans in this section occur in pairs. The odd-numbered lesson plans are the original ones and the
even-numbered lesson plans are the modified versions. The first two were used in an advanced seventh grade class.

Lesson Plan 1

First twenty minutes—Explain the distributive property through examples.

example 1  
\[
\begin{align*}
21 & \quad 6 \times 21 = 6 \times (20 + 1) \\
& \quad = (6 \times 20) + (6 \times 1) \\
& \quad = 120 + 6 \\
6 \times 1 \text{ ones} & \quad 6 \\
6 \times 2 \text{ tens} & \quad 120 \\
& \quad 126
\end{align*}
\]

The factor 6 is distributed over the addends 20 and 1.

example 2  Suppose you had 5 objects [ooooo].

(1)  \[ 2 \times 5 \text{ objects} = \begin{array}{c}
\text{[ooooo]} \\
\text{2X [ooooo]} \\
\end{array} \]

(2) Split the 5 objects into one group of 3 and another of 2. \[ \begin{array}{c}
\text{[ooooo]} \\
\text{[ooooo]} \\
\end{array} \]

(3) Then  \[ 2 \times (3 \text{ objects} + 2 \text{ objects}) = \begin{array}{c}
\text{[ooooo]} \\
\text{[ooooo]} \\
\end{array} \]

(4) Same as saying  \[ 2 \times 5 = 2 \times (3+2). \] (Refer to diagrams.)

General form of the distributive property of multiplication over addition is: Given any three numbers \(a, b, c\) then \(a \times (b+c) = (a \times b) + (a \times c)\). Note: This is what you do in multiplication.

Above example  
\[
\begin{align*}
21 & \quad 6 \times 21 = 6 \times (20 + 1) \\
& \quad = (6 \times 20) + (6 \times 1) \\
& \quad = 120 + 6 \\
6 \times 1 \text{ ones} & \quad 6 \\
6 \times 2 \text{ tens} & \quad 120 \\
& \quad 126
\end{align*}
\]

Next fourteen minutes—Show that the distributive property can be extended to more than 2 addends.
\[ a(x+b+c+d) = ab + ac + ad \]

Note: Also do this in multiplication.

\[
\begin{array}{c}
\text{20X7 ones} \\
\text{140} \\
\text{20X5 tens} \\
\text{1000} \\
\text{20X3 hundreds} \\
\text{6000} \\
\text{20X1 thousands} \\
\text{20000} \\
\end{array}
\]

\[ 20X(1000+200+50+7) = (20X1000) + (20X300) + (20X50) + (20X7) \]

Last ten minutes—Homework—Pass out homework sheet.

Remarks:
1. Cut down time for examples.
2. Stress more on working back.
   \[ aX(b+c) = (aXb) + (aXc) \]
   \[ (aXb) + (aXc) = ? \]
3. \((3X7) + (7X5) = 7X(3+5)\) Gave this problem to take up time. Use of commutative property involved also. Since students had questions, should have explained again instead of answering individuals.

Lesson Plan 2

First nine minutes—Go over homework problems.

Next fifteen minutes—Explain the distributive property through examples.

example 1
\[
\begin{array}{c}
\text{6X21} \\
\text{= 6X(20+1)} \\
\text{= (6X20) + (6X1)} \\
\text{6X1 ones} \\
\text{6} \\
\text{= 120 + 6} \\
\text{6X2 tens} \\
\text{120} \\
\text{= 126} \\
\end{array}
\]

The factor 6 is distributed over the addends 20 and 1.

example 2
Suppose you had 5 objects [ooooo]

(1) \[ 2X5 \text{ objects} = \begin{bmatrix} 00000 \\ 00000 \end{bmatrix} \]

\[ 2X \begin{bmatrix} 00000 \\ 00000 \end{bmatrix} \]
(2) Split the 5 objects into one group of 3 and another of 2. [ooo oo]

(3) Then $2X(3 \text{ objects } + 2 \text{ objects}) = [ooo \ oo]$

(4) Same as saying $2X5 = 2X(3+2)$. (Refer to diagrams.)

The two lessons are almost identical to this point. They even contain the same mistakes. At this point in the first lesson the student teacher went to the abstract or general form of the distributive property. In this lesson he has deleted this and included some additional numerical problems later in the lesson.

21 Use this example again.

\[
\begin{align*}
6x1 \text{ ones} & \quad 6x21 = 6x(20+1) \\
6x2 \text{ tens} & \quad = (6x20) + (6x1) \\
& \quad = 120 + 6 \\
& \quad = 126 \\
\end{align*}
\]

Use parenthesis for grouping to illustrate the distributive property.

(1) $5x(7+3) = \underline{\quad}$
(2) $6x(2+1) = \underline{\quad}$
(3) $6x(4+5) = \underline{\quad}$
(4) $(6x4) + (3x6) = \underline{\quad}$

Next ten minutes—Show that the distributive property can be extended to more than 2 addends.

\[
\begin{align*}
1357 \\
\times 20 \\
\hline
20x7 \text{ ones} & \quad 140 \\
20x5 \text{ tens} & \quad 1000 \\
20x3 \text{ hundreds} & \quad 6000 \\
20x1 \text{ thousands} & \quad 20000 \\
& \quad 27140 \\
\end{align*}
\]

\[
\begin{align*}
20x(1357) & = 20x(1000+300+50+7) \\
& = (20x100) + (20x300) + (20x50) + (20x7) \\
& = 20,000 + 6,000 + 1,000 + 140 \\
& = 27,140
\end{align*}
\]
Next ten minutes—Solve this problem through use of the distributive property of multiplication over addition in way shown.

\[
\begin{array}{c}
175 \\
\times 5
\end{array}
\]

It is not clear from the lesson plan whether he did this problem at the board or the students did it at their seats.

Last five minutes—Assign and start homework—Homework sheet.

Remarks: Did not give them the general form of the distributive property.

The lesson plan for the next day allowed fourteen minutes for going over homework. The next ten minutes were to be spent as follows:

Go over distributive property.
Ask students for a general form given any three numbers a, b, and c.

Under his remarks he says, "They got the right answer."

The second lesson plan is, in the opinion of the investigator, an improvement over the first on two counts. First, the student teacher recognized the need for additional concrete numerical examples before arriving at a general form for the distributive property. Second, he encouraged the students to assist in stating the generalization rather than merely presenting it to them himself.

The second pair of lesson plans was used in a second year Algebra class. They illustrate the use of a device
that the student teachers in the staggered group frequently employed in their modified lessons, namely, a study guide.

Lesson Plan 3

A. Go over homework—distance formula—15 minutes

B. Pass out graph paper and put the following on the board:

Graph the relations:
(a) \( \{(x,y) : x^2 + y^2 = 9\} \)
(b) \( \{(x,y) : (x-1)^2 + y^2 = 9\} \)
(c) \( \{(x,y) : (x-2)^2 + (y-1)^2 = 4\} \)

Hint for (a),
\[
x^2 + y^2 = 9 \quad \therefore \sqrt{(x-0)^2 + (y-0)^2} = 3
\]
10 minutes

C. Ask, "What is a circle?" If every point in a set is equidistant from a given point, say \((1,0)\), and that constant distance is \(r\), then the set of points (ordered pairs) would have to be the relation \( \{(x,y) : \sqrt{(x-1)^2 + (y-0)^2} = r\} \).

D. What of the points inside the circle? Try the point \((3,1)\).
\[
\sqrt{(3-1)^2 + (1-0)^2} = \sqrt{4 + 1} = \sqrt{5}, \text{ but } \sqrt{5} < 3, \text{ which is reasonable. The points inside the circle are not as far from the center as are the points "on" the circle. Similarly, the points outside the circle are at a greater distance from the center than are the points on the circle. Try (5,0).}
\[
\sqrt{(5-1)^2 + (0-0)^2} = \sqrt{16} = 4 > 3.
\]
5 minutes

E. Assignment: Read pages 300 and 301. On page 302, do problems 1, 4, 8, 12, 16, 20.

Remarks:

1. Do not need this much time for part A—homework.

2. A study guide would be better for parts B and C.
While reading the study guide for Lesson Plan 4, which follows this paragraph, the reader should keep in mind that the students had studied the formula for the distance between two points for the previous few days. Thus, much of the material in the second paragraph of the study guide is a review of previous work.

Alg.II Study Guide--Circles

A circle is a set of points which all have a definite geometric relationship. That is, they are all the same distance from one point, the center.

The distance from the point \((-1,3)\) to the point \((2,-7)\) is \(\sqrt{(-1-2)^2 + (3-(-7))^2}\). The distance from \((2,5)\) to \((7,10)\) is \(\sqrt{(2-7)^2 + (5-10)^2}\). The distance from \((x_1,y_1)\) to \((x_2,y_2)\) is \(\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}\),

If a set of points are all the same distance, say \(r\) units, from the point \((h,k)\), then they would be the set where if \((x,y)\) represents their coordinates, then \(\sqrt{(x-h)^2 + (y-k)^2} = r\).

For example:

\[\{(x,y) : \sqrt{x^2 + y^2} = 2\}\]

\[\sqrt{(x-0)^2 + (y-0)^2} = 2\]

is a set of ordered pairs (relation) whose graph is the circle centered on the origin with radius 2 units.

What is the graph of:

\[\{(x,y) : \sqrt{(x-1)^2 + (y-2)^2} = 5\}\]?

(It's the set of all \((x,y)\) points where the distance from each point to the point \((1,2)\) is 5.) The circle centered on \((1,2)\) with radius 5 units.

Find the equation of the circle centered on \((h,k)\) with radius \(r\) if:

(1) \(h = -1\), \(k = -1\), \(r = 1\)

\[\sqrt{(x-(-1))^2 + (y-(-1))^2} = 1\]

or \[\sqrt{(x+1)^2 + (y+1)^2} = 1\]
(2) \( h = +1 \quad k = +2 \quad r = 17 \)
\[ \sqrt{(x-1)^2 + (y-2)^2} = 17 \]

(3) \( h = -7 \quad k = +7 \quad r = 10 \)
\[ \sqrt{(x-(-7))^2 + (-7)^2} = 10 \]
or
\[ \sqrt{(x+7)^2 + (y-7)^2} = 10 \]

(4) \( h = \sqrt{2} \quad k = \sqrt{3} \quad r = 5 \)
\[ \sqrt{(x-\sqrt{2})^2 + (y-\sqrt{3})^2} = 5 \]

The equation of a circle may be "hidden" when it is expanded by operations on the equation. For example:

Look at (4) above.

\[ \sqrt{(x-\sqrt{2})^2 + (y-\sqrt{3})^2} = 5 \]
\[ (x-\sqrt{2})^2 + (y-\sqrt{3})^2 = 25 \]
\[ x^2 -2\sqrt{2}x + 2 + y^2 - 2\sqrt{3}y + 3 = 25 \]
\[ x^2 + y^2 - 2(\sqrt{2}x + \sqrt{3}y) = 20 \]

This is still the equation of that same circle, but could you recognize it as such?

