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ABSTRACT

A study was designed to assess the effects of the introduction of a state-mandated minimum competency test (MCT) on students' acquisition of basic and high-level mathematics skills. Subjects of the study were ninth-grade students, all of whom attended the same schools in the Austin (Texas) Independent School District, and took the same form of the standardized achievement test 1 year before, 1 year after, and 3 years after the introduction of the MCT. Items on the mathematics subtest of the Sequential Tests of Educational Progress (STEP) were divided into Basic Skills, and High-level Skills. Subjects' overall eighth-grade averages, as a measure of previous achievement, were used as the covariate in the study. Results of the data analyses indicate that the Basic Skills mean increased significantly between 1979 and 1981 but did not change significantly thereafter. The observed increase was constant for students at all levels of achievement. Analyses of High-level Skills means indicate that there was a significant interaction with level of achievement. Low achievers demonstrated a significant increase, and high achievers demonstrated a significant decline in High-level Skills scores between 1979 and 1983. Implications of the findings and limitations on the conclusions are discussed. (Author/JAZ)

MINIMUM COMPETENCY TESTING: HELPFUL OR HARMFUL TO HIGH-LEVEL SKILLS?

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ABSTRACT

A study was designed to assess the effects of the introduction of a state-mandated minimum competency test (MCT) on students' acquisition of basic and high-level mathematics skills. Subjects of the study were ninth-grade students, all of whom attended the same schools in the Austin Independent School District, Austin, Texas, and took the same form of the standardized achievement test one year before, one year after and three years after the introduction of the MCT. Items on the mathematics subtest of the Sequential Tests of Educational Progress (STEP) were divided into Basic Skills, i.e., items that correspond to skills assessed by the MCT, and High-level Skills, i.e., all other STEP mathematics items. Subjects' overall eighth-grade averages, as a measure of previous achievement, were used as the covariate in the study. Results of the data analyses indicate that the Basic Skills mean increased significantly between 1979 and 1981 but did not change significantly thereafter. The observed increase was constant for students at all levels of achievement. Analyses of High-level Skills means indicate that, while these means did not change significantly between 1979 and 1981 or 1983, there was a significant interaction with level of achievement. This interaction was such that low achievers demonstrated a significant increase, and high achievers demonstrated a significant decline in High-level Skills scores between 1979 and 1983. Implications of the findings and limitations on the conclusions that can be drawn from the study are discussed.

MINIMUM COMPETENCY TESTING: HELPFUL OR HARMFUL TO HIGH-LEVEL (MATHEMATICS) SKILLS?

Introduction

In Texas, as in approximately two-thirds of the states, the Legislature has mandated the administration of a criterion-referenced test to all students in selected grades. From 1980 through 1985 the Texas Assessment of Basic Skills (TABS) was administered to all public school students in grades 3, 5, and 9 and to students in grades 10, 11, and 12, who had not yet demonstrated mastery of the exit-level test.

Because the TABS was the only test administered uniformly throughout the State, ninth-grade scores on the TABS had been the most commonly used standard by which to compare school districts in Texas. These scores had been used by the media, as well as by school administrators and the general public to make informal judgments regarding district performance and/or informal comparisons of performance between districts. Recent legislation passed by the Texas Legislature, however, mandates that, beginning in 1987, mastery of the exit-level basic skills test will be required for attaining a high school diploma in every public high school in the State. This mandate has significantly increased the importance of scores on the State-mandated minimum competency test.

Historically, a major objection raised by critics of minimum competency testing has been that, if the results of such testing are used in a manner that is perceived to be negative or punitive by program administrators or instructional personnel, these individuals will tend to focus program and instructional objectives exclusively on the skills directly measured by the minimum competency test (Broudy, 1980). Although this practice is not strictly "teaching to the test," if not monitored closely, it can result in the teachers' narrowing the focus of instruction to the detriment of those skills not included on the test. If such a narrowing of focus does in fact occur after the implementation of a minimum competency test, the overall quality of a school's instructional program may be adversely affected and strong warning should be made to all personnel involved in planning, coordinating and implementing the instructional program.

It was the serious implications of the possible detrimental effects of the introduction of a minimum competency testing program that prompted the study described in the following pages. The specific purpose of the study was to determine the effects of the implementation of the TABS testing program on the acquisition of both basic and high-level mathematics skills by ninth-grade students in the Austin Independant School District (AISD). Mathematics skills were selected as the target of this study because they are generally regarded as more susceptible to teacher intervention and will more readily reflect changes in focus of instruction.

