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ABSTRACT

A study on effects of learning Bloom's mastery teaching strategy on teacher attitudes and effectiveness was made among a class of 21 members enrolled in a graduate science methods course. Each member studied a four hour, multi-media, self-instructional program called "Teaching for Mastery (TFM)" with objectives, practice problems, feedback on exercises, self-tests, and answers all given. A 24-item attitude measure, designed to assess teacher attitudes toward tests, grades, and diagnostic teaching, was taken by the members before and after studying TFM. The class members, concurrently employes as teachers, implemented mastery teaching in either a science or mathematics class. The results from five teachers were analyzed, using a posttest-only control group design. Each of the five teachers split their class to form the experimental and control groups. Data analyses showed the presence of a highly significant difference between the pretest and posttest attitude measures. Attitudes of all class members were improved by TFM study. Pupil posttest results favored the mastery-teaching experimental group for each teacher. Teachers were able to produce higher achievement when using skills. (CC)

The Effects of a Mastery Teaching Strategy* On Teacher Attitudes and Pupil Achievement

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Bloom (1968) has hypothesized that most pupils can master the content of our courses and that it is the task of teachers to make this occur. Bloom states that to accomplish this a change in both the thinking and the actions of teachers is needed. In this investigation both of these were tackled; an attempt was made to alter the attitudes of teachers and to teach them to use Bloom's mastery teaching strategy.

There is some evidence in support of Bloom's hypothesis that pupil achievement can be dramatically altered. A number of these studies are annotated in Block (1971). The classroom strategy that seems to make a difference is relatively straightforward: objectives are specified, tests for the objectives are prepared, pupils are instructed, diagnostic tests are given, and pupils restudy those objectives that they fail. This study-test-restudy cycle is repeated as needed in an effort to get all students to achieve objectives. When possible, alternative learning materials are provided so that each pupil may find suitable instruction.

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A critical component of the Bloom strategy is frequent diagnostic testing. Instead of testing at the end of a unit, say every two or three weeks, pupils are tested as soon as they finish instruction. This means that pupils may take several short tests each day. The purpose of the tests in the Bloom mastery strategy, however, is to locate learning deficiencies, not to give grades. Thus, the tests serve a diagnostic function. Summative tests for grading purposes may still be given at the end of a unit to see if achievement of objectives is maintained.

The major purpose of this study was to teach teachers to use Bloom's mastery strategy and to determine what effect its use would have on pupil achievement. Teachers were instructed in the strategy and provided with materials to implement it. The criterion or dependent variable was what pupils accomplished when teachers put Bloom's strategy into practice. A second purpose of the study was to find out if the attitudes of teachers toward testing and diagnostic teaching could be altered by an instructional program that teaches the frequent use of criterion-referenced diagnostic tests.

PROCEDURE

Students (n=21) enrolled in a graduate science methods class were the subjects for the study. All but three were employed as teachers in pre-school through eighth grade classrooms. The four men and 17 women in the group had teaching experience ranging from no teaching to about 20 years in the classroom.

As a requirement of the course, each student studied a four hour, multi-media, self-instructional program called Teaching for Mastery (Okey and Ciesla, 1972) that was designed to help teachers implement Bloom's mastery teaching strategy. Objectives, practice exercises, feedback on exercises, self-tests, and answers are given for each of the six sections in the Teaching for Mastery (TFM) program. A total of 22 objectives are stated for the program that cover such topics as sequencing objectives, constructing and administering diagnostic tests, and selecting alternative instruction for unsuccessful pupils. About two hours of class time were devoted to independent study of the TFM program with the remainder done outside of class.

Each of the 21 students in the class took a 24 item attitude measure before and after studying the TFM program. Responses were made on a five point Likert scale to statements like these: Tests aid students in learning, Students could administer and score their own tests, or Testing takes more time than its worth. The measure was designed to assess the attitude of a teacher toward tests, grades, and diagnostic teaching.

After instruction in the TFM program, each class member that was teaching (n=18) implemented mastery teaching in either a science or mathematics class. Three different experimental designs were used for measuring the effects of mastery teaching and are described elsewhere (Okey and Ciesla, 1973). The first and second grade teachers from the class used a Time Series Design and the fifth through eighth grade teachers used an Equivalent Time Samples Design. The results from the subgroup of five, third and fourth grade teachers using a Posttest-Only

Control Group Design (Campbell and Stanley, 1963) will be reported here.

Each of the five teachers split their class by assigning alternate names from an alphabetized class list to two groups. Then, for a two week unit, one group was taught using the mastery teaching strategy. The other group was taught the same unit with the same objectives for the two week unit without using Bloom's mastery strategy. This meant that the teacher gave frequent diagnostic tests to one group and attempted to remedy any errors they made and did not do this with the other group. While the teacher taught one group the other half of the class was out of the room.