Can you graph \( \{(x,y) : x^2 + y^2 - 2(x+y) + 1 = 0 \} \)? See page 301 in your book.

Lesson Plan 4

A. Go over homework on distance formula.  
   10 minutes

B. Pass out study guides on circles.  
   Circulate for any additional help.  
   15 minutes.

C. Should be able to graph \( \{(x,y) : x^2 + y^2 = 1 \} \) easily. Move on to \( (x-1)^2 + (y-1)^2 = 4 \), then to \( x^2 -6x + y^2 = 13 \). (Complete the square.)  
   10 minutes

D. Try the relation \( \{(x,y) : (x-2)^2 + (y+1)^2 \leq 10 \} \).  
   Last 5 minutes

E. Assignment: Read pages 300 and 301. On page 302, do problems 1,4,8,12,16,20.

Remarks:

1. Parts A and B were O.K.
2. Seemed to get good results with part C.
3. Part D was difficult for them.
4. Problem 1 on the homework was probably too simple. This lesson, implemented by the study guide, seemed to work much better than before. All that is on the study guide was brought out in the first class, but it seemed to help for students to have it all laid out before them in this form. Also, those who "picked it up" readily were able to get into the difficult forms near the end and their time was not wasted.

Here the student teacher strove for a higher degree of student involvement in his second lesson. Also, he permitted the more able students to work ahead on their own. He said that the same material was covered in both lessons, but there is nothing in Lesson Plan 3 to indicate that the "hidden" forms discussed at the end of the study guide were included in the previous lesson. His comments indicate that he felt the second approach to be more successful.

These four lesson plans are, in the opinion of the investigator, fairly typical of those submitted by the student teachers in this experimental group. They were presented to illustrate the type and extent of self-criticism practiced by these student teachers.

The Dual Experiment

The reader will recall that the dual experiment involved having two student teachers share the same class. At any given time, one acted as teacher (T) and the other as observer (O). Their roles changed at intervals of one to two weeks. For short units of work, one taught the
entire unit. With longer units, each student teacher taught roughly half the unit. On a few occasions, when the class was involved in supervised study, they both acted as teachers and assisted individual pupils.

The observers were not given any special instructions as to what to look for. It was assumed that the criticisms of their own lessons offered by the cooperating teachers and college supervisors would serve as a partial guide. Also, it was hoped that as they settled into the routine of planning for and teaching their own lessons, they would become more aware of some of the basic problems of teaching and be in a better position to recognize the mistakes of others. The comments which several student teachers made to the investigator seemed to substantiate this.

Four sets of lesson plans and observer's comments appear in the following pages. Each lesson plan is the work of a different student teacher. Thus, each student teacher in this phase of the experiment is represented twice in the work that follows—once as a teacher and once as an observer. The first lesson plan was used in a first year Algebra class.
Lesson Plan 5

Spend first five minutes on previous night's homework.

A. Ten minutes—Inverse Operations
   1. What is the opposite of the following?
      a) coming to school
      b) closing your book
      c) buying a car
      d) building a fire
   2. What is the inverse process you use on the following?
      a) adding n to 19
      b) adding 19 to n
      c) multiplying x by 7
      d) dividing x by 2
   3. Definition—Inverse—a process or operation which "undoes" another process or operation.
   4. What is the inverse operation of
      a) addition
      b) multiplication
      c) subtraction
      d) division

B. Fifteen minutes—Subtraction Axiom
   1. Number game
      a) I am thinking of a certain number. If I add 4 to this number, the result is 10. What is the number?
         \[ n + 4 = 10 \]
      b) Do more such examples.
         \[ n + 6 = 7, \quad n + 5 = 11 \]
      c) Have students ask two or three of these.
      d) How would you write an equation to express these problems?
         1) What did you do to find the missing number? (Make sure they say subtract from both sides.)
         2) How do you know that it is correct?
      e) Have students give more sample equations.
      f) Solve them like this.
         \[
         \begin{align*}
         n + 4 &= 10 \\
         \underline{-4} & \quad \underline{-4} \\
         n &= 6
         \end{align*}
         \]
g) What is the solution set of 
\[ n + 4 = 10 \]?
h) What is the solution set of 
\[ n = 6 \]?
i) Definition—Equivalent equations—
two equations having the same 
solution set.
j) What did we do to get the second 
equation?
k) When we subtract the same number 
from both sides, what seems to 
be true of the resulting equation 
and the first equation?
l) State the subtraction axiom--If 
you subtract the same number from 
both sides of an equation, the 
resulting equation has the 
same solution set as the original 
equation.

C. Seven minutes—Addition Axiom

1. What might you guess would be true 
if we added the same number to both 
sides of an equation?
2. Ask for several examples, e.g.,
\[ n - 6 = 7 \]
adding \[ + 6 + 6 \]
\[ n = 13 \]
3. Have students verbalize this axiom.
4. Exercises p. 44, problems 1 to 9.

D. Eight minutes—Introduction to Problems 
Depending on Axioms. Exercise p. 45, 
problems 1, 2, 4, 5, 6, 7.

E. Assignment—p. 44; 13, 14, 15 
p. 45; 10 to 14 
p. 46; 1 to 4 
Include steps and state axioms. For 
example:

\[ n + 3 = 5 \]
\[ - 3 - 3 \]
\[ n = 2 \] subtraction

axiom
T's Comments on Own Lesson

Students seemed bored with this lesson. Part of the reason I found out later is that they have been using these ideas and terms many times previously. Questions which I asked were answered rapidly and correctly in most cases. However, when students began on homework, a few had difficulty. It seemed I had not made the point clear that we were solving equations to find the values which could be substituted for the unknown and would satisfy the equation. Also, the idea of an inverse operation was not connected with solving an equation.

Observer's Comments

Subject: Inverse operations, addition and subtraction axioms.

Good points: T's transition from one subject to another, specifically from his number game to working equations; not as abrupt as it had been.

Criticisms: 1. In asking one student a question, the question should be phrased before calling on any student. He lost some of the other students.

2. Kids seem to pep up just having something to do, taking out their homework, anything. We should think about them having something to do, i.e., a physical break of some kind.

3. When T assigned homework on the addition and subtraction axioms, he asked them to show what they were adding to or subtracting from both sides of the equation and what axiom they were using. His example on the board was:

\[ x + 2 = 12 \]
\[ \text{and he subtracted } 2 \]
\[ \text{from both sides} \]
\[ \frac{x}{1} = 10 \]

One student asked, "Why do we have to subtract 2 from both sides?" and T interpreted the question as meaning that the student was too lazy to want to do it, and that was the way it sounded. However, had he thrown the
question back at the class, he might have gotten some good answers. Also, as it turned out, the student really didn't understand the process and what it was accomplishing.

The next lesson plan was written by the person who observed the previous lesson--their roles had changed. Again, it is a class in first year Algebra.

Lesson Plan 6

Topics to be covered: Combining like terms in an equation. The distributive law in equations. Word problems.

Pass back quizzes--most missed the statement of division axioms and combining like terms.

Introduce combining like terms through the following problem: "Think of a number, double it, subtract the original number, add three times the original number. Tell me your answer and I will tell you what the original number was." Show how this is related to $2n - n + 3n = 4n$.

Work these problems that involve combining like terms:
1. $25 = 4n - 2n + 6n - n - 10$
2. $a + 8 + 5a - 3a = 17.3$

Talk about the distributive law. What is it?

Have students work these examples:
3. $18 = 6(a + 2) - 2a$
4. $(3/4)(a + 4/3) - (1/2)a = 10$

Can be extended to more than the sum of two terms:
5. $3(2a + 7 - a) = 23$

Go over homework problems: Page 60; 1,3,4,5.
1. \( n + 5n = 42 \)  
   \( 6n = 42 \)  
   \( n = 7 \)  
   \( 5n = 35 \)

3. \( n + 2n = 7.50 \)  
   \( 3n = 7.50 \)  
   \( n = 2.50 \)  
   \( 2n = 5.00 \)

4. \( n + 3n + 6 = 102 \)  
   \( 4n = 96 \)  
   \( n = 24 \)  
   \( 3n + 6 = 78 \)

5. \( A + 2A + 3A = 180^\circ \)  
   \( 6A = 180^\circ \)  
   \( A = 30^\circ \)  
   \( B = 60^\circ \)  
   \( C = 90^\circ \)

These problems were, no doubt, the solutions to verbal problems from the text. Problem 5 in particular suggests this since there is no "B" or "C" in the equation.

Have students write their own problems. For example: My mother is 86 years older than my father. Together their ages total 110 years. How old is each of them? Cautions: Your examples may contain 2, 3, or 4 numbers, but they should be related to the first. Don't multiply the numbers by each other or you will get a second degree equation. You may multiply by other known numbers. Try to use distributive law.

Work the problems which the students have made up.

Homework assignment--Page 55; 8, 13, 18, 19.  
Page 56; 7, 10, 16.  
Page 61; 10, 11, 14, 16, 17, 19.

T's Comments on Own Lesson

The puzzle to find the missing number worked quite well--however, I didn't emphasize the point enough. Having them write their own problems was a good motivating device--however, not all students were able to write good problems. I must watch the board--sometimes I stand in the way.
Observer's Comments

I liked your idea for introducing combining terms in an equation. It seemed to spark some interest or enthusiasm in the class. However, I think you should have re-emphasized the idea before going on to the next topic. Watch which side of the board you’re on when you’re working a problem on the board. I couldn't see and I suppose the others on my side couldn't see either. I know that no matter which side of the board you’re on, someone won't be able to see, so I suppose it's best to shift from side to side as you work a problem—explaining what you are doing.

To get through the homework problems more rapidly, why not send students to the board. Then discuss only those problems which several students have missed. Or, perhaps you could read the answers and then discuss those which have caused trouble, also sending students to the board.

Speak louder—I think it would give you more authority in the class. Don't forget the girls in the back. (The physical arrangement of this class is not the best and here is where part of the problem lies I know.)

When having the students write their own problems, consider the following:
1. Be more specific.
2. Give an example before—explain this example.
3. Motivation—change of pace—adds a little spice to the class!

The next two lesson plans are the work of a different pair of student teachers. These plans were used in an eighth grade General Mathematics class.

Lesson Plan 7

Introduction: Write my name on board.
Class routine to be followed—paper and pencil every day.
Discipline—When I talk you are quiet, and I will listen to you when you raise your hands. If you
are reprimanded more than once
during one class period, you will
receive an F for the day. This
will affect your grade.

This rather stern introduction was prompted by the
way the class had behaved for the other student teacher
during their first unit with him. They had frequently been
noisy and inattentive.

Preview of unit:
Learn how to spend money: Discount sales—
% of discount
Buying cars—
loans from banks

Learn how to save money: Savings accounts
Savings bonds

Putting money to work: Life insurance

First let's spend money. (Put newspaper clip­
ing on opaque projector.)

