

IMPLEMENTING MASTERY LEARNING IN A TEACHER EDUCATION PROGRAM

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The fact that individual differences in learning exist has been recognized by great teachers throughout the history of Western culture. Broudy (1963) stated that Socrates, Abelard, Pestalozzi, Froebel, and Herbart (among others) "noted that somehow individuals learn different outcomes at different rates and the same outcomes at rates that differ among individuals."

Efforts to provide for the individual differences in ability, motivation, interest and modes of learning have been greatest at the elementary level in American education. Two early attempts to produce mastery learning in the public schools were described by Washburne, Vogel and Gray (1926) and Morrison (1926). The Winnetka Plan, as described by Washburne, et al, consisted of systematically arranged, self-instructional, self-corrective units of practice material, diagnostic tests and reteaching for those who needed it. Mastery of certain essential skills was required of each child, but at his own rate of progress.

Morrison's (1926) approach to individualizing instruction at the secondary level involved developing statements of objectives into well-defined units of study. For students who learned more slowly, reteaching, tutoring, restructuring of learning activities, and redirecting study habits aided in the attainment of the required degree of mastery.

At the college level, acceleration by means of credit by examination or through early admission has permitted exceptionally able students to complete undergraduate degrees in less than the usual four years. However, until very recently the literature contained little evidence of efforts to provide for the needs of college students whose ability or style of learning does not permit them to achieve mastery at the same rate as their more able classmates. Students who over-estimate their level of functioning and enter institutions with academic standards beyond their ability to attain, transfer to institutions with lower standards or drop out of higher education. Summerskill (1962) stated that, on the average, 50 percent of those who enter given colleges withdraw prior to graduation. He contended:

. . . . tens of thousands of students leave college each year because they cannot make the grade academically and for no other reason. Since the objectives of colleges are to educate and graduate the students they admit, academic failure must be viewed as a failure on the part of the institution as well as on the part of the individual student. When a student fails on purely academic grounds he testifies to inadequate admissions procedures or inadequate instruction.

The practice of "grading on the curve" used in most colleges and universities assures failure to a predetermined number of students. The practice is condemned by Bloom (1968) who contended, like Summerskill, that the

institution which fails students must be viewed as a failure. Bloom presented a case for mastery learning at all levels of education, building on the "Model of School Learning" proposed by Carroll (1963).

The variable of aptitude in Carroll's (1963) model is defined as "the amount of time required by the learner to attain mastery of a learning task." Individuals differ in rate of learning specific tasks depending upon prior learnings relevant to the task and upon traits and characteristics which have bearing upon the learning task. Carroll observed that "learners who need only a small amount of time are said to have high aptitude; learners who need a large amount of time are said to have low aptitude. Some learners, it may be, will never learn even under optimal conditions." Some individuals may possess special disabilities which interfere with specific learning tasks, such as tone deafness or color blindness. Some individuals think in concrete forms and may encounter difficulty in learning highly abstract conceptual systems. Bloom (1968) stated:

. . . . aptitudes are predictive of rate of learning rather than the level or complexity of learning that is possible given sufficient time and appropriate types of help, 95 percent of the students can learn a subject with a high degree of mastery.

In the past five years, there has been a promising effort to develop mastery learning strategies at all levels of education. Following publication of Bloom's article, "Learning for Mastery" in May, 1968, and an article by Keller entitled, "Goodbye, teacher . . .", also published in 1968, numerous articles appeared describing attempts to implement mastery learning at the college level. Reports were found of the use of the mastery strategy in such diverse areas as philosophy (Moore, Mahan and Ritts, 1969) and physics (Green, 1971), psychology (Biehler, 1970; Keller, 1968; McMichael and Corey, 1969) and graphics (Ratledge, 1970). Day and Houk (1970), Leo (1973) and Lewis and Wolf (1973) applied the concept in courses in chemistry, Koen (1970) in nuclear engineering, Hoberock (1971) in mechanical engineering, Sears (1971) in thermodynamics and Hurst, Husband, Hetherington and Postlethwait (1970) in biological sciences. The Massachusetts Institute of Technology initiated courses for training teachers in the use of the Keller Plan. Leo (1973) stated that the Keller Plan is "operating at some 150 to 200 colleges and universities." The use of mastery learning techniques has been reported from Canada, Brazil and Korea. Most of the attempts at implementing the mastery strategy are attributed to the leadership of Bloom and Keller, although some investigators appear to have developed their methods independently. Most of the efforts share several features in common:

1. The objectives of the course are stated in behavioral terms and are given to the students so that they may know what it is that they are expected to learn.
2. A variety of materials and alternative modes of instruction are made available.
3. Diagnostic progress tests are available for assessing the mastery of the unit content. Results of these tests are not a part of the final grade in the course.

