DOCUMENT RESUME

ED 141 379 TM 006 105

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TITLE Achievement and Intelligence: Individualized Instruction Reverses the Trend.
PUB DATE [Apr 77]
NOTE 17p.; Paper presented at the Annual Meeting of the American Educational Research Association (61st, New York, New York, April 4-8, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Achievement Tests; Affluent Youth; *Educational Trends; Elementary Education; *Individualized Instruction; Individualized Programs; Intelligence Tests; *Program Effectiveness; Standardized Tests; Statistical Analysis; *Test Results
IDENTIFIERS *Individually Guided Education; *Test Score Decline

ABSTRACT

Recent comprehensive analyses such as those by Harnishfeger and Wiley (1975) and Zajonc (1976) indicate the existence of a national and international downward trend in achievement and intelligence test scores. An analysis of the achievement and intelligence test scores in a small, upper middle class, New Jersey elementary school district showed an overall increase in achievement and intelligence test scores. This trend reversal was interpreted as being primarily due to the introduction in 1972 of an Individually Guided Education (IGE) program in the 3 elementary schools of the district. (Author/MV)

Achievement and Intelligence: Individualized Instruction Reverses the Trend

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Harnishfeger and Wiley (1975) summarized extensive amounts of achievement test data and concluded that since the mid-sixties achievement test scores have been decreasing and that the decrease has been most pronounced in the verbal-test area.

At a recent Rutgers University Conference on Reading and Writing Skills, Wiley (1976) summarized the available evidence in these words:

"Let me first describe the data base for our study. And I should emphasize that we did not engage in primary data collection, but, assembled and used, and interpreted data already collected by others.
Tests. Harnischfeger and Wiley (1975) reviewed data from ten test batteries involving more than forty tests. These nationwide data stem from pupils in kindergarten through twelfth grade, including college entrants, and the data covered all of the commonly used subject areas. The test batteries reviewed included the Scholastic Aptitude Tests, the American College Tests, the Iowa Tests of Basic Skills, and the National Assessment of Educational Progress.

Let me summarize the Achievement Test Score Data briefly. Generally, through the nineteen-forties, fifties, and up to the mid-sixties, achievement test scores steadily increased. Since then scores have been declining in all tested achievement areas for grades 5 through 12, with more dramatic drops occurring in recent years and being most evident for higher grades. The declines have been most pronounced in verbal tests and therein for college-bound females. There is no evidence for decline at younger ages and in lower grades (grades 1,2,3,4), but perhaps there are increase Today's first-graders enter school with more developed skills, such as knowledge of letter-names, numbers, and word meaning, than their counter-parts of the mid-sixties. Our analyses indicate that the findings are real, not artifacts and that they describe a National phenomenon." (Wiley, 1976).

Using a data base that included scores from other countries, Zajonc (1976) has concluded that IQ, as well as achievement, scores are decreasing nationally and internationally.

Paper presented to the Annual Meeting of the American Educational Research Association, New York, April, 1977.

The present paper reports the results of an evaluation of the test scores of a small, predominantly White, upper-middle class school district in Northern New Jersey. The district has three elementary schools, one middle school and one high school. The achievement test scores (Metropolitan Achievement Test) and the intelligence test scores (Lorge-Thorndike) of the three elementary schools and the one middle school were used as the basis of an evaluation of the effects of an Individually Guided Education (IGE) program using the Multi-Unit elementary school plan developed by Klausmeir, et al (1971).

The data base upon which the effects of the IGE program were assessed consisted of 13 separate variables (Variables 1 to 12 being Metropolitan achievement scores and Variable 13 being the Lorge-Thorndike IQ scores) for the pupils in Grades 2,3,4,5,and 6 within the four schools of the district for the years 1971, 1972, 1973, 1974 and 1975.

The 12 sub-tests of the Metropolitan Achievement Test were:

1. Word Knowledge
2. Word Analysis
3. Reading
4. Total Reading
5. Language
6. Spelling
7. Mathematics Computation
8. Mathematical Concepts
9. Math Problem Solving
10. Total Mathematics
11. Science
12. Social Studies

The verbal IQ score of the Lorge-Thorndike was the 13th variable.