Write on board:
R = regular price
%D = per cent of discount
$D = discount in dollars
X = sales price

Take this example from newspaper clipping:
R = $ 78.00, %D = 20%, find $D, S.

Find more examples like this in paper.

Find %D from $D/R. First example,
$31.20/$78.00. Give more examples from
paper.

Homework: From articles handed out in class,
find %D. Be ready to present your problem
in class.
Observer's Comments

Introduction: The class seemed to respond favorably to T's talk—he told them what he expected of them, and asked them what they expected of him. They gave good, fairly serious answers to his question. However, they didn't stay quiet for too long.

Preview of the unit: Several of the students were not paying attention; some were talking among themselves, one was writing (this boy usually does little private activities at his desk, however). One boy that we had trouble with concerning his paying attention was actually listening, which made us glad.

Opaque projector: Many were curious, and there were often several eyes on the projector, not on the screen. T had the students work the discount problems at their seats, and the class was commendably quiet during this time.

The students were being shown problems such as $34.00/$155.00. Before dividing, the four zeros could have been cancelled out of the problem, making it easier for the students to divide.

It was hard to keep the class from getting out of order, even though they had been warned that they would get an F if they were talking out of turn. At the very end of the period, the class was quite noisy.

The reader will note that O devoted most of his comments to a discussion of discipline. The investigator feels that there were two main reasons for this. First, this particular class was one that did often get out of hand and it continued to give the two student teachers trouble for the duration of their stay. Second, O had had quite a bit of trouble with them during the previous week, and his mind was "set" to notice any trouble of this sort.
Lesson Plan 8

Introduction to Bases Other Than Ten.

1. Write 23 x's on board—group by tens.
   2 tens, 3 ones—grouping by tens called
   base ten
2. Why base ten? ten fingers
   If one hand, then five fingers—base five
3. Group 23 x's by fives. 4 fives, 3 ones.
   New system—base five
4. Write 9 dots on board.
   Group by tens—0 tens, 9 ones.
   Group by fives—1 five, 4 ones.
   Group by eights—1 eight, 1 one.
   Group by nines—1 nine, 0 ones.
5. Now take 12 in base ten—to change to
   base five, draw x's and regroup by fives.
   1 ten, 2 ones = 2 fives, 2 ones.
   When we write a number in base five, we
   will write "five" after the number. That
   is, "12five" will mean 1 five, 2 ones.
   Draw this number of x's—seven x's in
   base ten.
6. 26eight becomes 2 eights, 6 ones = 22ten.
7. Students given worksheets to do in class.
   Answers gone over.
8. Three problems for homework.

Here is a copy of the worksheet that the students
used during the class period. It had been reproduced on
a spirit duplicator.

Name __________________

xxxxx Group by tens.
xxxxx How many groups of ten?__________
xxxxx How many ones left over?__________
   Write the number of x's in base ten._____

xxxxx Now group by fives.
xxxxx How many groups of five?__________
xxxxx How many ones left over?__________
   Write the number of x's in base five._____

xxxxx This time group by fours.
xxxxx How many groups of four?__________
xxxxx How many ones left over?__________
   Write the number of x's in base four._____


Draw 17 x's
Group by sixes.
How many groups of six?_____
How many ones left over?_____
Write the number in base six.___ ___

The number 24five has how many groups of five?
____ how many ones left over?_____

Draw 24five x's.
Group by tens.
How many groups of ten?_____
How many ones left over?_____
Write the number in base ten.___ ___

In the comments that follow, the observer has used marginal numbers that agree with those in the lesson plan.

Observer's Comments

1. Should have followed step 2.

2. Should have come first in lesson; a brief discussion of why we have a system based on ten. Also show that we used other bases, e.g., 60 with minutes, seconds, etc., in our everyday lives.

Some purpose for studying numeration systems with bases other than ten seemed to be necessary, since several students asked, "Well, why not just use base ten, it's easier."
The teacher was unable to justify his lesson and ignored this question.

3. Base five; students seemed to do well with this; I believe they could group better with this base since it is so closely related to base ten.

4. Stick to one base--students were not able to switch to so many different bases on the first day.

5. Should review how we regroup in base ten. Have 0,1,2,....,9 then we regroup and use only these symbols again. It was not at all clear to students that in base five, the only symbols used were 0,1,2,3,4.
6. Should not switch to another base.

7. Students asked far too many questions; teacher had to go all over class to answer questions; many students finished early and talked, causing quite a disturbance. Should place time limit on worksheet or when there are so many questions just go over explanation again.

8. Again too many different bases—should have more problems with just base ten and one other base, probably the best would be five.

General Comments

In reading base numbers, say the number 12five, T should say, "one two base five," not, "twelve base five." I feel this method of reading numbers when working with bases is less confusing. Students visualize everything in base ten instead of the base they are working with.

In going over worksheet, teacher asked, "Does 18 = 33five?" I think the question should be, "Does this represent or symbolize the same number of things?" This brings up one point which I feel should have been introduced and stressed—that our numerals are merely symbols for a certain amount of things. The numeral concept should have been a main point of the lesson—it was not mentioned at all.

Students said, "O.K., write twelve as 22five, but it's still twelve." To me this indicates they missed the whole point of the lesson.

More work should have been done working with base ten—so that students were aware of place value before going on to other bases. I feel the concept involving the significance of place value should have been stressed—thus bringing more understanding to place value in other bases than our own.

Discipline in class was poor, students talked out, got out of seats, talked to neighbors—were unable to see purpose in lesson. Teacher must correct students talking out. He must project his voice, speak much louder and project himself to the class. He did not do so and consequently he had very little control over the class.
Teacher used no authority, book, for basis of lesson. He based all lessons in unit on what he had learned in high school and had no reference material. I feel this was a handicap—if he would have had some source materials to indicate methods for introducing bases and suggested methods and problems the lessons in series probably would have been much more complete and moved faster—more interesting.

Again, the four sets of lesson plans and comments in this group were thought to be typical of the work done by the student teachers in this group throughout the study.

The Questionnaire Experiment

This phase of the study involved having the student teacher's pupils supply him with feedback by means of anonymous comments and rating sheets. As was true with the other experimental programs, one instance of this program was tested during the Autumn Quarter.

The student teachers in this phase of the experiment were asked to introduce the questionnaires in their own words. The investigator read the following sample introduction to them as an example of what they might say.

I will be here for ten weeks as a student teacher. This is probably the most important part of my preparation for teaching. I would appreciate it if you would help me by answering some questions about my teaching. I do not want you to sign your names to these sheets and you should feel free to give your honest opinions. I hope that you will be willing to do this for me several times during my stay here.
The first questionnaire used in the Autumn Quarter took the form of a ten-item rating sheet with one free response item at the bottom. The directions and the format for the multiple choice items followed those described in an article by Horace B. Reed (15:484). The items to be included were proposed by the student teacher and the college supervisor and touched on areas in which the student teacher might be rated weak by his students. A copy of this first questionnaire follows:

Questionnaire 1

Teacher ______ Class ______ Date ______

Write the number of your answer in the space at the left of each statement. Remember that there are no right or wrong answers. Be sure to give your honest opinion.

1. His voice is pleasant and easy to listen to...
   1-always 2-usually 3-sometimes 4-seldom 5-never

2. His voice is loud enough to be heard easily...
   1-always 2-usually 3-sometimes 4-seldom 5-never

3. The words he uses are hard to understand...
   1-very often 2-often 3-sometimes 4-few times 5-almost never

4. He seems to talk to just one or two students...
   1-very often 2-often 3-sometimes 4-few times 5-almost never

5. He uses the chalkboard to write important words and show sample problems...
   1-very often 2-often 3-sometimes 4-few times 5-almost never
6. It is hard to see what he writes on the board...
   1-very often  2-often  3-sometimes
   4-few times  5-almost never

7. His writing is easy to read...
   1-always  2-usually  3-sometimes
   4-seldom  5-never

8. He seems to understand the questions that students ask...
   1-always  2-usually  3-sometimes
   4-seldom  5-never

9. He gives clear answers to students' questions...
   1-always  2-usually  3-sometimes
   4-seldom  5-never

10. When he assigns new work, his directions are clear and easy to follow...
    1-always  2-usually  3-sometimes
     4-seldom  5-never

Can you think of anything he should do to improve his teaching? Please write your answer below.

The results of Questionnaire 1 were somewhat surprising in that the pupils gave the student teacher a high rating on all ten items despite the fact that these items were chosen to poll opinion in areas in which he might be considered weak. Both the student teacher and the college supervisor felt that the answers to the free response item were more helpful.

In constructing the second questionnaire, questions were based on the answers to the free response item of Questionnaire 1 in addition to suggestions from the student teacher and the cooperating teacher. Also, the second questionnaire had two free response items rather than one.
It was felt that pupils might be more willing to be critical of the student teacher if they first had a chance to praise his work. A copy of this second questionnaire follows:

Questionnaire 2

Teacher__________ Class_____ Date______

Your answers will help your teacher to do a better job. Think of some good teachers, and then think of how this teacher compares to them. Write your answers in the space at the left of each statement. Use the following key.

1) I disagree strongly.
2) I sort of disagree.
3) I'm not sure.
4) I sort of agree.
5) I agree strongly.

___ 1. He spends too much time on things most people know.

___ 2. His homework assignments are too long.

___ 3. He spends too much class time going over homework.

___ 4. We should spend more time working ourselves and less time listening to his explanations.

___ 5. He always knows the answers to the mathematics problems.

___ 6. His explanations are clear and easy to understand.

___ 7. He goes too fast in class.

___ 8. He is always willing to help his students.

___ 9. He makes mathematics interesting.

___10. His tests and grades are fair.
What do you like best about this teacher?

What suggestions can you make to help him become a better teacher?

The pupil responses to this questionnaire, while high, were more critical than those on Questionnaire 1. Again, the answers to the free response items seemed more helpful in the opinion of the student teacher.

The student teacher used each of these questionnaires in both of his classes. As a result, he had four samples of pupil-feedback. One interesting item that was noted was that his eighth grade students were more critical than his seventh grade students. This appeared to be true throughout the experiment, i.e., older students were more critical than younger students.

As a result of the experience of the Autumn Quarter, the investigator decided to use only free response items on the first two questionnaires for the Winter Quarter. A copy of the first questionnaire used in the Winter Quarter follows:

Questionnaire 3

Do not sign your name to this paper.

Student Teacher's Name    Class    Date
Would you please give honest and thoughtful answers to the two questions below? Your opinions can be very helpful. Thank you.

1) In your opinion, what are this student teacher's strong points?

2) What things do you think this student teacher should try to correct or improve in order to be a better teacher?

The actual questionnaire filled one side of an 8 1/2 x 11 inch sheet of paper. The questions were spaced in such a way as to leave room for the pupil to write his answer directly under the question. Here are some of the answers to the first question that one student teacher received.

