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AUTHOR Okey, James R.; Humphreys, Donald W.
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INSTITUTION National Center for the Development of Training Materials in Teacher Education, Bloomington, Ind.
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ABSTRACT

Competency-based teacher education should be directed toward teaching skills that have an impact on learners. Studies are needed that assess the effects of teachers using various skills on the achievement and attitudes of their pupils. In this study, teachers studied question asking skills in an inservice training program. The effects of the training were determined by measuring the teachers' knowledge about question asking, their use of questions in classroom discussions, and the achievement of pupils in their classrooms. The study was designed to show how different kinds of teaching skills could be assessed. (Author)

Evaluating Outcomes of Competency-Based Teacher Education

James R. Okey and Donald W. Humphreys
Indiana University

A basic assumption underlying teacher education programs (and expecially competency-based programs) is that there are teachers' behaviors that can be taught, learned and used that affect what pupils do. To help educators plan training programs for teachers with some confidence in the behaviors or skills selected for study, research is needed that directly links teacher behaviors with pupil outcomes.

Studies relating teacher behaviors to pupil accomplishments are called process-product studies (Rosenshine and Furst, 1971). The studies can be either correlational or experimental. What a teacher does (process) is correlated with what pupils do (product) or the effect of the process variable on the product variable is measured in an experimental study.

The importance of process-product research is obvious. Unless direct relationships between teacher and pupil behaviors can be established the credibility of teacher education is weakened.

Question asking is a teaching skill area that receives considerable attention. Studies consistently show a) that teachers ask an enormous number of questions and b) that the questions require primarily memorized responses from students (cf. Floyd, 1968).

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The purpose of this study was to investigate the effect of teacher questioning behavior (the process) on pupil cognitive achievement (the product). The intention was to train teachers to use questions from each of the six levels of Bloom's cognitive Taxonomy (1956) during classroom discussions and to determine the effect this would have on pupil achievement of test questions from each of the same levels.

Procedure

Sixteen inservice fourth and fifth grade teachers* were selected for the study and randomely assigned to treatment and control groups. Each teacher made an audiotape of a 15 to 20 minute question and answer discussion to provide a baseline measure of questioning behaviors. The 16 teachers also completed two pretests to measure their ability to classify and to write questions for each of the six Taxonomy levels.

After gathering baseline data, the 8 teachers in the experimental group studied exercises designed to alter their question asking practices. The exercises included a tape/slide program on the levels of the Taxonomy and a self-instructional manual that provided instruction in classifying, writing, and sequencing questions (Okey, Humphreys and Bedwell, 1973).

The instruction on question asking included about 5 hours of both individual and group work. Some of this time was spent practicing with pupils, recording these sessions on audio tape and classifying the questions used. Thus the teachers were encouraged to practice the desired behaviors and to provide their own feedback.

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*The assistance of Glenn Linnert, science consultant, and the 16 teachers from the New Albany-Floyd County (Indiana) School Corporation is gratefully acknowledged.

Following completion of instruction by the 8 experimental group teachers, all 16 teachers in the study taught 3 lessons to the pupils in their classes. For each lesson the pupils read a science article from a book regularly used in the school and then participated in a question and answer/discussion session led by their teacher. Each teacher made an audio tape of each session. Teachers in the treatment group were told to vary their questioning during the discussion to include questions from all 6 Taxonomy levels. Control teachers were told to use whatever questions they thought were appropriate. After the discussion, pupils in all classes completed a short multiple-choice and open-response test that included questions from each level of the Taxonomy.

Results

Table 1 summarizes the major findings from the study. The teachers in the experimental and control groups were similar to one another before the treatment began in their ability to classify and compose questions and in the range of questions they asked during Lesson 1. There were also remarkably similar after instruction. Some alterations were made in the treatment teachers abilities but the results are in no way impressive. Despite the training, the treatment teachers did not significantly alter the number of high level questions they used with their pupils. As expected under these circumstances, pupil achievement was not significantly different for experimental and control teachers.

Teachers in the treatment group also completed a questionnaire following their study of the question asking training materials. Results from

TABLE 1

Pupil and Teacher Data from Treatment and Control Classes

	n	mean number of pupils per classroom	Classifying questions[1]		Composing questions[2]		Lesson 1	Lesson 4[4]	
			Pretest	Posttest	Pretest	Posttest	% of high level questions[3]	% of high level questions	Pupil achievement[5]
Treatment teachers[6]	7	23.0	6.25	7.25	3.13	4.50	12.34	14.98	3.4
Control teachers	8	22.25	5.75	5.25	3.25	4.38	11.12	12.11	3.4

[1]The maximum possible score was 12. The posttest scores are significantly different at the .05 level.

