DOCUMENT RESUME

ED 029 809 SP 002 376

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Far West Lab. for Educational Research and Development, Berkeley, Calif.
Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.
Pub Date 15 Jan 69
Note-14p.; Paper presented at the annual meeting of the American Educational Research Association, Los Angeles, California, February 1969
EDRS Price MF-$0.25 HC-$0.80
Descriptors-*Behavior Change, *Field Studies, Microteaching, Preservice Education, Retention, Teacher Behavior

To test the effectiveness of the minicourse (an instructional microteaching package) in changing specific teacher behaviors, 20-minute pre- and postminicourse video-taped recordings of each of the 48 participating teachers' classroom lessons were made and were scored by trained raters. Further, to insure rater objectivity, delayed postcourse video tapes were mixed with pre- and postminicourse video tapes from another study and scored. Results of analyses of pre- and postminicourse scores showed that teachers made significant gains after the minicourse on 10 of 12 behavior scores and demonstrated a reduction to half the precourse level of teacher talk. Additional analyses of these data showed that when the sample was divided according to teacher grade level and compared on four behaviors relating to teacher talk and pupil response, teachers in all grade levels increased their use of higher cognitive questions, and students increased the length of their responses: when the sample was divided according to middle and lower class school setting, teachers serving lower class areas made greater gains on most of the skills; and when the sample was divided by sex, there were found to be no significant differences in each group's learning of teacher skills. Two months after completion of the course, a refresher course was given to one third of the group. Results of a posttest administered two months later showed no significant differences between this group and the rest of the sample, indicating that the teachers had retained most of the skills acquired in the minicourse without a refresher course. (SM)

THE MINICOURSE AS A VEHICLE FOR CHANGING TEACHER BEHAVIOR, THE RESEARCH EVIDENCE

by Walter R. Borg, Program Director

A paper presented as part of the symposium:
"MICROTEACHING AND MINICOURSES: RATIONALES AND CURRENT RESEARCH"

Annual Meeting

American Education Research Association

Los Angeles, California
February 7, 1969

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1/15/69

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Teacher Education Program

THE MINICOURSE AS A VEHICLE FOR CHANGING TEACHER BEHAVIOR, THE RESEARCH EVIDENCE[1,2]

by Walter R. Borg, Program Director

Dr. Langer has told you something of the instructional model that we are developing in the Teacher Education Program at the Far West Laboratory for Educational Research and Development and has also given you some idea of the research evidence and theoretical constructs as well as the biases that have helped determine the direction of our activities. Dr. Langer has made some statements about our progress as compared with other teacher education efforts, and it appears that my role in today's program is to try to back up these statements with the evidence we have gathered to date. You will note in the 27 steps of our development cycle that each minicourse we develop is field tested three times. The main field test is the most important of the three field tests and has as its objective the evaluation of the course to determine whether the changes brought about in teacher and student behavior reach the criterion levels that we have established. Minicourse 1 was designed to bring about changes in twelve specific teacher behaviors. The skills covered in this course all relate to the teachers' methods of conducting a class discussion lesson. To determine whether or

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1. The work reported herein was performed pursuant to a contract with the United States Department of Health, Education and Welfare, Office of Education.
2. The research and developmental effort reported in this paper was conducted by the entire Teacher Education Program staff of the Laboratory. Persons making a major professional contribution to the program include Drs. Marjorie Kelley, Philip Langer and Warren Kallenbach.

not the course brings about the desired behavioral changes, a 20-minute pre-course videotape recording was made of each of the 48 teachers in the main field test sample. The teacher received an instruction sheet for preparing the pre-course discussion lesson. A 20-minute videotape recording was made of this lesson with the teacher's regular class. Immediately after Minicourse 1 was concluded, the teacher received identical instructions for preparing a post-course discussion lesson. This lesson was also recorded on videotape under substantially identical conditions to the pre-course lesson. The videotapes from the pre-course and post-course lessons were then scored to determine the teachers' use of the specific skills. Graduate students from the University of California were trained to score these tapes. Inter-rater reliability coefficients obtained in scoring Minicourse 1 tapes ranged from .60 to .98 for the different skills. Pre and post-course tapes were mixed together randomly and a double-blind technique was employed in scoring these tapes. Delayed post-course videotapes, collected four months afer the end of the course, were mixed with pre-course and post-course videotapes from another study of Minicourse 1 involving preservice teacher education students. The initial results obtained from analysis of the pre and post-course tapes of inservice teachers were presented in my 1968 AERA paper. However, I would like to review the results briefly before going on to the remainder of the data collection and analysis which has been completed since the 1968 meeting. Table 1 summarizes the results of the analysis of the pre-course and post-course videotapes for the 48 main field test teachers in Minicourse 1. One of the original twelve teacher behaviors, "Calling on both volunteers and nonvolunteers" could not be scored. Another behavior, "Framing questions