Historical Perspective

Minimum competency testing had its origins in two very different sources. One was the United States' tendency to promote minimum levels of social well-being, as part of a philosophy that assumes that the government must provide means to ensure a decent minimum standard of living for those who cannot provide adequately for themselves (Cohen and Haney, 1980). The other source was the general tendency towards accountability that transferred from private industry into other settings such as schools, hospitals and government agencies.

Minimum competency testing, thus, has been used to assess the extent to which students master the skills deemed to be necessary for functioning in society. In the political arena, minimum competency testing serves as a yardstick by which the efficacy of various Federally-funded education programs can be measured.

Cohen and Haney (1980), in their discussion of the origins of minimum competency testing, state that:

> Unhappily, there is evidence of either parsimonious or punishing inclinations nearly everywhere. MCT (minimum competency testing) has gained momentum in a climate of scarce resources and scarcer patience with professionals and their clients. Questions about the efficacy of social policy have taken on a particularly pessimistic and even punishing aspect .... The pinched condition of most budgets in social agencies is understood not only as a consequence of hard times, but also as a reaction to liberal reform that "does not work." In the present climate, the general worry about getting one's money's worth is not simply a comment on corruption or economic constraints, but part of a broad opposition to increased spending on social welfare programs of doubtful efficacy. In such a climate the characteristic reflex is to blame both providers and recipients of social services for program failure. It would not be surprising if MCT provided more ammunition for this reflex. (Cohen and Haney, 1980, pp. 16-17)

The Denver public schools have been administering competency tests in basic skills for over fifteen years. In 1973, the state of Oregon passed legislation requiring graduates of the class of 1978 to take standardized tests in order to demonstrate proficiencies in twenty skill areas, thus becoming the first state to establish statewide minimum competency requirements. Florida and North Carolina were also among the first states to adopt statewide competency criteria and state-mandated tests. Spurred on by increased public demand for school accountability and a strong "back to basics" movement that surfaced in the late 1970's, other states rushed to implement minimum competency testing programs. By 1979, 29 states had state-mandated testing programs, some established by legislative mandates and others by State Board policies. In the May, 1978, issue of Phi Delta Kappan, Chris Pipho, of the research department of the Educational Commission of States, reported:

> What began as a startling idea in California, Florida, Oregon, and a handful of other states in 1975 and 1976 has now arrived in some form in each state. As of March 15, 1978, 33 states had taken some type of action to mandate the setting of minimum competency standards for elementary and secondary students. All the remaining states either have legislation pending or legislative or state board studies underway.
>
> (Pipho, 1978, p. 585)

Some authors feel that minimum competency tests provide a basis for establishing standards of achievement that is more fair than any that might be derived from standardized achievement tests. In 1980, Jenne Britell, of Educational Testing Services, presented a paper at the American Educational Research Association conference in which he argued that the standard of minimum competence is a more egalitarian and realistic standard than standards followed in the past. He stated:

> Educational competence is defined as that level of performance that citizens require to function in their society. Educational excellence, on the other hand is the ideal standard, established apart from the criterion of function and attained by few.
>
> (Britell, 1980, p. 24)

Britell's comment reflects the "minimalist" point of view. Minimalism is a philosophy that advocates minimum levels of social well-being. It is a social policy established in response to the notion that the welfare of some members of the society has fallen below minimal levels of decency (Cohen and Haney, 1980). The minimalist philosophy proposes that, if the bottom of a distribution is raised, the top will rise also because those at the top want to maintain the difference between themselves and those at the lower end of the distribution. Thus, according to the minimalist position, actions that directly benefit the bottom members of a distribution ultimately benefit the whole distribution. While this argument presents an intriguing hypothesis, the authors were unable to find any research evidence that might confirm or deny this theory.

In 1979, the Texas Legislature responded to growing public dissatisfaction with the level of basic skills competencies demonstrated by Texas high school graduates by passing HB 723. Among other educational reforms related to curriculum and program administration, HB 723 also mandated the development and implementation of a minimum competency test, which would assess basic skills in the areas of reading, writing and mathematics.

In response to this legislative mandate, the Texas Education Agency coordinated the development and implementation of the Texas Assessment of Basic Skills (TABS), which was first administered to all students in grades 5 and 9 in Texas public schools in 1980. TABS measured basic skills in three areas - mathematics, reading and writing. The TABS items sampled a set of skills, identified by educators from all over Texas as necessary for students to succeed in society following graduation from high school. The tests were administered in a standardized way throughout the State to all third-, fifth- and ninth-grade students and to all students in grades 10 through 12 who had not previously demonstrated mastery.