4. Students are required to attain a predetermined level of mastery on a unit before proceeding to the next unit.
5. Tutors are available to provide individual help to those who need it.
6. A final examination provides an assessment of achievement in the course and contributes to or determines the final grade in the course.

The level of mastery is predetermined by the instructor or instructors in the course. Bloom (1968, 1971, 1973) and Keller (1968) advocate 100 percent mastery of the unit examinations. Block (1971) found that the 95 percent level yielded higher cognitive outcomes but less positive attitudes toward learning. The 85 percent level, although giving slightly lower cognitive outcomes, promoted positive attitudes on the part of the learner and therefore is considered most desirable. Hurst, et al (1970) set a level of 70 percent mastery while Sears (1971) used the C level as the required mastery level. With the exception of those studies following the Bloom or Keller model, the most frequently used level of mastery appeared to be the point between B and A in the distribution of scores on a control group.

Setting of the Study

Before admission to Florida Atlantic University, students have completed their lower division work in a junior college or in another state university or private college. They bring widely varying educational backgrounds as well as divergent work experiences. When Florida Atlantic University opened in 1964, a program was designed for the general professional education sequence of courses such that it permitted students to accelerate in a course or to take more time to complete the course requirements. For each of the four courses, a study guide was written which set forth the objectives for each unit of study, instructions for independent study, reading lists for in-depth study and self-tests on the content of the units.

Comprehensive examinations were developed for the courses. A student who failed to pass an examination at the prescribed level of mastery was permitted to spend more time in study and retake the examination. If the student had not successfully passed all of the examinations in a course at the end of the term, a grade of "I" was given and the student had more time in which to master the material. When the examinations were completed, the grade of "I" was removed.

Only the first two courses in the sequence, ED 302 (Philosophic, Historical and Social Foundations of Education) and ED 303 (Tests and Measurements) are included in this study, as only in these two courses did departmental examinations continue to be used and the concept of time for mastery and additional testing to be implemented.

Purpose of the Study

The purpose of this study was to determine the validity of the practice of permitting students in the two-year teacher education program at Florida Atlantic University to repeat examinations in order to attain passing grades in the first two courses in the general professional education sequence of courses, ED 302 and ED 303. Specifically, the questions asked were:

How do students who repeat examinations in order to attain the minimum required standard of mastery compare with students who do not repeat examinations on (a) completion of the teacher education program, (b) grade in student teaching, (c) supervising teacher's rating, and (d) performance on the Graduate Record Examination: Advanced Education Test?

Subjects

The group of students in the Florida Atlantic University program in teacher education who were the subjects of the study were the cohort of a particular term (Fall Quarter, 1969). In a sense that group comprised a sample; i.e., a time sample, presumably representing the larger group entering that year and somewhat earlier and later years. Such a selection of students rather than a sample stratified by year and quarter of entrance was dictated by availability of common data.

To allow time for even the slower students to complete the program in time to provide information on the criterion measures, the group chosen for study was that group of students completing Center of Discovery I in the Fall Quarter, 1969. Final collection of data was in the summer of 1973, giving the students four school years in which to complete their degree programs.

A total of 633 students completed Center of Discovery I in the Fall Quarter, 1969, 593 of whom were undergraduates and thus were included in this study.

Data Acquisition

The names of students completing ED 302 were obtained from the final grade reports for the Fall Quarter, 1969. From the records kept by the Foundations Department, subjects were categorized according to their performance (grades and whether with repeating or not having to repeat exams if a grade of C was attained). The resulting categories were F, D, C with repeat, C, B and A.

Official transcripts on file in the Registrar's Office were examined to obtain information concerning graduation/non-graduation, student teaching grade, age, entering grade point average and intended level of teaching. Supervising teacher's rating was obtained from the Office of Student Teaching for those who had completed the teacher education program and graduated with certification. The Graduate Record Examination: Advanced Education Test was administered to all graduating seniors. These scores were available through the Testing Center of the University.

Analysis of Data

In the original study from which this report is taken, eighteen hypotheses were postulated and tested. The most important concern of the study, however, was the performance of the students who repeated examinations to attain a grade of C and the performance of those who attained a grade of C without repeating examinations.

In order to examine the question of frequency of completion of the program by students in the categories of C and repeat for C and among the several grade categories, the chi square test of the significance of the difference between frequencies was used.

To examine the questions of comparisons of performance on the three criterion measures of grade in student teaching, supervising teacher's rating, and performance on the Graduate Record Examination: Advanced Education Test for the grade categories A-F, the test of the significance of the difference between means was one-way analysis of variance. The t test was used to test the significance of the difference between means of the C and Repeat for C groups, the groups of central concern to the study.