[2]The maximum possible score was 6. Teachers were given a topic and told to write one question at each of the 6 Taxonomy levels.

[3]High level questions combine the application, analysis, synthesis, and evaluation categories of the Taxonomy. These are the questions asked by teachers during the discussions.

[4]Lessons 2, 3, and 4 were all post-treatment measures of pupil and teacher behavior. Only results from Lesson 4 are shown here.

[5]The maximum possible score was 7. Multiple-choice and open-response questions came from each Taxonomy level.

[6]One treatment teacher was unable to complete the training and was dropped from the study.

this survey and informal observations made during the training sessions and classroom visits showed high enthusiasm and interest among the treatment teachers. They liked the training, perceived it as important, and thought they were changing their classroom behaviors. Despite these positive fellings, analysis of the audio tapes failed to show differences in the question asking practices of treatment and control teachers.

Discussion

A maj[illegible] point to be made is that the experiment does not show that question asking skills have no relation to pupil achievement. Treatment group teachers did not use significantly more high level questions after their training so the hypothesis relating teacher questions to pupil achievement was never tested.

Despite not getting a test of the research hypothesis, the study was valuable. Information was obtained that helped to revise the instructional materials on question asking.* Perhaps more important, knowledge of how (and how not) to conduct a process-product study was gained.

Process-product studies relating teacher behavior to pupil outcomes are often conducted in two parts or phases. The first phase involves the acquisition of a skill (or skills) by teachers and the second phase the effectiveness of the skills when used. Figure 1 shows the two phases and the independent and dependent variables in each portion of the process-product study.

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*The revised verson of the materials used to train teachers to ask higher level questions is now being tested.

	SKILL ACQUISITION PHASE	SKILL EFFECTIVENESS PHASE
INDEPENDENT VARIABLE	teacher training materials and procedures	use of skill(s) by teacher
DEPENDENT VARIABLE	use of skill(s) by teachers	cognitive and/or affective pupil outcomes

Figure 1. Two phases of a process-product study.

The dependent variable (use of skills by teachers) during the skill acquisition phase becomes the independent variable for the skill effectiveness phase of the study. Using this conception of process-product research makes the defects in this study obvious; the independent variable was never put into effect in the skill effectiveness phase because the teachers didn't learn the skills in the acquisition phase of the experiment.

Process-product studies may include both a skill acquisition and skill effectiveness phase but only the latter is crucial to the testing of relationships between teacher behaviors (products) and pupil outcomes (processes). Thus studies can be planned using various combinations of the two phases. Some possibilities are:

1. Conduct a skill acquisition study with treatment and control teachers (some teachers study a skill and other don't). Then contrast the effects of the trained and untrained teachers in the second (effectiveness) phase.

2. Train a group of teachers to use certain skills. Then have them deliberately use and not use the skills with different groups of students to determine the effects. No control group is present during the acquisition phase. Teachers serve as their own controls during the effectiveness phase of the study. Okey and Ciesla (1973) report a study using this procedure.

3. Identify teachers that can already exhibit the teaching skills of concern. Compare their effectiveness with a selected control group or have them use and not use the skills as described above. This procedure eliminates the skill acquisition phase of the process-product study and concentrates only on the effectiveness phase.

It is essential in process-product studies to demonstrate that teachers actually use the skills being studied. If this is not done, there is no way to tell if the independent variable is operating in the effectiveness phase of the study and to show that the process-product hypothesis has actually been tested. Worthen (1968) and Ciesla and Okey (1974) describe procedures and instruments for determining whether teachers are using the skills of interest.

Because of the failure to train teachers in the way we had intended in this study, several changes are being made in both our training and research procedures. One of these is to more clearly separate the skill acquisition and skill effectiveness phases of the process-product studies. There is no point in conducting an effectiveness study if skill acquisition has not occurred.

Another change we have made is to rely much less on teacher self-evaluation during skill acquisition. At least some teachers are unable to tell when they have acquired a skill and need another person to assist in evaluation. Peck and Tucker (1973) conclude that teacher self-evaluation is less effective than when an outsider participates in the feedback process. We are presently using both other teachers and supervisors to provide feedback to teachers on their ability to use a skill.

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