Until the 1985-86 academic year, failure to master the TABS did not have any State-prescribed consequence for students. Prior to 1985, only a few Texas school districts required mastery of the TABS for graduation. However, recent changes in Texas law (HB 72) require that, beginning in 1987, the state-mandated, exit-level basic skills test be mastered before students are granted a high school diploma. As might be expected, this new requirement has dramatically increased the importance of the acquisition of basic skills by all Texas high school students.

Although the TABS tests were administered to students in grades five and nine for the first time in the Spring of 1980, emphasis on teaching the TABS skills actually began to show up at the classroom level during the 1979-1980 academic year. Support services from the Texas Education Service Centers, as well as from district-level sources became not only available, but ever present in teachers' curricula and lesson plans. Consultants in Education Service Centers were instructed to make TABS objectives their highest priority. They were urged to focus developmental efforts primarily on materials that would, directly or indirectly, help students master TABS objectives.

Support materials were developed and distributed to all teachers in AISD. Objective specifications, sample items and practice tests became mandatory elements in every teacher's planning.

Public addresses made by the AISD Superintendent alerted the entire staff to the need to "do better on TABS objectives" every year. A competitive atmosphere prevailed among local districts, as evidenced by the constant comparison of TABS results. This competition was increased by the media through publications that periodically feature TABS results of various districts. At the State level, the Joint Urban Evaluation Council (JUEC) held a meeting every year to compare and discuss TABS results.

Testing Controversy

In spite of the fact that minimum competency testing has been surrounded by controversy since its inception, there has been little empirical research directed towards the investigation of the actual consequences of this type of assessment: According to Brim (1965), rejection and criticism of tests often seem to be based on intuitive feelings or personal experiences with tests. Much of the debate on minimum competency testing has been confined to statements either induced to support personal caveats or deduced from ideological or political positions.

A frequent criticism is that the content of tests is often trivial and provides no basis for evaluating many pupil characteristics such as creativity, imagination, and the abilities to learn and make informal judgments (Green, 1975; Quinto, 1977; and Schuartz, 1975). Other critics question the use of tests for assessing teacher effectiveness. Tests are seen as giving rise to a form of simplistic accountability, and their use in this context has been denounced as irrelevant, crude, unfair and unreliable (McKena, 1975; Weber, 1974).

Other critics have pointed to the effects of tests on school programs and participants. They claim, for example, that testing pressures teachers into teaching to the test, and, thus, leads to narrowing the curriculum to focus on score-producing areas. Testing is also seen as perpetuating a standard curriculum and discouraging diverse and innovative programs (De Rivera, 1974; Perrone, 1977; and Quinto, 1977).

Although content validity most commonly refers to the question, "Is the test measuring what was taught?", minimum competency testing presents the question in reverse, i.e., "Is the curriculum teaching what the test is measuring?" This reverse occurs because, at the high school level, the basic skills assessed by minimum competency tests are operationally defined as the basic skills necessary for a student to survive in society. This domain may or may not correspond to the essential elements that constitute the basis of the curriculum objectives of any particular high school. Nevertheless, once minimum competency tests are linked to graduation, school districts must assure that all students are taught the material included in the assessment program. Such districts are compelled to model their curriculum so as to match the test more closely.

Cooper and Leiter summarize the potential problems of minimum competency testing and misapplication of the results of such tests by pointing out that they

> "can injure individual students and erode curriculum and instruction... create social and intellectual segregation... and reduce learning to rote and regurgitative modes," (Cooper and Leiter, 1980, p.35.)

Public school principals have questioned the predictive validity of competency tests. In 1983, Peach and Reddick reported the following results from a questionnaire distributed to 147 public school principals. Most of the 121 principals who responded thought that passing a test did not necessarily indicate that the student actually had the basic skills measured by the test. These principals also indicated that they did not think that instruction in subject areas not covered by the test would diminish as a result of competency testing. Their responses, however, were based on personal opinion, not on the results of empirical data derived from studies of the competency testing process.