He doesn't go over our level even though he is smarter in math than we are. He doesn't force his way of doing things on us. He is a nice guy and he tries to keep our minds going in the problems. He has a strong personality and isn't shy like most student teachers. He gives us tests that are challenging, not easy.

He's cheerful about his work and he's fun and although we learn a lot, we also (and in my opinion this is more important) enjoy learning and being in his class. He's fair. He doesn't pick favorites.

He has a good sense of humor and it is fun to have him teaching us. He lets us do the work instead of him. I think this is good. The way he teaches class is interesting, doing boardwork, etc.
Here are some answers to the second question received by the same student teacher:

Check with teacher first to find out how she had taught the class. He told us some new things and a different way to do problems that got us confused because we had already learned it one way.

He spends too much time on one problem. If the problem starts out wrong he won't say anything and will just let the person go ahead and finish it. I'm not saying this is bad, it probably even helps you. It's just that it takes too much time of the limited 42 minute period.

Don't expect everyone to know the answers to questions right away and before that type of problem has been discussed. Let us have some time to think.

In response to the second question, one student teacher had 22 of 31 students, just under 71%, complain about his lack of discipline. One said, "He should make the kids respect him more, be quiet while he's trying to teach because others can't learn anything with that noise."

The investigator felt that this would have a greater impact on him than anything his college supervisor could say. Apparently it did have some effect since on a subsequent questionnaire only 9 of 30, or 30%, still felt that discipline was a big problem for this student teacher. However, not everyone was pleased with the change for one student said, "He used to be nice but now he's too strict. I think he could be mean in a nicer way."
The second questionnaire was designed with the aim of eliciting comments on more specific teaching techniques. Its wording was as follows:

**Questionnaire 4**

*Do not sign your name to this paper.*

**Student Teacher's Name**  **Class**  **Date**

Please think about the lessons your student teacher has presented in the last two or three class days.

1) What are some of the things you liked about the way the student teacher taught these lessons?

2) In your opinion, what are some of the things about these lessons that could have been better?

Thank you for your help.

In response to the first question, 8 of 28 pupils in one class replied that they had enjoyed the use of the overhead projector and felt it had made the lessons more interesting and easier to follow.

Another student teacher had four of his students commend him for the interest he showed in their homework papers. One said, "Many teachers, I think, give homework just to be doing something, but he is very interested in homework and goes over it carefully." A second said, "He
went over each question carefully and collected the homework and looked at what we were doing wrong."

The next questionnaire made use of the multiple choice item format. The investigator examined the results of questionnaires 3 and 4 and identified those comments that had been made frequently by the pupils of several student teachers. The multiple choice items were selected so as to poll pupil opinion on those points. Many of the questions had been used on questionnaires 1 and 2 during the previous quarter.

**Questionnaire 5**

*Do not sign your name to this sheet.*

<table>
<thead>
<tr>
<th>Student Teacher</th>
<th>Class</th>
<th>Date</th>
</tr>
</thead>
</table>

Write your response in the space at the left of each statement. Use the following key:

1) I disagree strongly.
2) I sort of disagree.
3) I am not sure.
4) I sort of agree.
5) I agree strongly.

1. His writing at the board is easy to read.
2. He spends too much time going over homework.
3. His voice is loud enough to be heard easily.
4. He goes too fast in class.
5. He should have students work at the board more often.

6. His explanations are clear and easy to understand.

7. He spends too much time on things most people know.

8. When he gives assignments, his directions are clear and easy to follow.

9. He uses words that are hard to understand.

10. He does a good job of controlling the class.

In your opinion, what is this student teacher's biggest problem and what should he do about it?

One student teacher had 11 of 33 pupils, roughly 33%, express the opinion on the free response item that he was going too fast and should slow down.

The investigator felt it would be informative to give some examples of the type of responses given to the ten items at the top of the page. The following two tables show the manner in which the pupil responses to Questionnaire 5 were distributed for two different student teachers.
The reader will note that the responses on items 2, 4, 5, and 6 are somewhat critical. That is, eight people thought that perhaps "he spends too much time going over homework," four people agree "strongly" and nine others "sort of agree" that "he goes too fast in class," six agree "strongly" and four "sort of" that "he should have students work more at the board," and one "disagrees strongly" and eight "sort of disagree" that "his explanations are clear and easy to understand."
These opinions tallied closely with those of the investigator in his role of college supervisor. This particular student teacher was prone to spend too much time going over homework and, as a result, he frequently had to rush his explanations of new work and, as a consequence, these explanations were often confused. When he followed the advice of his students and had them work at the board more often, he was able to cover the homework in less time and the other two problems became less acute.

**TABLE 2**

**DISTRIBUTION OF PUPIL RESPONSES ON QUESTIONNAIRE 5 FOR STUDENT TEACHER 2**

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<thead>
<tr>
<th>Item Number</th>
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<th>3</th>
<th>4</th>
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<td>5</td>
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</table>
In this case the pupils were more critical. Items 1, 4, 5, 6, and 10 received unfavorable pupil responses. That is, the pupils were critical in the areas of writing, pace, boardwork by pupils, explanations, directions, and discipline.

The next questionnaire had a format similar to that of Questionnaire 5. A copy of this last questionnaire follows:

Questionnaire 6

Do not sign your name to this sheet.

Student Teacher    Class    Date

Write your response in the space at the left of each statement. Use the following key:

1) I disagree strongly.
2) I sort of disagree.
3) I am not sure.
4) I sort of agree.
5) I agree strongly.

____ 1. He is always friendly and considerate.

____ 2. It is often hard to see what he writes on the board.

____ 3. He seems to understand the questions students ask.

____ 4. He gives clear answers to students' questions.

____ 5. His homework assignments are too long.

____ 6. We should spend more time working ourselves and less time listening to his explanations.
7. He is always willing to help his students.
8. He tries to make mathematics interesting.
9. His tests and grades are fair.
10. He has a good knowledge of mathematics.

What do you like best about this student teacher?

This was the last of the questionnaires used in this part of the experiment. The pupil responses did not differ appreciably from those on the previous questionnaires.

The Evaluation Instruments

In considering possible evaluation instruments for the study, the investigator kept two thoughts in mind. First, considering the small number of student teachers involved in the experiment it was thought desirable to have several different people evaluate the performance of each student teacher. Consequently, an instrument that did not require special training seemed best. Second, since the investigator had frequently seen otherwise satisfactory lessons marred by a teacher's inadequate understanding and explanations of the mathematical concepts involved, it was felt important to have competence in the subject matter field reflected in some of the evaluations.

The investigator decided to make use of four different groups of evaluators, namely, the student teachers
themselves, their cooperating teachers, their college supervisors, and their pupils.

A search of the literature uncovered several teacher rating sheets designed for use by one's pupils. At the suggestion of Professor L. O. Andrews, the Coordinator of Student Field Experience at The Ohio State University, the investigator decided to use the Pupil Rating of Student Teachers which appears on page 303 of Guiding Your Student Teacher by Curtis and Andrews (2:303). A few modifications of wording were made and several items were deleted. The following is a copy of the Pupil Rating of Student Teachers that was used in this experiment.

Teacher ________  Class ________  Date ________

PUPIL RATING OF STUDENT TEACHERS

In general, how good a teacher is this student teacher? In the blank opposite the word RATING below, place a 1, 2, 3, 4, 5, 6, or 7 to indicate what you think would be a proper rating for this student teacher on this scale.

Scale: (1) as poor as any teacher could be  
(2) a little better than the poorest  
(3) not quite as good as the average  
(4) like the teacher you consider average  
(5) a little better than the average  
(6) not quite as good as the best  
(7) as good as any teacher ever is

RATING ________  

In order to help this student teacher discover his strong and weak points, read the following list all the way through. Then check in the left hand column those characteristics in
which you think he is especially strong, and in the right hand column those in which you consider him rather weak. Please don't check any item on which this student teacher appears to be about as most teachers are.

<table>
<thead>
<tr>
<th>Especially Strong</th>
<th>Rather Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is fair and plays no favorites</td>
<td>1. ___</td>
</tr>
<tr>
<td>2. Knows his subject and can really answer questions.</td>
<td>2. ___</td>
</tr>
<tr>
<td>3. Has work well planned with interesting things to do.</td>
<td>3. ___</td>
</tr>
<tr>
<td>4. Has a pleasant, easily understood voice.</td>
<td>4. ___</td>
</tr>
<tr>
<td>5. Helps us when we need it, but not too much.</td>
<td>5. ___</td>
</tr>
<tr>
<td>6. Makes class interesting with a variety of activities and materials.</td>
<td>6. ___</td>
</tr>
<tr>
<td>7. Gives us plenty of chance to take part and do things on our own.</td>
<td>7. ___</td>
</tr>
<tr>
<td>8. Is always cheerful and friendly.</td>
<td>8. ___</td>
</tr>
<tr>
<td>9. Is forceful and firm, but not too strict.</td>
<td>9. ___</td>
</tr>
<tr>
<td>10. Explains things clearly, and is patient if we fail to get it.</td>
<td>10. ___</td>
</tr>
<tr>
<td>11. Has many worthwhile interests in life, and shares them with us.</td>
<td>11. ___</td>
</tr>
<tr>
<td>12. Is willing to face the facts and admit his own mistakes.</td>
<td>12. ___</td>
</tr>
<tr>
<td>13. We really learn a lot when we have this student teacher.</td>
<td>13. ___</td>
</tr>
<tr>
<td>14. Is quick to catch on to new and different situations.</td>
<td>14. ___</td>
</tr>
<tr>
<td>15. Can be depended upon to do what he says he will do.</td>
<td>15. ___</td>
</tr>
<tr>
<td>16. Knows the practical side of his subject and helps us to see it.</td>
<td>16. ___</td>
</tr>
<tr>
<td>17. Has self-control; doesn't lose his temper or become excited easily.</td>
<td>17. ___</td>
</tr>
<tr>
<td>18. Has no annoying habits or mannerisms that bother us.</td>
<td>18. ___</td>
</tr>
<tr>
<td>19. Is able to see our side of a problem.</td>
<td>19. ___</td>
</tr>
<tr>
<td>20. Has a sense of humor and isn't afraid to laugh when things are funny.</td>
<td>20. ___</td>
</tr>
</tbody>
</table>
If there are other comments you would like to make, use the back of this sheet. Please do not sign your name to this rating sheet. Thank you.

For the purpose of evaluating the performance of the student teachers, only the numerical rating at the top of the sheet was used. At Professor Andrews suggestion, the effect of extreme answers was reduced by eliminating those ratings that fell in the top 10 per cent or the bottom 10 per cent. Thus a composite pupil rating was arrived at by taking the average (arithmetic mean) of the central 80 per cent of all the pupil ratings for a given student teacher.