Given the overall trends for a decreasing tendency in both achievement and intellignece test scores reported by Wiley and by Zajonc, the expectations of the analysis of the above data were that either a decrease or a no-change situation should hold if the program proved to be ineffective. Since the data base of the

present study included Grades 5 and 6, were the trends to operate in these grades, the expectation would be an overall decrease in both types of scores (this would hold for the case where there would be no increase nor decrease in the scores of the lower grades. The other expectation of "no-overall-change" would be based upon an expected decrease in grades 5 and 6 that would be cancelled by an increase in the lower grades. Thus, the expectations based upon the trends reported for national and international data bases for the results of the present study would be either a decrease in both types of scores, or a situation of "no-change".

The IGE Program

Individually Guided Education (IGE) is a comprehensive system of education and instruction designed to provide higher educational achievements by providing for differences among students in rate of learning, learning style and other characteristics. Organizationally, IGE utilizes a multi-unit structure in which the staff are assigned to instructional teams, hierarchical instructional roles are established within each instructional team (unit leader, unit teacher, intern teacher, instructional aide, and clerical aide), and students are multi-aged grouped within a team for instructional purposes. More specifically, instructional objectives to be mastered are established, students are pre-assessed to determine strengths and weaknesses in relation to these objectives, instructional strategies and materials are used to correct the weaknesses, and a post-assessment procedure is used to determine the success of the instructional strategies.

Originally developed by the Wisconsin Research and Development Center for Cognitive Learning at the University of Wisconsin-Madison, during the years 1965 to 1971, the IGE system has spread to thousands of elementary schools throughout the nation as a practival alternative to the age-graded, self-contained school.

This program was adopted for use in the Northern New Jersey School district of the present study in 1972. It should be noted that the senior author of the present paper has at no time advocated either a positive nor a negative position as to the merits of the IGE system within elementary schools.

Results and Discussion

In order to test the overall effects upon the achievement and intelligence test scores of the IGE program within the district since its inception in 1972, the total sample of scores was divided into a pre-program group and a post-program group. Since the program effects were not reflected in the data until the 1973 testing, the pre-program scores were those of 1971 and 1972 and the post-program scores were those of 1973, 1974 and 1975.

In order to provide a test score that could be directly comparable across all 13 variables, all scores used in the present analysis were the national percentile scores for each of the 3,145 separate scores used in the total study. As may be seen in Table 1 and in Figure 1, an overall effect of the IGE program has been the fact that 9 out of the total 12 achievement areas have increased in mean performance levels when the pre-program scores are compared to the post-program scores. (i.e., before and after the

start of the IGE program).

However, when this overall trend towards increased achievement performance scores is evaluated by performing a separate analysis of variance for each of the 12 achievement areas, only two statistically signficant increases occurred: in Total Reading (the increase from a mean of 66.1 to a mean of 68.1 being significant at the 5% level of confidence) and in the Language Test (where the increase from 66.3 to 68.8 was also significant at the 5% level of confidence).

An examination of the overall pattern of increases and decreases shown in Figure 1 shows that IGE may be more effective in the verbal areas than in the non-verbal areas (Word Knowledge, Word Analysis, Reading, Total Reading, Language and Spelling all increased from before to after the start of the program, while two of the Mathematics scores decreased slightly and two increased slightly).

An unexpected, and even startling finding was that the greatest mean increase of all 13 scores from before to after the start of the IGE program occurred in the intelligence test scores data. (The mean score increase from 70.7 to 74.8 yeilded a difference that was statistically significant at the 1% level of confidence.) The most reasonable conclusion from this finding is that the IGE program has facilitated a significant growth in intellectual performance within the children of the district.

Thus, assuming that all other factors are operating in a random fashion and are not systematically affecting the data, it is possible at this point to conclude that:

a) There is an overall trend towards increased achievement

scores (9 of 12 areas increased) associated with the IGE program.

b) The effects of IGE seem to be more pronounced in the verbal than in the non-verbal areas.

c) The IGE program is associated with statistically significant increases in the Total Reading and Language scores.

d) The IGE program is associated with statistically significant increases in intellectual performance.