Jaeger and Tittle (1980) summarize their concerns regarding minimum competency testing as follows:

> Minimum competencies are most often expressed as rote-learning objectives or direct application of facts to supposedly practical situations. If, as suggested in this volume, the content of the tests comes to define the content of our high school curricula, we are indeed in danger of "having the minimum become the maximum." More than one author represented here warns that public education may revert to the equivalent of a kindergarten through sixth-grade curriculum for the children of the masses, while the children of parents who can afford private schools may enjoy an enriched college-preparatory curriculum that adequately spans the content of secondary as well as elementary instruction. (Jaeger and Tittle, 1980, p. 485)

In other words, Jaeger and Tittle fear that we may be institutionalizing mediocrity in our public schools.

Since 1980, the Office of Research and Evaluation of the Austin Independent School District (AISD) has performed an annual equating study to determine specific TABS raw scores that equal various STEP grade equivalent scores. These equating studies indicated that the State "mastery" criteria for the reading section of the TABS was equal to a grade equivalent of approximately 6.6 and for the mathematics section, approximately 7.9. Such standards for mastery lend strong support to Jaeger and Tittle's concern.

The study described in this paper was undertaken in an effort to contribute empirical data to the controversial area of minimum competency testing, an area that has, thus far, been characterized primarily by conjecture and opinion. The focus of the study was the effect of a minimum competency test on students' acquisition of basic and high-level mathematics skills, one of the subject areas commonly assessed by minimum compentency tests. The study explored a number of questions that are highly relevant to the minimum competency issue:

- Does the implementation of a minimum competency program in a school district enhance the acquisition of basic skills? Does it also benefit the acquisition of high-level skills?

- Does the minimum competency program have similar effects on students at different achievement levels?

The State-mandated minimum competency test, the Texas Assessment of Basic Skills (TABS) was administered in all public schools in Texas from 1980 through 1985. The TABS was preceded by much publicity and support in the form of instructional materials and workshops for educators at all levels. It would have been very difficult for an Austin ISD teacher, in 1979-1980, to miss the high priority placed on mastering the TABS objectives. This support has continued since 1979, and the pressure for good performance has been enhanced by the publication of TABS results from year to year.

It is unquestionable that the skills measured by the TABS have become extremely important instructional objectives in school districts throughout the State. What has never been assessed, since the initiation of the TABS testing program in 1980, is the effect this procedure has had on skills not included in the TABS and on the performance of students who are not in great need of basic skills enhancement. If the minimalists' theory is correct, one would expect to see an overall improvement in skills performance by students at all achievement levels. On the other hand, if, as Jaeger and Tittle suggest, we are gradually institutionalizing mediocrity through overemphasis on basic skills, one would expect to see a marked improvement in the performance of low achieving students accompanied by either no change or a gradual decline in the performance of high achievers.

Design of the Study

Mathematics was chosen as the subject area for investigation because, of the three areas assessed by the TABS (reading, writing and mathematics), mathematics skills are the most likely to be influenced solely by the instructional program. Reading and writing are influenced by many external factors, such as other courses, personal interests or family educational background.

The standardized achievement test in use in AISD during the years encompassed by the study was the Sequential Tests of Educational Progress (STEP). Each item on the mathematics subtest of the STEP was compared to the TABS objectives. If the item met the specifications established for the TABS objectives, the item was labeled a "Basic Skills" item; otherwise, the item was labeled a "High-level Skills" item. Thus, the dependent variables in the study became students' total scores on each set of items resulting from this procedure. The maximum possible score was 50 on each set of items.

The following hypotheses were explored:

1. There would be a significant increase in Basic Skills means after the introduction of the TABS test.

2. There would be no significant change in High-level Skills means after the introduction of the TABS test.

3. Low achieving students, but not high achievers, would show a significant increase in Basic Skills scores.

4. Low achieving students would show a significant increase in High-level Skills scores, due to the transfer effect of improved Basic Skills.

5. There would be a decline in the High-level Skills scores of high achievers, due to decreased instructional emphasis on these skills.

Hypotheses 1 and 2 address the potential main effects of the introduction of a minimum competency test, while hypotheses 3, 4, and 5 explore the possibility that students at different achievement levels are affected differently by the MCT procedure.

In designing the study, several constraints were imposed to assure that the comparisons between performance data derived from different academic years would be as valid as possible. The first such constraint pertained to what years would be included in the study. Because the purpose of the study was to investigate the effects of the introduction of a minimum competency test on the acquisition of mathematics skills, it was necessary to include student performance data derived from years prior to the introduction of TABS in Spring 1980, for purposes of comparison. However, since the type of measure of prior achievement necessary to test Hypotheses 3, 4, and 5 was not included in 9th grade student data until 1979, it was decided that only 1979 would be used as the measure of mathematics skills performance before the introduction of the TABS test.