Results and Discussion

As can be seen in Table 1, analysis of the differences between the grade categories with respect to the criterion measures resulted in the following:

1. There were no significant differences between grade categories C and Repeat for C with respect to
 - a. completion/non-completion (i.e., graduation with certification in education, graduation from other colleges, academic dismissal or withdrawal for reasons unknown);
 - b. grade in student teaching;
 - c. supervising teacher's rating; and
 - d. Graduate Record Examination: Advanced Education Test Score.
2. There were significant differences among grade categories A through F for ED 302 and ED 303 on the above criterion measures, with the exception of ED 302 grade with respect to student teaching performance (See Table 2).

The purpose of the practice of permitting students who initially failed examinations in ED 302 and ED 303 to utilize more time and repeat examinations was to provide opportunity for the development of individuals who enrolled in the courses with less readiness than needed for mastery of the course content. The most important conclusions of this study, therefore, focus on the comparisons of the performance of the students who repeated examinations to attain a grade of C with those who attained a grade of C without repeating examinations.

The major conclusion to be drawn from the set of results of this study concerning students in the teacher education program at Florida Atlantic University is as follows: Students who repeat examinations in order to demonstrate a minimum level of mastery of the course objectives and to attain a grade of C in ED 302 and ED 303 do not differ significantly in performance as student teachers or in the likelihood of completion of the degree program from their classmates who attain a grade of C without repeating examinations. Thus the practice of providing an opportunity for the development of students who initially fail examinations by giving more time for study and repeat of examinations is supported.

Table 1

Results of the Analysis of Data for the
Grade Categories C and Repeat for C
with Respect to the Criterion Measures

Variable	Course	Statistic	Value	d.f.	P
Completion- Non- Completion	ED 302	Chi Square	7.31	3	.06
	ED 303	Chi Square	2.84	3	.42
Grade in Student Teaching	ED 302	t	.07	130	.94
	ED 303	t	1.46	165	.15
Supervising Teacher's Rating	ED 302	t	.94	109	.35
	ED 303	t	1.16	139	.25
Graduate Record Exam: Ad. Education	ED 302	t	1.70	115	.09
	ED 303	t	1.71	148	.09

Table 2

Results of the Analysis of Data
for the Grade Categories A-F
with Respect to the Criterion Measures

Variable	Course	Statistic	Value	d.f.	P
Completion- Non- Completion	ED 302	Chi Square	130	18	.001
	ED 303	Chi Square	159.34	18	.001
Grade in Student Teaching	ED 302	F	1.95	5, 305	.09
	ED 303	F	4.73	5, 306	.001
Supervising Teacher's Rating	ED 302	F	1.33	5, 257	.25
	ED 303	F	2.31	5, 258	.05
Graduate Record Exam: Ad. Education	ED 302	F	19.61	5, 275	.001
	ED 303	F	23.85	5, 275	.001

The foregoing major conclusion has to be examined against the background of predominantly significant relation of category of grade over the wider range (A-D) to performance on the several criterion measures. To varying degree, the expected association between level of course performance and criterion performance obtains. It is only within the narrower range of C, with and without repeating examination, that differences do not -- and consistently do not -- follow on the criterion measures. Whether or not the program, with its demand for at least the minimal mastery of the criterion of a C grade and its provision for additional time for preparation and for repeating examinations, does produce fully equal functioning on the C with repeat students, at least the criteria used in the study and the statistics used to analyze performance on the criterion measures do not show significant differences in performance at the 5 per cent level of confidence. Thus the conclusion has to be that, whatever other relations obtain over the wider grade range, as long as C constitutes an acceptable grade, as it does for graduation and for legal certification purposes, the practice of repeating examinations is warranted. It is warranted on the basis of non-significantly different criterion performance. It provides opportunity to individuals with less than the expected academic readiness for the courses to prepare themselves with at least minimal adequacy and thus have access to continuation in the program of teacher preparation.

The results of this study appear to support the concept of mastery learning advocated by Bloom, Carroll, Keller, and others. Not only were students who initially performed below a prescribed level of mastery able to attain that level given more time and study, but their performance on more nearly ultimate criteria at a later time appears not significantly different from those who attained mastery of the course on first attempt.

In view of the spreading use of the mastery learning concept in colleges and universities around the country and of the efforts to implement competency based teacher education programs, the results of this study assume increasing significance. Hypothesizing that the results of this study would pertain should students in teacher education programs be held to a higher level of performance than that for a C grade and assuming that a higher level of course performance would result in a higher level of teaching performance (as indicated in this study), teacher education programs should produce consistently more effective teachers by requiring all teachers-to-be to invest the time and effort to attain a high level of mastery in their courses. More research is needed to test the consistency with which students in teacher education held to a mastery level equivalent to A or B performance become more effective teachers in the classroom. Educating students to become better teachers is a challenge to all teacher education institutions. The implementation of mastery learning in all courses in teacher education may provide one much needed means to meeting that challenge.

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