to obtain longer pupil replies" yielded two scores. Thus, twelve scores were obtained on the eleven behaviors analyzed. These are the first twelve entries in Table 1. You will note that teachers who took Minicourse 1 made significant gains on ten of these twelve scores. As you know, a gain may be statistically significant but be too small to make any noteworthy change in what occurs in the classroom. Nine of the ten changes brought about by Minicourse 1 appear to be large enough to be of practical as well as statistical significance. The final entry in Table 1, although not one of the twelve specific behaviors taught, is related to several of these behaviors and was an objective of the course. This objective was to reduce the proportion of time taken up by teacher talk in a discussion lesson. We regard the reduction of teacher talk to about half of the pre-course level to be a major accomplishment.

After last year's AERA meeting, we conducted additional analyses and collected additional data on the Minicourse 1 sample. In order to gain further insights into the functioning of the minicourse model, we first analyzed the performance of different subgroups of teachers in the main field test sample. It seemed likely that some of the behaviors would be influenced by grade level. The proportion of higher cognitive questions asked by teachers, percentage of teacher talk, average number of words per pupil reply, and the number of one-word pupil replies all seemed likely to be related to grade level. Thus, we divided the main field test sample into fourth, fifth and sixth grade teachers and compared the performance of these three subgroups on the four scores that I just mentioned. The results of this analysis are summarized in Table 2. On the pre-course

tapes, the proportion of fact questions was highest for fourth grade teachers and lowest for sixth grade teachers. After the course, differences in grade levels were somewhat less. However, teachers in all three grade levels significantly increased the proportion of higher cognitive questions that they asked during discussion lessons. One might expect the average length of pupil replies to be related to grade level on both pre-course and post-course tapes. However, it is interesting to note that on the pre-course tapes, there was virtually no difference in the length of replies made by pupils in the fourth, fifth and sixth grades. Since length of pupil replies is related to the cognitive level of the reply and also indicates to an extent the complexity of the pupil's sentence structure, it is rather surprising that these pre-course tapes did not reflect progress from grade to grade. All three groups made substantial gains in length of pupil reply on the post-course tapes with fourth grade pupils nearly doubling the length of their replies and fifth and sixth grade pupils doing somewhat better than that. It is noteworthy that the greatest gain was made by sixth grade pupils, suggesting that their pre-course performance was far short of their potential. The number of one-word pupil replies is another indicator of the teachers' ability to frame questions that call for higher cognitive processes. Although many fact questions are answered with more than one word and it is possible to frame higher cognitive questions that can be answered with one word, I believe you will agree that the usual pattern is for one-word replies to be most appropriate for simple fact questions. Fourth and fifth grade pupils both gave significantly fewer one-word replies in the post-course tape discussion lesson. Sixth grade pupils, on the other

hand, although starting out somewhat better, did not improve significantly on this score. We had expected percentage of teacher talk to diminish as we moved up the grade levels. This was not the case on the pre-course tapes where, in fact, the sixth grade teachers talked for a greater proportion of the time than either fourth or fifth grade teachers. The post-course tapes revealed large and statistically significant reductions in proportion of teacher talk at all grade levels, with the greatest reduction occurring at the sixth grade level. You will note that after completing the course, sixth grade teachers talked somewhat less than half as much as they had before taking the course.

We were also interested in learning the relative effectiveness of Minicourse 1 in schools serving culturally disadvantaged areas as opposed to schools serving predominately middle class neighborhoods. In setting up the field test, half the participating teachers came from schools serving predominately lower class areas while half came from schools serving predominately middle class areas. Table 3 summarizes the results of comparing teachers from these two types of schools. A quick look at the results indicate that while both groups made substantial gains on most of the behaviors measured, teachers serving predominately lower class areas made greater gains on most of the skills. These data would suggest strongly that the minicourse instructional model is appropriate and effective for teachers serving pupils of different socioeconomic levels.

Finally, we were interested in learning whether any sex differences occurred in the mastery of those teaching skills covered in Minicourse 1. No significant differences were found in the gains made by male versus

female teachers or in their retention of the skills four months after completion of the course.