The standardized achievement test in use in AISD at that time was the Sequential Tests of Educational Progress (STEP). While this test was administered throughout AISD each Spring, the District used Forms 2A and 2B in such a way that any particular school used Form 2A one year and Form 2B the next. It was decided that data used in the study would be derived exclusively from Form 2A of the STEP. This control was deemed necessary because, according to the STEP, Series II: Teacher's Manual for Administering, Scoring and Interpreting, the two forms of the STEP mathematics subtests are not equal in item difficulty.

Finally, in order to insure the greatest possible comparability of ninth-grade student test data, it was decided that the same schools would have to be used for each year included in the study. The years that satisfied the requirements of all of these constraints were 1979, 1981 and 1983, which represent one year prior to the introduction of TABS and one and three years after the introduction of TABS. The data used in the study were derived from 9th grade students attending the same schools and taking the same form of the STEP test during each year of the study.

Certain students were excluded from the study in accordance with District policies related to testing of students. There were no test data for students who spent three or more hours a day in a special education class and had been exempted from testing by the students' Admission, Review and Dismissal (ARD) Committee. Also, there were no test data for students who transferred into AISD from a foreign country and did not speak or read English well enough to understand the test questions.

Application of the constraints indicated above resulted in a sample of 4,653 AISD 9th-grade students, 1,789 of whom were tested in 1979, 1,483 in 1981, and 1,381 in 1983. The data file for each student included a student number, the student's overall eight-grade average (used as the measure of previous achievement), the year in which the student took the STEP, and the student's Basic Skills score and High-level Skills score. These data were obtained through the AISD Office of Research and Evaluation.

Regression analysis was chosen as the most appropriate statistical approach because it not only permits tests of main effects and interaction effects, while controlling for the influence of a covariate, but it also permits tests for the linearity or non-linearity of the regression distributions. Although separate analyses were conducted for each dependent variable, the same comparisons were performed in each analysis. The first comparison between regression models was used to determine whether the distribution of skills scores regressed on previous achievement was linear or curvilinear. The second comparison was used to determine if there was a significant main effect for year tested, i.e., if a significant difference existed between Basic or High-level Skills scores obtained in 1979, 1981 or 1983. The third comparison was used to determine if there was a significant interaction between previous achievement and year tested.

Because of the large number of students included in the sample, the authors

selected .01 as the level of significance to be used for all model comparisons. This more stringent test of significance was chosen to avoid obtaining significant differences solely as a result of large sample size.

Results of the Study

The raw score means for Basic Skills and High-level Skills, for 1979, 1981 and 1983 are shown in Table 1 below. These means are based on a total possible raw score of fifty for each type of skill. Table 1 also shows the 8th grade averages of the students included in the study and the adjusted skills means, which reflect the influence of the covariate on the dependent variables. Eighth grade averages, for students in the sample, ranged from 59 to 99. Grade equivalents for these numerical scores are shown in Table 2.

TABLE 1

Table of Means

	1979		1981		1983	
YEAR TESTED	$\bar{X}$	$\bar{X}'$	$\bar{X}$	$\bar{X}'$	$\bar{X}$	$\bar{X}'$
N	1,789		1,483		1,381	
BASIC SKILLS	25.08	25.95	24.24	26.14	24.95	26.12
SD	8.10		8.15		7.28	
H-L SKILLS	21.68	19.75	20.60	19.81	21.19	19.84
SD	7.09		6.95		6.77	
8TH-GRADE AVG.	85.19		82.97		83.87	

TABLE 2
AISD Letter Grade Equivalents for Numerical Grade Point Averages

Letter Grade	Numerical Grade
A+	100-100
A	97-99
A-	93-96
B+	89-92
B	87-88
B-	83-86
C+	79-82
C	77-78
C-	73-76
D+	69-72
D	67-68
D-	60-66
F	0-59

The correlation ratio between the covariate and the dependent variables was determined to be r =.599 for Basic Skills and r =.601 for High-level Skills. Since r^2 represents the proportion of variance of the dependent variable accounted for by the covariate, it can be concluded that previous achievement accounted for 36 percent of the variance of both Basic Skills and High-level Skills scores.