In devising a rating sheet to be used by the three groups of adults, the investigator made use of the directions and format of a rating sheet found in the appendix of A Study of the Relationship Between Observed Classroom Behaviors of Elementary Student Teachers, Predictors of those Behaviors, and Ratings by Supervisors by Wilk and Edson (11:A-2.1). Several of the items on their rating sheet suggested items to be included on the rating sheet designed by the investigator, but no item appears in exactly the same form as it did on the Wilk and Edson rating sheet.

Having decided to employ a rating sheet, the investigator examined many rating sheets found in the literature or offered by colleagues in an attempt to formulate a reasonably comprehensive set of items. Those which ultimately proved to be most helpful were the one by Wilk and Edson
mentioned previously, a second which had been used by Professor Harold P. Fawcett when he was supervising student teachers in mathematics at The Ohio State University, and a third used by Mr. Harry Ebert in supervising student teachers of English at The Ohio State University.

Preliminary versions of the rating sheet were submitted to the investigator's adviser, Professor Harold C. Trimble, a member of his reading committee, Professor F. Joe Crosswhite, and several of his fellow graduate students. Their suggestions were incorporated in the following version which was approved by Professor Trimble and Professor Crosswhite.

Teacher _________ Date _______ Observer _______

From your observation of the classroom behavior of this student teacher, rate each of the statements below using the following key. Your rating should reflect your judgment of the extent to which each statement would be generally true.

Key:  1. Almost never.  
2. Less often than most teachers.  
3. As often as most teachers.  
4. More often than most teachers.  
5. Almost always.  

____ 1. Gives evidence of thorough preparation for his class.  
____ 2. Maintains a pleasant and professional classroom atmosphere.  
____ 3. Holds the attention of his students.  
____ 4. Encourages exchange of ideas in the classroom.  
____ 5. Encourages pupils to assume responsibility.  
____ 6. Exhibits enthusiasm for the subject he is teaching.  
____ 7. Sets reasonable tasks for his students and sees that they are completed.
8. Demonstrates confidence in his students.

9. Treats students with courtesy and respect and avoids use of sarcasm.

10. Relates subject matter to actual life situations.

11. Capitalizes on student questions and suggestions.

12. Proceeds from the concrete to the abstract in presenting new material.

13. Encourages students to think for themselves rather than accept ideas on authority.

14. Uses a good variety of teaching techniques.

15. Assists pupils of all levels of ability to participate.

16. Succeeds in getting student participation.

17. Gives ample opportunity for students to demonstrate their level of understanding.

18. Takes time to prepare models, worksheets, visual aids, etc.

19. Is proficient in the technical aspects of communication, i.e., good speech, legible handwriting, etc.

20. Provides challenging problems for his students.

21. Seems aware of class reaction to his presentations.

22. Makes efficient use of class time.

23. Responds well to suggestions and criticism.

24. Employs creative ideas in classroom presentations.

25. Makes use of history of subject, applications, puzzle problems, etc.

26. Responds well to unexpected or unusual questions.

27. Gives lucid explanations of his subject.

28. Makes it a point to emphasize important aspects of his lesson.

29. Seems knowledgeable in areas other than his own subject.

30. Recognizes his own strengths and weaknesses.

What do you like best about this student teacher?

As a means of helping this student teacher, please suggest one or two things that you think he could do to become a better teacher.
Using the Evaluation Instruments

Each of the four groups of evaluators rated the student teachers twice during the ten week teaching period. The first rating was made during the fifth week and the second during the tenth week.

The first rating was made at a time when the pupils had had a chance to become acquainted with the student teachers and when the student teachers in the experimental groups had had a chance to familiarize themselves with their particular routines. For example, by the fifth week each student teacher in the dual experiment had had the opportunity to act as teacher and as observer at least once.

A period of four to five teaching weeks elapsed between ratings. If the various experimental schemes had merit, the student teachers who employed them should have improved as student teachers at a more rapid rate than those in the control group. The differences between the initial and final ratings were considered a measure of such improvement.

By working with differences, it was hoped that as much as possible of the variation due to individual and institutional differences would be eliminated. For example, a given student teacher who had a self-critical nature and gave himself a low initial rating probably did not change radically during the four to five week interval and there-
fore tended to rate himself low on the second rating also. Thus, the difference between the ratings might still be considered a measure of the extent to which he had improved in his own opinion.

Similarly, some cooperating teachers were more critical than others but, if they were consistent, the differences in their ratings should have been comparable.

The student teachers made their self evaluations during two of the weekly seminars which they had with their college supervisors. Also, the distribution and collection of the pupil rating sheets and the cooperating teachers' rating sheets was done during these seminars.

The rating sheets for the cooperating teachers were placed in unsealed envelopes bearing the following message.

Dear Miss Blank,
As soon as it is convenient for you, would you please fill out the enclosed rating sheet for John Doe, seal it in this envelope, and return it to John so that he may bring it to our seminar next Tuesday. He will not see your rating.
Thank you for your help.

When the student teachers were given the pupil rating sheets to be used in their classes, they were also given the following sheet of instructions.

Please keep the following points in mind when using the Pupil Rating of Student Teachers.

1. Choose a "neutral" day to use them. The day after a difficult test, for example, would be a poor choice.
2. Use the first ten minutes of the period for this rating.

3. Be sure the students understand they are not to sign their names to these.

4. Before you start, write your name, the class (Algebra 9 say) and the date on the board for the students to refer to in filling out the heading.

5. Point out to them the one space where a numerical rating is entered.

6. Be sure they understand that check marks are to be used on the bottom of the sheet.

7. Before you collect them, ask the pupils to check that they have filled out the heading properly and that the numerical rating is where it belongs.

8. While they are filling out these sheets, you should remain at the front of the room in a position that will not permit you to see what is being written on any paper.

Please use this rating sheet as soon as it is convenient for you. If you are on campus during the day, I would appreciate it if you would return the completed sheets to my office, Room 275 Arps Hall. Otherwise, bring them with you to next week's seminar.

If you have any questions, I can usually be reached at one of the following telephone numbers:

<table>
<thead>
<tr>
<th>Office</th>
<th>Home</th>
</tr>
</thead>
</table>

Thanks for your help.

These points were discussed in the seminar and the student teachers were given an opportunity to ask questions.

The investigator received fine cooperation from the student teachers, their pupils, and their cooperating teachers. The mechanics of distribution and collection went smoothly each time the ratings were made.
CHAPTER III

DATA AND DISCUSSION

The Nature of the Tables

In the tables that follow, each of the student teachers in the study has been designated by a single letter of the alphabet. The members of the control group are represented by the lower case letters a through m, those in the staggered experiment by the upper case letters A through E, those in the dual experiment by the upper case letters K through N, and those in the questionnaire experiment by the upper case letters T through Z. These letters appear in the column called "Identification."

Under the headings "Self Evaluation," "Cooperating Teacher," and "College Supervisor," the reader will find two-digit or three-digit numbers which represent the scores assigned to the student teacher in question by the evaluator corresponding to that column. These numbers are simply the total scores from the thirty-item rating sheets. The totals were determined by the investigator and each was checked twice.

The entries in the "Pupil Rating" column are the arithmetic means of the numerical scores, one through
seven, assigned by the pupils being taught by the student teachers. The top 10 per cent and the bottom 10 per cent of the ratings were deleted before the mean was calculated. The computations were done on a desk calculator.

For the student teachers in the dual experiment, only the classes they taught by themselves were asked to evaluate them. It was felt that the shared classes, seeing them as teachers only half the time, were not sufficiently acquainted with their work to evaluate them.

The calculation of arithmetic means and standard deviations was done at the Computer Center of The Ohio State University. The conversion to standard or z-scores was done by the investigator with the help of a desk calculator.

**The First Rating**

As is frequently the case with rating sheets, the scores on the first rating sheets were skewed toward the upper end of the scale. Of the 87 ratings in the first three rating-columns, 74 were above the "average" scores of 90, i.e., a rating of three on each of the thirty items. Thus after less than five weeks of teaching experience, our student teachers earned "above average" ratings better than 85 per cent of the time!

The Pupil Ratings were even more generous since all nineteen of them were above four, the "average" rating
according to the Pupil Rating of Student Teachers. These scores would seem to indicate the inherent danger in using a single rating to evaluate an experiment.

However, the scores are reassuring in one respect. The reader will recall that the control and experimental groups were not "balanced" with respect to test scores, average grades, or any other outside measure. An inspection of the mean scores of the four groups seems to indicate that the members of the control group were at least as able as members of the experimental groups. Indeed, their mean scores were slightly higher for the first three rating-columns and comparable for the "Pupil Rating" column.
### TABLE 3

**SCORES ON INITIAL RATING SHEETS**

<table>
<thead>
<tr>
<th>Identification</th>
<th>Self Evaluation</th>
<th>Cooperating Teacher</th>
<th>College Supervisor</th>
<th>Pupil Rating</th>
</tr>
</thead>
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<td><strong>Control Group</strong></td>
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TABLE 3—Continued

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<th>College Supervisor</th>
<th>Pupil Rating</th>
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### TABLE 4

MEANS AND STANDARD DEVIATIONS OF SCORES ON INITIAL RATING SHEETS

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<th>Self Evaluation</th>
<th>Cooperating Teacher</th>
<th>College Supervisor</th>
<th>Pupil Rating</th>
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The Second Rating

As might be expected, the scores on the second rating sheets were even higher than those on the first rating sheets. Only three of the sixteen mean scores were lower than the comparable mean scores on the first rating, namely, the mean of the cooperating teachers' scores for the staggered experiment, and the means of the pupil ratings for the control group and the dual experiment. The remaining thirteen mean scores were higher than those for the first rating.
TABLE 5
SCORES ON FINAL RATING SHEETS

<table>
<thead>
<tr>
<th>Identification</th>
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<th>Pupil Rating</th>
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<td>96</td>
<td>106</td>
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TABLE 5--Continued

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</tr>
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<td>K</td>
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</tr>
<tr>
<td>N</td>
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</tr>
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<td></td>
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</tr>
<tr>
<td>T</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U</td>
<td></td>
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</tr>
<tr>
<td>V</td>
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</tr>
<tr>
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</tr>
<tr>
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<tr>
<td>Z</td>
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### TABLE 6
MEANS AND STANDARD DEVIATIONS OF SCORES ON FINAL RATING SHEETS

<table>
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<th>Statistic</th>
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Differences in Ratings

As has been stated previously, the differences obtained by subtracting the first rating for a given student teacher from his second rating by the same evaluator was used as a measure of his improvement over the intervening period. These differences, their arithmetic means, and their standard deviations appear in the following two tables.
### TABLE 7
DIFFERENCES BETWEEN SCORES ON INITIAL AND FINAL RATING SHEETS

<table>
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<tr>
<th>Identification</th>
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<td>49</td>
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<td>0.14</td>
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TABLE 7—Continued

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<td>College Supervisor</td>
<td>Pupil Rating</td>
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<td>-----------------</td>
<td>---------------------</td>
<td>--------------------</td>
<td>--------------</td>
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<td>14.31</td>
<td>13.45</td>
<td>0.5057</td>
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</table>
**Analysis of the Data**

An underlying assumption in the discussion that follows is that for each of the groups of evaluators the twenty-nine score differences in Table 7 belong to a population that is normally distributed. In one case, as will be seen presently, it was found necessary to modify this assumption. The means and standard deviations for the total groups which appear in Table 8 will be considered the best estimates of the means and standard deviations of the parent populations.