Performance After Four Months

As you know, most learning studies show sharp drops in performance during the months following training. It was anticipated that such drops would occur in the behavioral changes brought about by those teachers taking Minicourse 1. Since the goal of our program is to bring about permanent changes in the teachers' classroom behavior, it was decided to develop a short refresher course that could be used to reduce the retention losses that we anticipated. A refresher course requiring four hours of teachers' time was developed. This course followed essentially the same instructional model as the minicourse. It consisted of two instructional tapes, two model tapes and two microteach lessons. It was decided to administer this course to one-third of the main field test sample two months after they had completed Minicourse 1. Another third of the sample was scheduled to be given four hours of classroom observation and feedback from Laboratory personnel on the specific skills covered in the course. A third subsample, which served as a control, was shown four hours of instructional films that were unrelated to the minicourse and its content.

Two months after the completion of these three treatments, the 38 teachers from the main field test sample who were still available were asked to prepare another 20-minute discussion lesson. This discussion lesson was recorded on videotape under virtually the same conditions that existed when pre-course and immediate post-course videotapes had been made. The same

instructions were given and the teacher again worked with their entire classes as had been the case with the previous recordings. Table 4 shows the performance of teachers receiving the three refresher treatments on the pre-course, post-course and delayed post-course videotapes. It may be seen that there is a slight tendency for teachers who took the refresher course to perform better on the post-course tapes. However, this tendency was neither large nor consistent. Thus, there seems to be little overall difference in the delayed post-course performance of teachers who were exposed to the refresher course, the classroom observation and feedback, and the control treatment. This result was at first puzzling, but when the data for all 38 of the teachers for whom delayed post-course tapes could be obtained were analyzed, the reason for the failure of the refresher course became apparent. This course failed simply because the teachers were in no need of the refresher when the course was given. A comparison of the delayed post-course tape scores with post-course tape scores in Table 5 shows that on most of the Minicourse 1 behaviors virtually no loss occurred. In fact, a significant loss occurred in only one behavior, prompting, while on two other behaviors, use of further clarification and teacher repetition of their own questions, significant improvement took place between the post-course and delayed post-course tapes. Thus, it appears that if we wish to test the effectiveness of the refresher course, we will have to allow a much longer period for losses in the teacher skills to occur.

In conclusion, I would like to refer briefly to some of the implications of Table 5 for teacher education. If you compare the teachers' performance means on the pre-course videotapes and the delayed post-course videotapes,

I believe you will agree that the degree to which most of these behaviors improved is striking. Consider, for example, the reductions in three behaviors that Minicourse 1 attempts to extinguish. The average teacher repeated his own questions 14 times in the 20-minute pre-course lesson. This behavior was reduced to a bit over 2 times for the average teacher on the delayed post-course lesson. Equally dramatic reductions occurred in the number of times teachers repeated pupil answers and the number of times they answered their own questions. Also note that the proportion of higher cognitive versus fact questions was nearly doubled while proportion of teacher talk was nearly halved between the pre-course and delayed post-course lessons. These data seem to suggest not only that the minicourse instructional model brings about substantial changes in teacher behavior, but that these changes are for the most part incorporated into the teachers' permanent repertory of teaching skills. A look at the t-test levels in the last column of Table 5 shows that virtually no losses occurred in most of these skills over the four month interval.

Our principal concern now is to learn whether the large and relatively permanent changes achieved by Minicourse 1 will be equaled by other minicourses we are developing. Main field tests will have been completed on four more minicourses by early May and the outcome of these field tests should tell us whether the minicourse instructional model is capable of bringing about changes in teacher and student behavior over a wide range of classroom skills and behavior patterns. Analysis of the data for these four courses should be completed by late summer so hopefully we will be able to report on these results at next year's AERA meeting.

Let me close with an invitation. Although our evidence to date indicates that the minicourse instructional model works, we need much more research to learn why it works and how it can be made to work better. We cannot get all of the answers we need and we are hopeful of setting up cooperative projects with other researchers who want to manipulate minicourse materials as independent variables in teacher education studies. We are interested in research evidence from both preservice and inservice teacher education programs.

TABLE 1

Preliminary Results From Analysis of Minicourse 1
Pre-course tapes and Post-course tapes (N=48)

	Behavior Compared	Pre Tape Mean	Post Tape Mean	t	Sig. Level
1.	Number of times teacher used redirection.	26.69	40.92	4.98	.001
2.	Number of times teacher used prompting.	4.10	7.17	3.28	.001
3.	Number of times teacher used further clarification.	4.17	6.73	3.01	.005
4.	Number of times teacher used refocusing.	.10	.02	.00	NS
5.	Number of times teacher repeated his/her own questions.	13.68	4.68	7.26	.001
6.	Number of times teacher repeated pupil answers.	30.68	4.36	11.47	.001
7.	Number of times teacher answered his/her own questions.	4.62	.72	6.88	.001
8.	Length of pupil responses in words (based on 5 minute samples of pre and post tapes)	5.63	11.78	5.91*	.001
9.	Number of 1-word pupil responses (based on 5 minute samples of pre and post tapes).	5.82	2.57	3.61*	.001
10.	Length of teacher's pause after question (based on 5 minute samples of pre and post tapes).	1.93	2.32	1.90	.05
11.	Frequency of punitive teacher reactions to incorrect pupil answers	.12	.10	.00	NS
12.	Proportion of total questions that called for higher cognitive pupil responses.	37.30	52.00	2.94	.005
13.	Proportion of discussion time taken by teacher talk.	51.64	27.75	8.95	.001

* Means would have been approximately 4 times larger if entire tapes had been analyzed, t-test would have been higher.