The same objectives, clas room exercises, diagnostic test items, and remedial materials were provided each teacher. However, only pupils in the experimental group from each class were given the diagnostic tests and remedial materials. A posttest on the 20 objectives from the unit was given to each teacher. They administered it at the end of the two week unit to learners in both groups.

ANALYSIS AND RESULTS*

The results obtained by the five teachers using mastery and non-mastery techniques are shown in Table 1. Achievement of pupils on the 20 objectives favored the mastery group for each of the teachers.

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Table 1

Achievement by Mastery and Non-mastery Pupils on 20 Objectives

Teacher	Experimental Group			Control Group			t	Significance Level
	n	$\bar{X}$	SD	n	$\bar{X}$	SD		
A	13	12.8	3.26	13	10.2	3.30	2.02	.05
B	13	14.4	2.98	12	12.6	2.96	1.51	.10
C	13	8.6	2.77	12	7.4	2.87	1.06	.15
D	15	14.5	2.81	15	13.5	2.70	1.00	.20
E	12	15.7	2.37	12	15.2	2.75	0.48	.35

Even though only one of the teachers produced significantly different performance using the mastery procedure (using $p < .05$ as the criterion) the direction of the results consistently favored the mastery pupils. Fisher (1938) suggests that for cases in which repeated tests are made of the same hypothesis that a single test of the significance of the result be made by calculating the likelihood of obtaining a set of probabilities each in the same direction. Following the method of analysis suggested by Fisher (1938, p. 105) produced a value of $\chi^2 = 19.7$ ($p < .05$, $df = 10$). The interpretation of this result is that the overall probability of obtaining the series of outcomes is less than 5 in 100.

The 24 items on the attitude pre- and posttest were scored by assigning values to the five point Likert scale; desired responses were given a value of five and undesired a one. Two items were dropped from the analysis when agreement could not be reached on a desired response. Scores were then obtained

for 20 of the teachers (one teacher missed a test) by summing their responses on the 22 items. In one case pre- and posttest scores were identical; in the remaining 19 cases a more positive attitude toward tests, grades, and diagnostic teaching was found following study of the TFM program. The difference in attitude scores was highly significant ($\bar{X}_E$ = 92.1, SD = 8.26; $\bar{X}_C$ = 81.1, SD = 6.83; t = 7.3; $p < .001$, df = 19).

The attitude data suggest that the feelings teachers have toward testing can be altered by showing them ways to use tests for the benefit of students. If mastery teaching procedures are to gain wide use this will be necessary. These results, however, should be interpreted with some caution. At this time the attitude test has been found to be only marginally reliable (r = .58) using a test-retest strategy on another group of 18 students in a graduate methods class.

DISCUSSION

A critical test of teacher training materials is whether they lead to increased pupil achievement. In this study, the effect of teachers studying and using skills designed to promote achievement was found to do just that. With a minimum of instruction for teachers (about five hours), pupil achievement could be altered. Teachers were able to produce higher achievement when they used the skills than when they did not. To a greater extent, training programs for teachers and classroom practice should be based on skills with demonstrated classroom power.

Experimental studies measuring the effect on pupils of teachers engaging in certain behaviors are few in number (cf. Rosenshine and Furst, 1971). More often, studies are reported

on the use of a skill (e.g., whether teachers ask high level questions or make supporting statements to pupils following responses). Of course, we should be concerned about the use of particular teaching skills, but we should also conduct studies that measure the effect on pupil achievement of the use of skills by teachers. Scriven (1967) calls this latter type of study "payoff" evaluation.

Because of the increased emphasis on competency or performance based teacher education (PBTE), a good deal of attention will have to be given to validation of teaching skills. In order to have confidence in the skills included in a PBTE program, evidence is needed that use of the skills makes a difference in classrooms.

The study reported in this paper is not a pure case in which a set of teaching skills is validated. There already was evidence (e.g., the studies reported in Block) that use of a mastery strategy could have an effect. Instead the study constitutes the partial validation of a set of training materials. It was shown that teachers could learn to use the Bloom mastery strategy by studying the TFM materials and that use of the skills had a desirable effect.

Even though the benefits to pupils of mastery teaching can be demonstrated, wide use of the strategy may not result. The extra burden on the teacher is considerable: objectives have to be written or selected, diagnostic test items must be prepared and administered, records of individual progress by each pupil on each objective must be kept, alternative instruction for some pupils must be devised, and frequent decisions must be made about individual pupils as the teacher works with them to achieve

mastery. The task for the teacher is formidable. A quote from a recent book by Piaget (1971) is appropriate.

> Generally speaking, the more we try to improve our schools, the heavier the teacher's task becomes; and the better our teaching methods, the more difficult they are to apply. (p. 123)

Because a teaching procedure is shown to be effective, there is no assurance that it will or should be widely adopted. The difficulty of implementing the procedure in classrooms is another matter. Researchers, developers, publishers, and administrators must aid teachers in using validated procedures by providing assistance, encouragement, resources, software, training, and manpower.

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