If the various experiments did not lead to a greater improvement in student teaching effectiveness as measured by the two rating sheets, then the scores of the student teachers in these groups should not differ greatly from those in the control groups.

For purposes of comparison it was thought desirable to convert the difference scores to standard scores or z-scores. For example, student teacher a had gains of 19 and 20 as measured by the differences in self evaluations and cooperating teacher's ratings. However, the mean of all self evaluation differences was 5.69 and the mean of all differences of cooperating teachers' ratings was 7.21. Thus these two ratings show gains of 13.31 and 12.79 in excess of the average gain for their particular groups of evaluators. Also, since the standard deviation of
differences in self evaluations was 11.13 as compared to 14.31 for cooperating teachers' ratings, the difference of 19 represents a gain of 1.20 standard deviations above the mean while the difference of 20 represents a gain of 0.89 standard deviations above the mean. In the discussion that follows, the difference of 19 in self evaluation was considered to represent a greater gain than the difference of 20 in cooperating teacher's ratings.

When the first attempt was made to convert the difference scores for college supervisors to standard scores, it became apparent that the scores assigned by the two college supervisors could not be considered as samples from a single normally distributed parent population. Table 9 shows the means and standard deviations for the difference scores assigned by the two college supervisors.

<table>
<thead>
<tr>
<th></th>
<th>Supervisor I</th>
<th>Supervisor II</th>
</tr>
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<tbody>
<tr>
<td>Arithmetic Mean</td>
<td>17.90</td>
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<td>16.25</td>
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</tr>
<tr>
<td>Number of Student Teachers</td>
<td>19</td>
<td>10</td>
</tr>
</tbody>
</table>
The F-ratio of the variances is 12.21 which far exceeds the figure needed to indicate a significant difference at the 1 per cent level.

Thus, in converting the college supervisors' score differences to standard scores, it was necessary to use two different means and standard deviations. To illustrate the necessity, consider the following hypothetical cases. A student teacher whose score difference as rated by supervisor I was 17.90 + 16.25 or 34.15 was one standard deviation above the mean gain for all the student teachers he supervised. A student teacher whose score difference as rated by Supervisor II was 13.60 + 4.65 or 18.25 was one standard deviation above the mean gain for all student teachers he supervised. If one were to convert these score differences to standard scores using the total group mean of 16.41 and standard deviation of 13.45, the first student teacher would be assigned a z-score of \((34.15 - 16.41)/13.45\) or 1.32 while the second would be assigned a z-score of \((18.25 - 16.41)/13.45\) or 0.14. It was felt that these z-scores would not truly reflect the judgment of the two college supervisors.

Thus, the z-scores for the score differences of the two college supervisors were calculated using the mean and standard deviation of the scores of the supervisor in question.

The table that follows expresses the differences in scores of Table 7 in the form of standard scores.
TABLE 10
DIFFERENCES BETWEEN SCORES ON INITIAL AND FINAL RATING SHEETS EXPRESSED AS STANDARD SCORES

<table>
<thead>
<tr>
<th>Identification</th>
<th>Self Evaluation</th>
<th>Cooperating Teacher</th>
<th>College Supervisor</th>
<th>Pupil Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>1.20</td>
<td>0.89</td>
<td>-0.79</td>
<td>-0.40</td>
</tr>
<tr>
<td>b</td>
<td>-1.50</td>
<td>-1.06</td>
<td>-0.86</td>
<td>0.35</td>
</tr>
<tr>
<td>c</td>
<td>-0.96</td>
<td>-0.64</td>
<td>-0.92</td>
<td>0.09</td>
</tr>
<tr>
<td>d</td>
<td>-1.68</td>
<td>1.59</td>
<td>-0.79</td>
<td>-1.94</td>
</tr>
<tr>
<td>e</td>
<td>-0.60</td>
<td>-0.85</td>
<td>-0.30</td>
<td>0.69</td>
</tr>
<tr>
<td>f</td>
<td>-0.87</td>
<td>0.40</td>
<td>-0.98</td>
<td>-0.58</td>
</tr>
<tr>
<td>g</td>
<td>0.03</td>
<td>-0.29</td>
<td>-1.53</td>
<td>0.41</td>
</tr>
<tr>
<td>h</td>
<td>-1.68</td>
<td>-0.43</td>
<td>0.50</td>
<td>-1.29</td>
</tr>
<tr>
<td>i</td>
<td>0.93</td>
<td>0.33</td>
<td>-0.24</td>
<td>-0.38</td>
</tr>
<tr>
<td>j</td>
<td>1.11</td>
<td>-0.15</td>
<td>1.91</td>
<td>-0.96</td>
</tr>
<tr>
<td>k</td>
<td>1.11</td>
<td>0.20</td>
<td>-1.25</td>
<td>0.92</td>
</tr>
<tr>
<td>l</td>
<td>-0.24</td>
<td>-0.85</td>
<td>-0.06</td>
<td>-1.17</td>
</tr>
<tr>
<td>m</td>
<td>-0.87</td>
<td>-1.62</td>
<td>-2.28**</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Staggered Experiment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>-0.60</td>
<td>0.27</td>
<td>0.30**</td>
<td>0.57</td>
</tr>
<tr>
<td>B</td>
<td>0.12</td>
<td>-2.46</td>
<td>0.73**</td>
<td>0.85</td>
</tr>
<tr>
<td>C</td>
<td>0.21</td>
<td>0.13</td>
<td>-0.34**</td>
<td>1.18</td>
</tr>
<tr>
<td>D</td>
<td>0.66</td>
<td>-0.29</td>
<td>-0.12</td>
<td>1.24</td>
</tr>
<tr>
<td>E</td>
<td>-0.33</td>
<td>-0.78</td>
<td>0.31</td>
<td>-0.84</td>
</tr>
</tbody>
</table>
**TABLE 10—Continued**

<table>
<thead>
<tr>
<th>Identification</th>
<th>Self Evaluation</th>
<th>Cooperating Teacher</th>
<th>College Supervisor</th>
<th>Pupil Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dual Experiment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>0.39</td>
<td>1.94</td>
<td>-0.34**</td>
<td>-2.52</td>
</tr>
<tr>
<td>L</td>
<td>1.11</td>
<td>1.87</td>
<td>0.95**</td>
<td>-0.42</td>
</tr>
<tr>
<td>M</td>
<td>0.21</td>
<td>0.40</td>
<td>0.95**</td>
<td>0.57</td>
</tr>
<tr>
<td>N</td>
<td>0.03</td>
<td>0.06</td>
<td>0.73**</td>
<td>-0.36</td>
</tr>
<tr>
<td><strong>Questionnaire Experiment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>1.56</td>
<td>-0.29</td>
<td>0.09**</td>
<td>-1.13</td>
</tr>
<tr>
<td>U</td>
<td>0.66</td>
<td>-0.36</td>
<td>-0.78**</td>
<td>0.33</td>
</tr>
<tr>
<td>V</td>
<td>1.65</td>
<td>1.38</td>
<td>1.05</td>
<td>0.90</td>
</tr>
<tr>
<td>W</td>
<td>-0.96</td>
<td>0.75</td>
<td>1.30</td>
<td>0.41</td>
</tr>
<tr>
<td>X</td>
<td>1.29</td>
<td>0.61</td>
<td>0.99</td>
<td>0.39</td>
</tr>
<tr>
<td>Y</td>
<td>-0.69</td>
<td>-0.99</td>
<td>0.50</td>
<td>0.85</td>
</tr>
<tr>
<td>Z</td>
<td>-1.23</td>
<td>0.27</td>
<td>1.36</td>
<td>1.68</td>
</tr>
</tbody>
</table>

**These scores were computed with a mean score of 13.60 and a standard deviation of 4.65. All other scores in this column were computed with a mean score of 17.90 and a standard deviation of 16.25.**

The relative sizes of the z-scores can be seen more easily in the graphs that follow. The first set of graphs shows z-scores on the four evaluations for each of the individual student teachers. For student teachers a through m, the control group, 18 of 52 z-scores were
positive and 34 were negative, i.e., about 35% of the z-scores represent gains greater than the mean gains for all student teachers in the study, and about 65% represent gains or losses less than the mean gains for all student teachers in the study.

Student teachers A through E, the staggered group, had 12 z-scores positive and 8 negative, i.e., 60% represent greater than average gains and 40% represent less than average gains, or losses.

The dual group, student teachers K through N, had 12 positive and 4 negative z-scores, i.e., 75% represent greater than average gains and 25% represent losses or less than average gains.

Student teachers T through Z, the questionnaire group, had 20 positive and 8 negative z-scores, i.e., about 71% represent greater than average gains and about 29% represent losses or less than average gains.

These figures tend to support the claim that the experimental groups showed more rapid growth than the control group over the final weeks of the student teaching experience.

The second and third sets of graphs show the same z-scores arranged in different orders. Here the z-scores associated with a single group of evaluators are grouped
together to show how they rated the control group and each of the experimental groups.

In each case, a single letter refers to the student teacher in question and two letters refer to an evaluation. "SE" stands for self evaluation, "CT" for cooperating teacher, "CS" for college supervisor, and "PR" for pupil rating.
GRAPH 1

Z-SCORES GROUPED ACCORDING TO STUDENT TEACHERS
GRAPH 2

Z-SCORES GROUPED ACCORDING TO EVALUATORS

Self Evaluations

Control

Staggered Dual Questionnaire
GRAPH 2 -- Continued

Cooperating Teachers' Ratings

Control

+1

-1

Staggered Dual Questionnaire

+1

-1

A B C D E K L M N T U V W X Y Z
College Supervisors' Ratings

Control

Staggered Dual Questionnaire
GRAPH 2 -- Continued

Pupil Ratings

Control

-1

Staggered Dual Questionnaire

+1

A B C D E K L N T U V W X Y Z

-1
GRAPH 3
Z-SCORES IN DESCENDING ORDER GROUPED ACCORDING TO EVALUATORS

Self Evaluations

Control

-1

Staggered Dual Questionnaire

+1

-1

-1

+1

+1
Cooperating Teachers' Ratings

GRAPH 3 -- Continued

Control

Staggered  Dual  Questionnaire

+1  +1  +1  +1

-1  -1  -1  -1
GRAPH 3 -- Continued

College Supervisors' Ratings

Control

-1

Staggered Dual Questionnaire

-1

-1
Pupil Ratings

Control

Staggered Dual Questionnaire
Consider our findings to this point. An inspection of the mean scores in Table 8 reveals that ten of the twelve means of score differences for the experimental groups were higher than the corresponding mean scores for the control group. We see that for the staggered group three of the four mean scores are higher than those of the control group. The dual group has three of four mean scores higher than those of the control group, and the questionnaire group has all four mean scores higher than those of the control group.