TABLE 2

DIFFERENCES OBTAINED FOR 4th, 5th & 6th GRADE TEACHERS WHO COMPLETED MINICOURSE 1

	4th Grade N=16		5th Grade N=14		6th Grade N=14		t-Tests		
	Pre	Post	Pre	Post	Pre	Post			
Skill	A	B	C	D	E	F	A vs B	C vs D	E vs F
Proportion of fact questions	79.12	52.43	71.35	54.35	65.92	41.57	4.29	2.54	3.95
Average number of word/remarks	5.84	10.59	5.18	10.50	5.59	14.60	3.92	3.02	3.60
Number of one word remarks	5.87	2.50	7.35	2.35	4.00	3.14	2.34	2.56	.91
Proportion of teacher talk	49.78	28.72	46.94	30.95	54.73	24.37	5.63	2.48	7.06

TABLE 3

COMPARISON OF TEACHERS IN SCHOOLS SERVING MIDDLE CLASS vs LOWER CLASS NEIGHBORHOODS

	Skill	N=24 A MC Mean Pre-course	B MC Mean Post-course	N=24 C LC Mean Pre-course	D LC Mean Post-course	t-test* A vs B	t-test C vs D
1.	Redirection	23.66	33.58	29.70	48.25	2.64	4.37
2.	Prompting	4.20	6.79	4.13	7.82	1.97	2.61
3.	Clarification	3.16	6.95	5.16	6.50	3.38	1.06
4.	Repeating own questions	14.30	5.82	14.79	3.58	3.51	7.00
5.	Repeating pupil answers	27.39	4.82	33.70	4.04	7.49	9.18
6.	Answering own question	4.52	1.17	4.70	.29	4.29	5.37
7.	Length of pupil responses in words	5.55	10.50	5.59	13.09	4.58	4.41
8.	Number of 1-word pupil responses	6.26	3.00	5.41	2.16	2.37	2.95
9.	Length of teacher pause	2.03	2.23	1.76	2.30	.44	1.58
10.	Proportion of higher cognitive questions	28.53	46.79	26.05	54.00	3.33	5.33
11.	Proportion of teacher talk	50.10	30.49	53.18	25.01	5.78	8.66

* Using a one-tailed test, a t of 1.71 is significant at .05 level, 2.50 at .01 level and 3.49 at .001 level

TABLE 4

PERFORMANCE OF TEACHERS WHO RECEIVED THE DIFFERENT REFRESHER TREATMENTS OF MINICOURSE 1

	TREATMENT 1 Refresher Course 11 Cases			TREATMENT 2 Observer 11 Cases			TREATMENT 3 Viewing Films (Control) 11 Cases		
	Pre Mean	Post M	Delayed Post M	Pre M	Post M	Delayed Post M	Pre M	Post M	Delayed Post M
1. Redirection	28.27	38.72	38.72	17.90	42.09	34.00	25.50	38.35	37.85
2. Prompting	3.45	9.63	6.27	5.27	7.63	5.36	3.92	5.21	2.64
3. Clarification	3.00	6.36	7.09	4.72	6.54	10.81	3.92	7.07	8.21
4. Repeating own question	14.00	4.90	1.72	12.54	5.54	3.27	15.50	4.14	2.14
5. Repeating pupil answer	23.00	4.18	2.36	31.45	5.90	4.18	35.64	3.92	8.57
6. Answering own question	4.90	.63	.45	5.00	1.09	.36	4.07	.50	1.28
7. Length of pupil response in words	5.07	13.06	18.27	6.43	9.50	10.71	5.86	12.72	10.67
8. Number of one word pupil responses	7.41	2.18	2.00	5.00	3.72	3.63	5.40	1.85	3.50
9. Length of teacher pause	1.49	2.87	2.48	2.10	2.59	2.05	2.05	1.86	2.27
10. Proportion of higher cognitive questions	30.10	49.19	52.28	31.37	51.73	45.37	17.93	55.15	49.93
11. Proportion of teacher talk	59.44	27.52	26.42	55.94	37.75	32.39	48.30	23.42	30.49