Regression analysis of the Basic Skills scores indicated that the regression lines were curvilinear, and that there was a significant difference between the curves for 1979, 1981 and 1983. The test for an interaction between previous achievement and year tested was not significant, however, indicating that the three regression lines curved to the same degree and in the same direction.

Post hoc regression analyses were performed to determine which years differed significantly. These analyses indicated that the only significant difference between Basic Skills means was to be found between 1979 and 1981, with 9th grade students scoring significantly higher in 1981 as compared to 1979. The 1983 Basic Skills mean was not significantly different from either 1979 or 1981 means. The Basic Skills regression lines shown in Figure 1 indicate that, initially, Basic Skills scores increased after the introduction of TABS, and this performance level was maintained two years later.

The failure to find a significant interaction between previous achievement and year tested indicates that the Basic Skills scores of students at different levels of achievement were similarly affected by the introduction of the TABS. Thus, the results confirmed Hypothesis 1, that there would be a significant increase in Basic Skills means following the introduction of TABS; however, Hypotheses 3, that this increase would be demonstrated by low achievers but not by high achievers, was not confirmed.

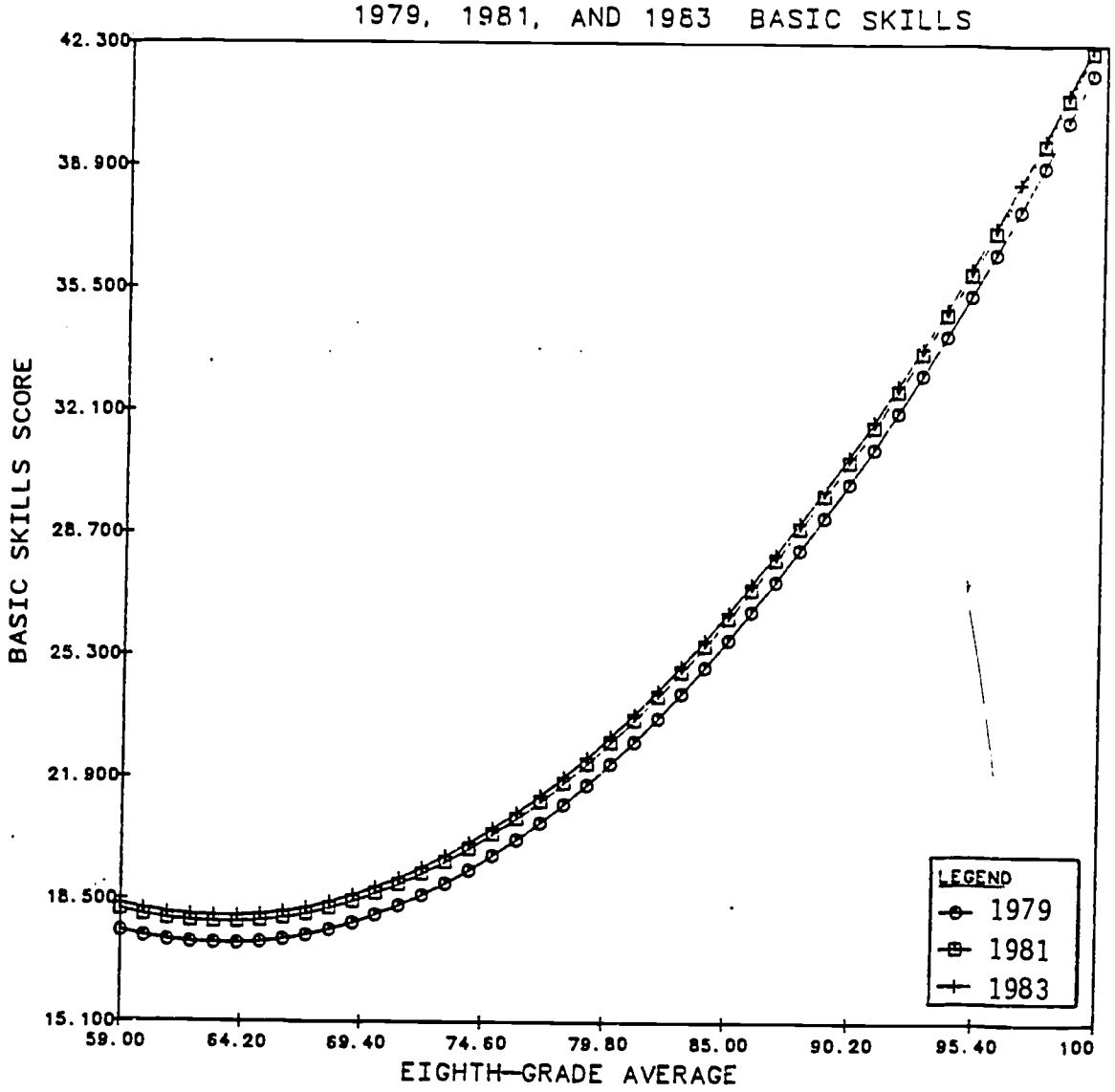

Figure 1. REGRESSION LINES FOR BASIC SKILLS SCORES (Model 3): Students Tested in 1979, 1981, and 1983.