Also, as we have noted previously, the percentage of positive z-scores for the various groups seems to favor the experimental groups over the control group.

Of course, such results can happen occasionally by chance alone. What is needed is some test of significance that will permit one to estimate the likelihood of such a chance occurrence.

One such test is the t-test for establishing the significance of differences between mean scores. Unfortunately this familiar test cannot be applied in most of the cases we wish to test because our various samples are small and unequal.

Additional comments about small-sample t's are needed before we conclude the chapter. The t-formula we have used for large samples is not exactly correct for small samples with unequal N's and strictly speaking should be used with small samples only if the N's are equal. However,
if there is a difference of one or two cases no
great error will be introduced and we may still
feel reasonably confident in the standard formu-
las as presented here. It is inadvisable, how-
ever, to use this formula if the N's are quite
different, say, 5 cases in one group and 12 in
another (10:133).

However, we can make reasonable estimates of the
probability of chance occurrences by means of the binomial
probability distribution. Its use will first be illustrated
in a case where we can also apply the t-test.

Consider the dual and staggered groups. While the
sample sizes are small, four and five respectively, they are
nearly equal and hence this is not an obstacle. Also, the
variances are obviously comparable and so we are justified
in using the t-test to estimate the significance of the dif-
fences between the means. From the difference scores
arising from self evaluations we have the following data.

<table>
<thead>
<tr>
<th>Dual Group</th>
<th>Staggered Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean 10.50</td>
<td>Mean 5.80</td>
</tr>
<tr>
<td>S.D. 5.26</td>
<td>S.D. 5.45</td>
</tr>
<tr>
<td>n 4</td>
<td>n 5</td>
</tr>
</tbody>
</table>

Now \( t = \frac{|M_1 - M_2|}{\sigma_{\text{diff}}} \) where \( \sigma_{\text{diff}} = \sqrt{(5.26^2/4 + 5.45^2)/5} = 3.59 \). Thus \( t = \frac{|4.70|}{3.59} = 1.31 \).

With \( 4 + 5 - 2 \) or 7 degrees of freedom, a t-score
of at least 2.36 is needed for significance at the 5%
level. Thus, we conclude that the means of 10.50 and 5.80
do not differ sufficiently to be considered statistically
significant.
The difference scores from the cooperating teachers' ratings yield the following data.

<table>
<thead>
<tr>
<th></th>
<th>Dual Group</th>
<th>Staggered Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>22.50</td>
<td>-1.80</td>
</tr>
<tr>
<td>S.D.</td>
<td>14.01</td>
<td>15.77</td>
</tr>
<tr>
<td>n</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Again, the variances are comparable. \[ 6_{\text{diff}} = \sqrt{(14.01^2)/4 + (15.77^2)/5} = 9.95. \] Therefore,

\[ t = \frac{|22.50 - (-1.80)|}{9.95} = 2.44 \] which is significant at the 5% level, but not at the 1% level.

Now consider the following analysis based on the z-scores of these two experimental groups.

If the scores in a population that is normally distributed are converted to z-scores, 95% of them will fall below 1.645 and only 5% above. Similarly, 90% will fall below 1.282 and 10% above, and 80% will fall below 0.842 and 20% above. Since the normal curve is symmetric, we can make corresponding statements about the percentage of z-scores that will fall above and below the corresponding negative z-scores, e.g., 95% will fall above -1.645 and 5% will fall below.

An inspection of our graphs or of Table 10 shows that of the four z-scores corresponding to cooperating teacher's ratings for the dual group, two of them are above 1.282 and of the five z-scores for the staggered group, one is below -1.282.
If we chose a sample of four from a normally distributed population expressed as z-scores, the probability that the first score would exceed 1.282 and the other three would not be \( \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \) or 0.0729. However, if we wanted the probability that any one of the four exceeded 1.282, we would have to multiply this by four since it could occupy any one of four positions in the sample. Similarly, the product \( \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} \) or 0.0081 gives the probability that the first two would be greater than 1.282 and the next two would not. If we wish to consider the probability that any two of the four exceeded 1.282, we must multiply this by the number of ways the two higher z-scores could occur in the sample of four. This is represented by the symbol \( \binom{4}{2} \) and equals 6, i.e., the possibilities are xxoo, xoxo, xoxx, oxxo, oxox, ooxo. Multiplying 6 times 0.0081 we get 0.0486, the probability that exactly two of our four z-scores will exceed 1.282.

To analyze the data from the dual group we will wish to compute the probability that two or more z-scores from a sample of four would exceed 1.282. This is given by the expression \( \binom{4}{2} \times \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} + \binom{4}{3} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} + \binom{4}{4} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \). This equals 0.0486 + 0.0036 + 0.0001 or 0.0523. Fortunately, it is not necessary to make these calculations each time since tables of these binomial probabilities are available. For
a discussion of this technique and tables of probabilities, the reader is advised to consult *Probability with Statistical Applications* by Mosteller, Rourke, and Thomas (8:444). For the case we have just considered, they give the probability as 0.052. We can interpret this as meaning that a sample of z-scores this favorable for the dual group would occur about one time in twenty by chance alone.

Similarly, the probability that one or more z-scores in a sample of five would fall below \(-1.282\) is given by

\[ \binom{5}{1} \times \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} + \binom{5}{2} \times \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} + \binom{5}{3} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} \times \frac{9}{10} + \binom{5}{4} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{9}{10} + \binom{5}{5} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \]

which, by our table, is 0.410, i.e., this could happen by chance roughly two times out of five.

Now these two events are independent, and the probability that both will happen is given by the product of the individual probabilities. Since \(0.052 \times 0.410 = 0.0213\), we assert that a combination of z-scores for the two samples that is at least this favorable to the dual group will happen by chance only about 2% of the time. Compare this to the results of the t-test which showed the means significantly different at the 5% level, but not at the 1% level.

A similar analysis can be made for the z-scores arising from the self-evaluations. We note that none of
the z-scores for the dual group exceed 1.282 and only one
exceeds 0.842. Thus, we might not work with the 10% prob-
ability as before, but might use the 20% probability associ-
ated with the z-score of 0.842. In this case none of the
z-scores for the staggered group are below - 0.842. When
we calculate the probability that zero or more z-scores will
be below - 0.842 we get what our intuition tells us should
be true, namely, a certainty represented by a probability
of one. When we multiply this by the probability that one
or more z-scores will exceed 0.842, 0.590, we see that a
combination this favorable to the dual group would occur
59% of the time by chance alone. This compares favorably
with the results of the t-test which showed no significant
difference in the means at the 5% level.

This, then, is the technique we have used for
analyzing our data. Since any z-score that exceeds 1.282
is take to have 0.10 probability of occurring, when in
truth its probability is no more than 0.10 and may be much
lower, the combined probability estimates that arise from
this method should prove to be conservative.

We had twelve comparisons to make, ten for which
the mean score of an experimental group exceeded the cor-
responding mean score of the control group and two for
which the control group had the higher mean score. These
latter two will be referred to as reversals. We wished to
determine which, if any, of these differences should be considered significant.

For each of the four groups of evaluators we calculated two sets of binomial probabilities, those associated with z-scores of $\pm 1.282$ (10%) and those associated with z-scores of $\pm 0.842$ (20%). In a few cases an additional probability was thought to be informative and was given as a footnote to a table.

The following notation was adopted. The symbol "13,3,-" was used to signify that out of a sample of 13 z-scores three were less than the score in question ($-1.282$ or $-0.842$). Likewise the symbol "7,2,+" signifies that out of a sample of 7 z-scores two exceeded the z-score in question (1.282 or 0.842). In the following tables, these symbols occur in the second column which is labelled "Distribution."

The third column gives the tabular value for the binomial probability associated with this distribution. The fourth column is the product of the probability for the control group and the probability for the experimental group and is labelled "Combined Probability."

The two cases for which the mean of the control group exceeded the mean of an experimental group are discussed immediately after the tables.
**TABLE 11**

PROBABILITIES ARISING FROM SELF EVALUATIONS

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>z = ± 1.282</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>13,3,-</td>
<td>0.134</td>
<td>0.134**</td>
</tr>
<tr>
<td><strong>Staggered</strong></td>
<td>5,0,+</td>
<td>1.000</td>
<td>0.134</td>
</tr>
<tr>
<td><strong>Dual</strong></td>
<td>4,0,+</td>
<td>1.000</td>
<td>0.134</td>
</tr>
<tr>
<td><strong>Questionnaire</strong></td>
<td>7,3,+</td>
<td>0.026</td>
<td>0.003484</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>z = ± 0.842</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>13,6,-</td>
<td>0.030</td>
<td>-</td>
</tr>
<tr>
<td><strong>Staggered</strong></td>
<td>5,0,+</td>
<td>1.000</td>
<td>0.030**</td>
</tr>
<tr>
<td><strong>Dual</strong></td>
<td>4,1,+</td>
<td>0.590</td>
<td>0.0177</td>
</tr>
<tr>
<td><strong>Questionnaire</strong></td>
<td>7,3,+</td>
<td>0.148</td>
<td>0.00444</td>
</tr>
</tbody>
</table>

**Using a z-score of ± 0.524 (30%) to compute this probability we find 13,7,- is 0.062 and 5,1,+ is 0.832. The combined probability is 0.0516.**

From these probabilities we conclude that the z-scores arising from the self evaluations for the staggered group are possibly better, those from the dual group probably better, and those from the questionnaire group almost certainly better than those of the control group.
**TABLE 12**

**PROBABILITIES ARISING FROM COOPERATING TEACHERS' RATINGS**

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>13,1,-</td>
<td>0.746</td>
<td>——</td>
</tr>
<tr>
<td>Staggered</td>
<td></td>
<td></td>
<td>This is a reversal.</td>
</tr>
<tr>
<td>Dual</td>
<td>4,2,+</td>
<td>0.052</td>
<td>0.0388**</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>7,1,+</td>
<td>0.522</td>
<td>0.3894</td>
</tr>
</tbody>
</table>

**z = ± 1.282**

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>13,4,-</td>
<td>0.253</td>
<td>——</td>
</tr>
<tr>
<td>Staggered</td>
<td></td>
<td></td>
<td>This is a reversal.</td>
</tr>
<tr>
<td>Dual</td>
<td>4,2,+</td>
<td>0.181</td>
<td>0.0458**</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>7,1,+</td>
<td>0.790</td>
<td>0.1999</td>
</tr>
</tbody>
</table>

**z = ± 0.842**

**The two z-scores in question actually exceed 1.645, the 5% probability boundary score. Using this probability we arrive at a combined probability of 0.014 for the dual group.**

From these probabilities we conclude that the z-scores arising from cooperating teachers' ratings for the dual group are probably higher than those for the control group. The questionnaire group is not significantly higher, and the staggered group will be discussed later with the other reversal.
TABLE 13
PROBABILITIES ARISING FROM COLLEGE SUPERVISORS' RATINGS

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>z = ± 1.282</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13,3,-</td>
<td>0.134</td>
<td></td>
</tr>
<tr>
<td>Staggered</td>
<td>5,0,+</td>
<td>1.000</td>
<td>0.134**</td>
</tr>
<tr>
<td>Dual</td>
<td>4,0,+</td>
<td>1.000</td>
<td>0.134</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>7,2,+</td>
<td>0.150</td>
<td>0.0201</td>
</tr>
<tr>
<td>z = ± 0.842</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13,6,-</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Staggered</td>
<td>5,0,+</td>
<td>1.000</td>
<td>0.030**</td>
</tr>
<tr>
<td>Dual</td>
<td>4,2,+</td>
<td>0.181</td>
<td>0.0054</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>7,4,+</td>
<td>0.033</td>
<td>0.00099</td>
</tr>
</tbody>
</table>

**Using a z-score of ± 0.523 (30%) to compute this probability we find that 13,5,- is 0.018 and 5,1,+ is 0.832. The combined probability is 0.0150.