A final procedure that was applied to the two significant increases in Total Reading and in Language scores was an attempt to check upon whether the observed significant differences in these two areas might more properly be attributed to differences in initial levels of intellectual functioning as revealed by the IQ scores. Analysis of covariance procedures revealed that the Total Reading scores remained significantly different from each other even when initial IQ differences were taken into account by the ANCOVA procedure. However, the results of the Language tests became non-significantly different from each other, indicating that when the ANCOVA procedure takes into account initial IQ differences, the observed amount of increase in Language scores is less than that amount that would have been expected on the basis of initial differences in intellectual functioning.

A second way of looking at the data was employed in order to both study changes over time and to attempt to control for the effects of "brighter" versus "less bright" classes on the results. Rather than using IQ as a measure of student capability, as was done in the analysis of covariance procedure, this approach

employed the mean score for any one class on any one variable in any one given year as a pretest for the mean score obtained by that same class the following year. Since all scores were expresses in terms of national percentiles, scores from two succeeding years could be considered together even though students had advanced from one grade level to the next during that period.

This type of analysis requires that at least one year's data be available in order to assess the data for the present year. Since data for the 1971 testing was incomplete, the analysis using this method was begun using 1972 as the pretest year for 1973, using 1973 as the pre-test year for 1974 and using 1974 as the pretest year for 1975; thus, since the program began in 1972 (at the same time as the 1972 testing), all three data points (1972-73, 1973-74 and 1974-75) represent the effects of the program. Since more students would progressively experience the effects of the program for more years as time passed, it was expected that program success would be reflected in a steady increase in the size of the gain scores form year to year. Also, the use of pre-test scores would insure that the results plotted as gain scores would reflect the quality of the program and not the levels of capability of the students.

Results were analyzed by grade level in order to see those levels at which changes were or were not made. For each grade level changes in Total Reading and in Total Mathematics were examined. In addition, the changes in Language and in Spelling were also examined at the 5th and 6th grade levels.

The results are shown in Table 2 and in Figure 2. As the results show, in all but 5th grade, the reading scores are

steadily increasing in all year-to-year comparisons. This finding is an affirmation of the previously herein finding that Total Reading scores were significantly increased by the IGE program.

In Total Mathematics, the overall result is that an improvement occurs across all grade levels from 1972 to 1974, but that in all grades but 3rd, there is a decrease in this measure of achievement in the 1974-75 data point.

The pattern for Spelling is clearly a decreasing one at all grade levels where it is measured and across all ot the years used in the present study.

Language scores increase in 4th grade and first increase then decrease in 5th grade. This again points to the earlier finding that Language increases in a sighigicant manner in the ANOVA, but not in the ANCOVA, procedure. Thus, the results of using the change-scores parallel the results obtained by the combined use of ANOVA and ANCOVA procedures for the Language performance scores of the present study.

Looking at the results by grade level, it appears that the experiences of grades 3 and 4 are most successful while those of grades 2 and 5 are relatively less successful. However, it should be noted that grade 5 experiences are assessed at the beginning of middle school rather than in the familiar surroundings of the elementary school and this situational factor may play some role in the decreased scores. It should also be noted program impact may not be strongly felt as early as 2nd grade, the most important effects of the program may be cumulative in nature.

In summary of this analysis of change-scores, it appears that the program had the most clearly positive effect upon the Total Reading scores and upon Language and that the program had little or no effect upon mathematics.

In conclusion, in light of the recent evidence that indicates the existence of a national and international trend towards the decrease of achievement and intelligence test scores, an analysis of achievement and intelligence test scores in a small, upper middly class, northern New Jersey elementary school district indicated that perhaps a reversal of this trend had occurred. This trend reversal was interpreted as being primarily due to the introduction in 1972 of an Individually Guided Educational (IGE) program in the three elementary schools of the district. Finally, it should be noted that whereas the greatest decline in the national and international data bases occurs in the verbal areas, the greatest increases found in this local school district occurred in the verbal area. Thus, the possibility exists that IGE programs may prove to be an effective way of reversing the trend, especially in verbal areas, towards declining scores in both achievement and intelligence.