Regression analysis of the High-level Skills scores indicated that the regression lines were curvilinear, and that there was no significant difference between the curves for 1979, 1981 and 1983. The test for an interaction between previous achievement and year tested was significant, however, indicating that the quadratic components of the three regression lines were not equal, i.e., that the curves intersected. See Figure 2.

Post hoc analyses indicated that the significant interaction occurred between the years 1979 and 1983, and that this interaction was significant for "C" and "D" students and for "A" students. The nature of the

interaction was such that the High-level Skills scores of "C" and "D" students were significantly higher in 1983 as compared to 1979, while the scores of "A" students were significantly lower in 1983. There was no significant difference for "B" students.

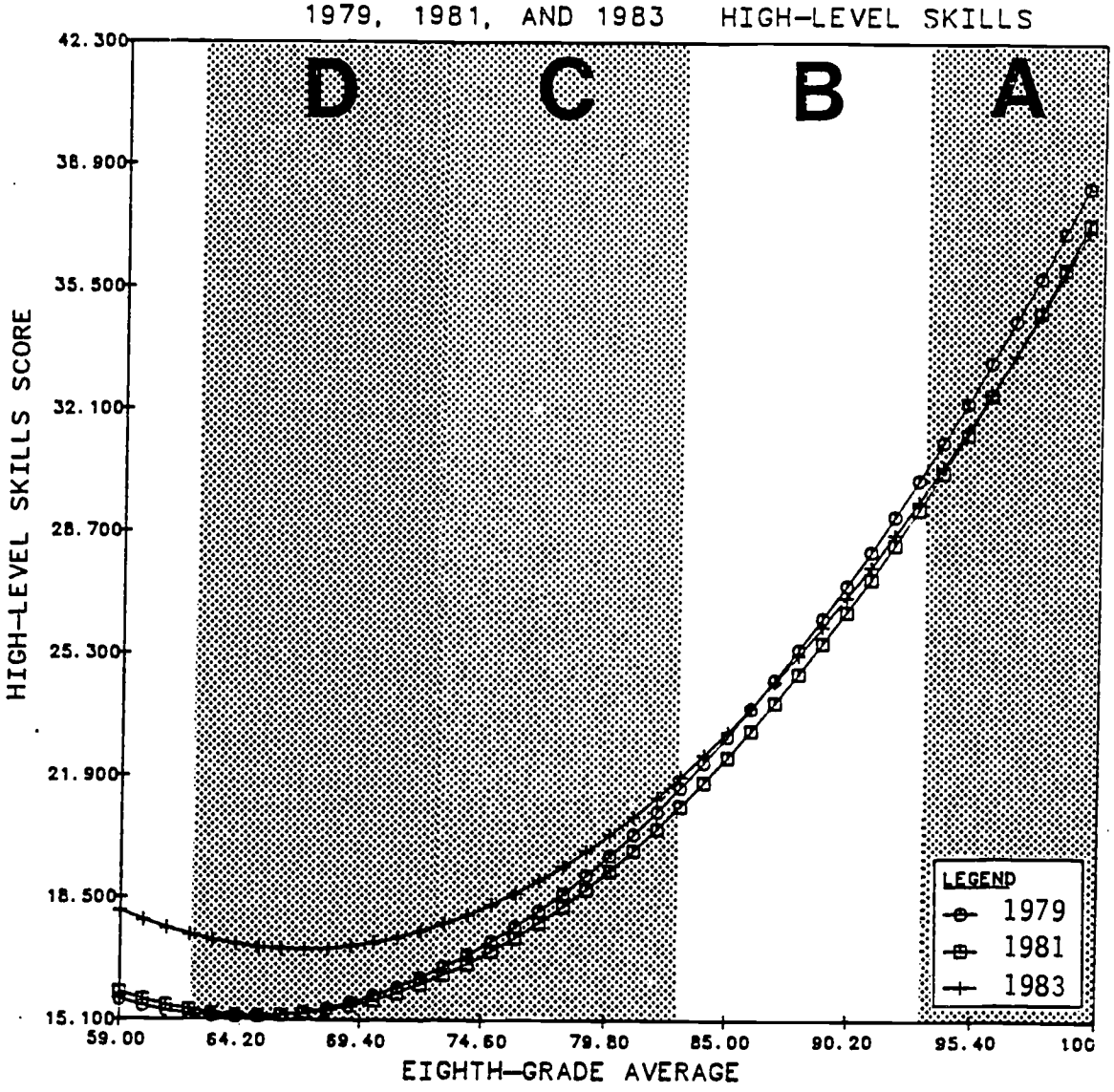

Figure 2. REGRESSION LINES FOR HIGH-LEVEL SKILLS SCORES (Model 2): Students tested in 1979, 1981, and 1983.

Results of the analyses of 1979, 1981 and 1983 High-level Skills scores confirmed Hypotheses 2, 4, and 5. There was no significant change in High-level Skill means after the introduction of the TABS; however, students at different levels of previous achievement performed differently in 1983 as compared to students at comparable achievement levels tested in 1979. This difference was significant for low and high achievers, such that low achievers increased their High-level Skills scores in 1983, while the scores of high achievers declined.

Conclusions

Conclusions derived from this study are limited by the fact that they must be based on data derived from only two test administrations following the introduction of the State-mandated minimum competency test. The study does, however, cover a five-year span during which time great attention was given to TABS objectives. Also, because the study includes only 9th-grade students, results cannot be generalized to students at lower grade levels or to students who are required to pass a minimum competency test in order to receive a high school diploma.

One of the promising findings from the study was that all students, regardless of achievement level, increased performance on basic skills mathematics items after the introduction of the minimum competency test. The finding that basic skills scores did not continue to increase three years after the introduction of TABS was disappointing, especially since AISD has made a serious effort to assure that remedial courses are available to all students who are at risk of failing to achieve the minimum competency standard. The fact that the MCT has now been linked to receiving a high school diploma may motivate students to make better use of the remedial courses that are available.