From these probabilities we conclude that the z-scores arising from college supervisors' ratings for the staggered group are possibly better, those from the dual group are probably better, and those from the questionnaire group are very probably better than those of the control group.
### TABLE 14
**PROBABILITIES ARISING FROM PUPIL RATINGS**

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td>13,2,-</td>
<td>0.389</td>
<td>0.389</td>
</tr>
<tr>
<td><strong>Staggered</strong></td>
<td>5,0,+</td>
<td>1.000</td>
<td>0.379</td>
</tr>
<tr>
<td><strong>Dual</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Questionnaire</strong></td>
<td>7,1,+</td>
<td>0.522</td>
<td>0.1978</td>
</tr>
</tbody>
</table>

\[ z = \pm 1.282 \]

<table>
<thead>
<tr>
<th>Group</th>
<th>Distribution</th>
<th>Probability</th>
<th>Combined Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td>13,4,-</td>
<td>0.253</td>
<td>0.3875</td>
</tr>
<tr>
<td><strong>Staggered</strong></td>
<td>5,3,+</td>
<td>0.058</td>
<td>0.0147</td>
</tr>
<tr>
<td><strong>Dual</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Questionnaire</strong></td>
<td>7,3,+</td>
<td>0.148</td>
<td>0.0374</td>
</tr>
</tbody>
</table>

\[ z = \pm 0.842 \]

From these probabilities we conclude that the z-scores arising from pupil ratings for the staggered and questionnaire groups are probably better than those for the control group.

If we analyze our reversals (cases for which the control group had a higher mean score than an experimental group) in the same manner, we find that the lowest combined probability associated with any of them is 0.3875. That is, the least favorable comparison could be accounted for.
by chance alone almost 39% of the time. Hence we conclude that none of the reversals represent significant difference.

The following table summarizes the combined probabilities that differences as large as those calculated between the experimental and control groups would be observed. They are all based on the 20% findings ($z = \pm 0.842$).

**TABLE 15**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Evaluators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S.E.</td>
</tr>
<tr>
<td>Staggered</td>
<td>0.030</td>
</tr>
<tr>
<td>Dual</td>
<td>0.018</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>0.004</td>
</tr>
</tbody>
</table>

The z-scores for all three experimental groups are seen to be significantly better (5% level) for three ratings out of four. Those for the dual and questionnaire groups are especially favorable.

The investigator regards these probabilities as evidence of the worth of the dual and questionnaire experiments and feels that even the staggered experiment cannot be dismissed without further investigation.
CHAPTER IV

SUMMARY AND SUGGESTIONS

Summary

The purpose of this study was to explore a statement found in the Forty-Third Yearbook of The Association for Student Teaching: "In our opinion it is the information received by the student (teacher) through the feedback process which is going to make the difference in the development of a teacher" (1:94). More specifically, the investigator tried to determine if providing additional feedback and different types of feedback improved the value of student teaching.

Three sources of additional feedback were considered, the student teachers themselves, their fellow student teachers, and the pupils taught by the student teachers. The first and third groups also helped to evaluate the study along with the cooperating teachers and the college supervisors.

In the first experiment the student teachers, who provided their own feedback, taught two sections of the same subject. These sections were kept one or two days "out of phase" so that the lesson plans used in the first
class could be modified and tried again in the second class. Written comments were made on both lesson plans and many of these were turned in to the investigator to keep him informed as to the nature and extent of the self evaluations.

In the second experiment, student teachers working in pairs provided each other with feedback as a result of their work in a shared class. This shared class, which they taught in addition to one regular class for which each had individual responsibility, gave them a chance to take turns acting as teacher and observer. Daily meetings provided the opportunity to discuss the observer's criticisms of the lessons. The roles of teacher and observer were changed every week or two depending on the units being taught. The investigator was kept informed as to the progress of the experiment by means of written lesson plans and written comments by the observer.

In the third experiment, the pupils were asked to supply feedback by means of anonymous questionnaires. The completed questionnaires were studied by the student teachers and, several days later, turned over to the investigator. In some cases the student teachers discussed a questionnaire with their cooperating teachers or college supervisors.

The study was evaluated by means of two rating sheets. The first of these was a thirty-item rating sheet which was completed by the student teacher, his cooperating teacher,
and his college supervisor. The second was a student rating sheet which called for a numerical rating of one through seven with four considered an average rating. These two rating sheets were used twice during the quarter of student teaching, during the fifth and tenth weeks. The differences in scores were taken as a measure of student teacher improvement over the last five weeks of the quarter.

In previous chapters, samples of lesson plans, questionnaires, and rating sheets were given to acquaint the reader with the type and quality of the student teachers' work and with the opinions and evaluations of the pupils, cooperating teachers, and college supervisors.

The data from the study were presented in tabular and graphical form and a discussion of the significance of the differences in scores was given which employed the idea of binomial probability distributions.

The data from the study seemed to support the claim that additional feedback and different types of feedback do enable the student teacher to progress at a more rapid rate. When the difference scores for the various experimental groups were converted to z-scores and compared with those for the control groups, all three experimental groups had scores which were significantly higher at the 5% level than those of the control group. The experiments which provided for feedback from fellow student teachers and from pupils seemed to be particularly successful.
In the opinion of the investigator, all three schemes seemed promising enough to warrant further investigation.

Suggestions for Further Experimentation

A comparison of the self criticisms made as part of the staggered experiment with those made by a fellow student teacher in the dual experiment suggests that student teachers are not adept at self criticism. Perhaps part of the trouble arises from the fact that a teacher, involved in the problems of instruction, does not have the opportunity to take notes on what happens in the classroom. When he has a chance to reflect on his performance, he has to rely on his memory as to what actually went on during the class period.

If it were possible to record what went on in the classroom so that the student teacher might review it afterwards, the quality and quantity of self criticism might improve. For this reason, this investigator suggests that the staggered experiment be repeated but that each lesson be taped recorded. If possible, inconspicuous equipment should be employed so as to avoid having the class aware that questions and comments were being recorded. Perhaps a miniature recorder could be placed on the chair behind the teacher's desk. With the quality of such equipment constantly increasing while its size is decreasing, this seems feasible.
A more ambitious program might involve the use of video tape equipment. Several manufacturers are currently producing portable equipment that could prove useful. The price of camera, monitor, and tape unit is approximately $1500. Experiments that involve taping classes have been performed at Stanford University and at Hunter College, but in neither case have experiments similar to those described in this study been tried.

While the results of the questionnaire experiment were favorable, there was a feeling on the part of many of the student teachers involved that their pupils tired of the rating sheets. It seems possible that as much or more information could be secured while having individual pupils fill out fewer questionnaires.

One way to accomplish this would be to have only part of the class rate the student teacher's performance at any one time. Perhaps half the class could fill out the rating sheets one week, while the other half responded the following week.

Or perhaps a more detailed rating would occur if the rating sheets were passed out at the beginning of a week and the pupils were asked to make notes on them several times during the week. Since this would no doubt provide more feedback for the student teacher to consider, the time between ratings could be increased.
It would even be possible to employ a combination of these two ideas, i.e., at any given time several pupils in the class could be keeping a detailed "log" on the performance of the student teacher.

The main criticism of the dual experiment that was offered by the student teachers was that sharing a class presented some teaching problems. The pupils would just become adjusted to the personality and teaching techniques of one student teacher when the other would assume control of the class. In some cases this tended to create discipline problems. Perhaps the same results could be achieved while eliminating the shared class. Each student teacher could teach his own class every day and also observe his "partner's" class daily. This would actually provide more feedback since each student teacher would be observed daily every week rather than on alternate weeks as was the case for the student teachers in this experimental group. Also, this would permit student teachers with a nine quarter hour assignment to take part in this part of the study since each need only teach one class.

Another variation of this scheme would be to have more than two student teachers work together. The student teacher who was observed by several of his fellow student teachers would probably receive a greater variety of
criticism and would be more apt to be impressed by those comments which were offered by several people.

The investigator would be pleased if these, or any other variations on the initial schemes, should prove to be even more useful in promoting the professional growth of student teachers.
APPENDIX

SCHOOLS, PRINCIPALS, AND TEACHERS INVOLVED IN THIS EXPERIMENT
## APPENDIX

### SCHOOLS, PRINCIPALS, AND TEACHERS INVOLVED IN THIS EXPERIMENT

<table>
<thead>
<tr>
<th>School</th>
<th>Principal</th>
<th>Cooperating Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brookhaven H.S.</td>
<td>H. Delbert Swain</td>
<td>Rebecca Decker</td>
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<tr>
<td></td>
<td></td>
<td>Raymond Tata</td>
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<tr>
<td>Brookpart Jr. H.S.</td>
<td>Robert Walker</td>
<td>James Casebolt</td>
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<tr>
<td></td>
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<td>Margaret Reidy</td>
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<tr>
<td>Clinton Jr. H.S.</td>
<td>Raymond Trinter</td>
<td>Wallace Johnson</td>
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<td>Philip Fulton</td>
<td>Benjamin Bennett</td>
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<td>Earl Downs</td>
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<td>Carl Hopkins</td>
<td>Beulah Smith</td>
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<td>Medina Jr. H.S.</td>
<td>E. Eugene Yontz</td>
<td>Martha Hance</td>
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<td>F. W. Raisbeck</td>
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<td>School</td>
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<td>Cooperating Teacher</td>
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</table>
BIBLIOGRAPHY
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**Unpublished Material**