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	Word Knowledge	Word Analysis	Reading Comp.	Total Reading	Language	Spelling	Math Comput.	Math Concepts	Math Prob	Total Math	Science	Social Studies	Intelligence
District Mean Pre-IGE	68.1	64.7	65.1	66.1	66.3	61.4	60.5	66.5	62.5	64.9	67.9	64.2	70.7
District Mean Post-IGE	69.0	67.5	65.6	68.1	68.8	63.6	60.0	67.0	64.4	63.9	67.3	66.1	74.8
Mean Percentile Diff.	+0.9	+2.8	+0.5	+2.0	+2.5	+2.2	-0.5	+0.5	+1.3	-1.0	-0.3	+1.9	+4.1
ANOVA Significance level	n.s.	n.s.	n.s.	.05	.05	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	.01
ANCOVA Significance level	----------	----------	----------	.023	n.s.	----------	----------	----------	----------	----------	----------	----------	----------

Table 1-A Summary of Major Findings for all 13 Variables Before and After IGE Program

Figure 1 - Achievement and IQ Before and After IGE Program

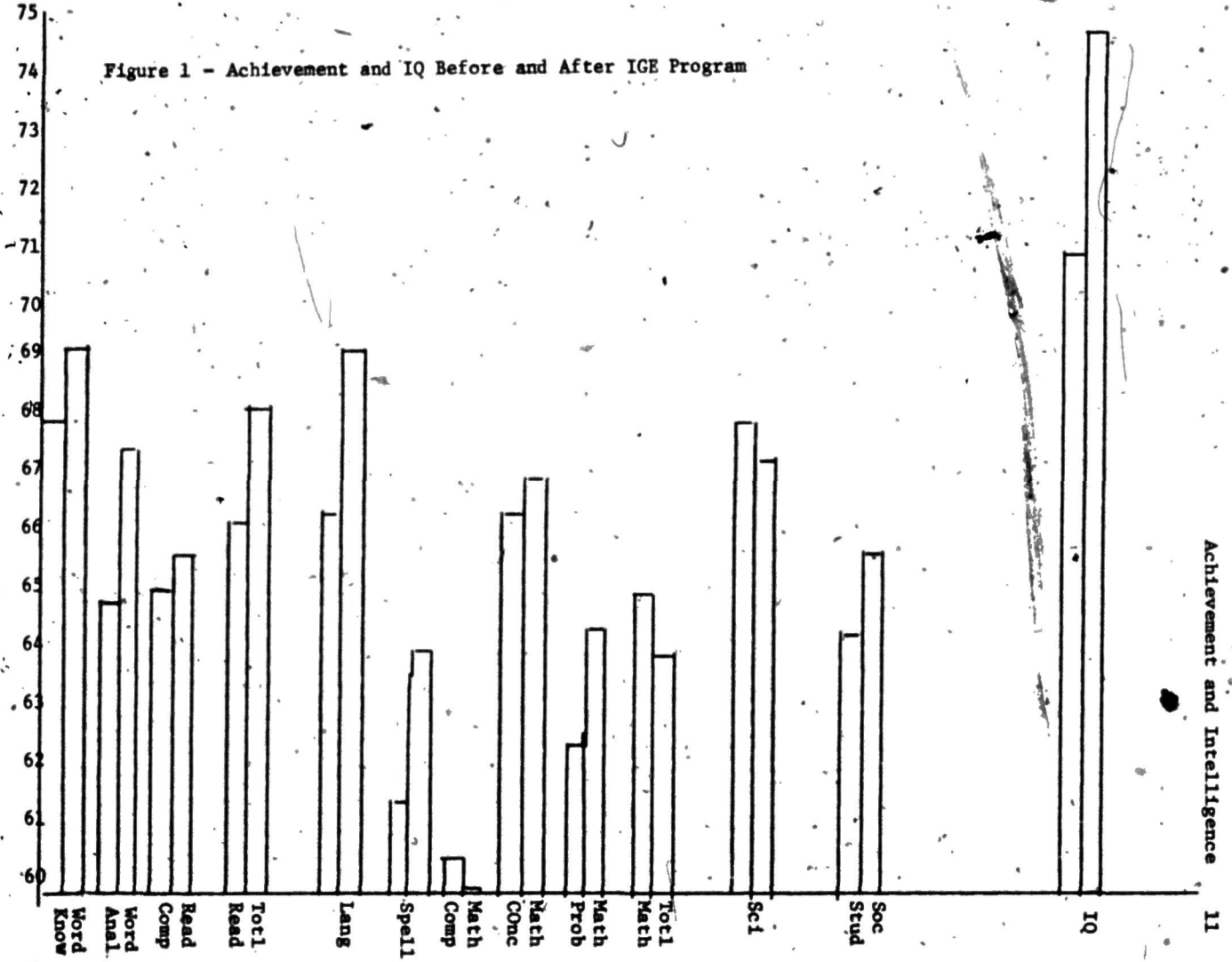


Table 2 - Changes in Test Scores for Successive Years

TOTAL MATHEMATICS

	Grade Level Tested			
Years	3rd	4th	5th	6th
72-73	-7.1	-2.9	-1.9	+4.0
73-74	+2.5	+1.2	+5.7	+9.7
74-75	-2.3	+5.1	+2.4	+0.6