The increase in the 1981 Basic Skills mean lends support to the minimalist theory that raising scores at the lower end of a distribution will result in an increase in scores for the rest of the distribution, as well. Additional analyses would have to be performed to determine if this pattern is maintained after 1987, when students are required to pass the MCT to receive a diploma.

High-level Skills scores, on the other hand, varied for students at different levels of achievement. Students who achieved an overall 8th-grade average of "C" or "D" showed a dramatic increase in acquisition of High-level mathematics skills from 1979 to 1983. This increase could be attributed to a transfer of knowledge and understanding from the stronger foundation in basic skills to high-level mathematics skills.

Unlike students at the lower end of the 8th-grade average distribution, students with an "A" average in 8th grade showed a decrease in High-level Skills scores from 1979 to 1983. No significant changes occurred in High-level Skill means between 1979 and 1981 at any level of the 8th-grade average distribution. It took more than one year for changes that were both noticeable and statistically significant to occur.

While it is apparent that the decline in "A" students' scores occurred after the introduction of the State-mandated minimum competency test, it is impossible to determine the precise reason for the decline. One can state, however, that, based on the High-level Skills' regression lines for 1979, 1981 and 1983, a declining trend in the scores of high achievers has been established. If allowed to continue, this trend may represent a serious problem for the School District and for society. It would result in students' completing high school with fewer high-level mathematics skills acquired each year. This decline would lend support to Jaeger and Tittle's hypothesis that the minimum will become the maximum.

The findings of this study are of particular importance to personnel at all levels of the educational process for two reasons. First, the additional instructional emphasis on basic skills, that occurred after the introduction of a state-mandated minimum competency test, benefitted both the basic skills performance and the high-level skills performance of low-achieving students. It is possible that teachers can incorporate the concept of this transfer effect into their lesson plans, so as to build even more effectively on the better grasp of basic skills demonstrated by students at all levels of achievement. Second, attention must be paid to the needs and capabilities of high achievers, at the same time that the skills included in the minimum competency test are being stressed. Using basic skills as the primary guide for curriculum development restricts the scope of instruction to the detriment of high achieving students.

Further research is needed to determine if these findings and recommendations apply to other areas, such as reading and writing, as well.

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