TOTAL READING

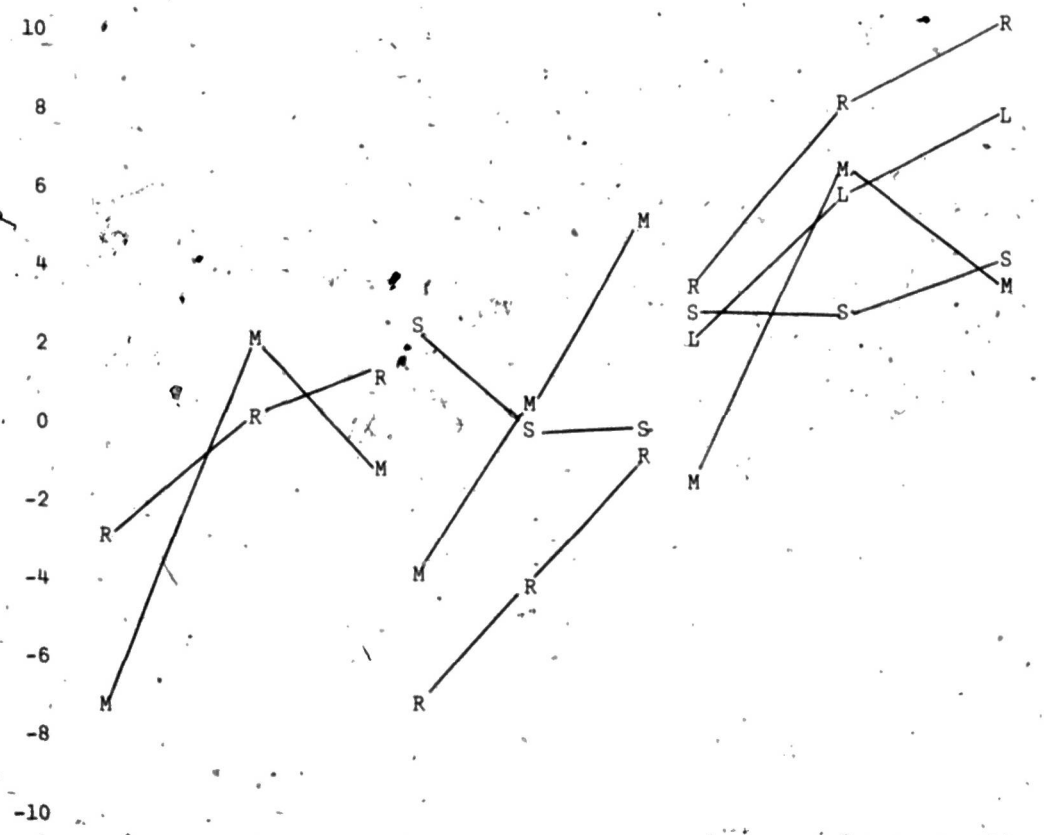
Years	3rd	4th	5th	6th
72-73	-2.7	-7.0	+3.5	+0.4
73-74	-0.6	-3.9	+6.8	+4.8
74-75	0.	-0.4	+10.6	-0.5

LANGUAGE

	Grade Level Tested	
Years	5th	6th
72-73	+2.2	-3.2
73-74	+5.5	+1.3
74-75	+7.1	-7.4

SPELLING

	Grade Level Tested		
Years	4th	5th	6th
72-73	+2.6	+3.1	+2.4
73-74	+0.6	+1.7	+2.5
74-75	+0.4	+2.7	-6.5



R = Total Reading M = Total Mathematics L = Language S = Spelling

Figure 2 - Progressive Changes in Test Scores