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ABSTRACT

This study from the city school district in Saginaw, Michigan measures the effects of the Chapter 1 Academic Achievement program on fifth grade students during the 1981-82 school year. A total of 463 students were classified into four categories depending on whether they were single year, multiple year, or continuous participants in the program; or whether they were from the regular education program. Three different standards were used to gauge the growth of the three groups receiving compensatory education: (1) normal curve equivalent; (2) normal growth; and (3) relative growth. The single and multiple year groups failed to meet the criterion score in reading, while the continuous group exceeded it. All three groups exceeded normally expected reading growth but failed to do so in mathematics. On the index that compared the compensatory groups to the regular group, only the continuous group showed a decrease in the gap between their group and the comparison group. The recommendations were the following: (1) future studies such as this one should be outlined in advance to assure that accurate longitudinal records are kept; (2) special studies are needed for students who test high but are still in need of compensatory education; and (3) these kind of data should be collected state-wide and shared with all of the educational community. Tables, appendices providing calculation instructions in gap reduction research design, and a brief bibliography are included. (VM)

3-15-88

EVALUATION REPORT

LONG-TERM CONTINUOUS AND SUSTAINED EFFECTS OF CHAPTER 1 PARTICIPATION

1983-1985

DEPARTMENT OF EVALUATION SERVICES

- PROVIDING ASSESSMENT, PROGRAM EVALUATION AND RESEARCH SERVICES -

Saginaw Public Schools

Saginaw, Michigan

LONG-TERM CONTINUOUS AND SUSTAINED EFFECTS OF CHAPTER 1 PARTICIPATION

1983-1985

An Approved Report of the

DIVISION OF ADMINISTRATION AND PERSONNEL

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INTRODUCTION

This study was designed to achieve two primary goals. The first goal was to evaluate the long-term sustained impact of the Chapter 1 Compensatory Education Program operated by the School District of the City of Saginaw on both former participating pupils and pupils who continued to participate because of low achievement. A second goal was to meet the evaluation requirement of Chapter 1 of the Education Consolidation and Improvement Act (ECIA) of 1981 which mandates that once every three years (after the 1978-79 school year) a determination be made as to whether improved performance is sustained over a period of more than one year from programs funded under this act.[1] The Long-Term Sustained Effects of Chapter 1 Participation, 1979-1982 was the first report which focused on satisfying these two goals. This first report tracked the performance of compensatory education students from third grade through fifth grade.

What follows is the second report in the series that starts with fifth grade students who have participated in the compensatory education program at least one of the prior three years (as third, fourth, or fifth graders) and then tracks their performance through the eighth grade. However, before covering the precise details of the study an overview of Saginaw's Chapter 1 Compensatory Education Program is necessary to put the details of the study in the proper perspective.

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[1]The funding legislation was originally known as Title I of the Elementary and Secondary Education Act of 1965.

The Saginaw program funded under Chapter 1 is currently[2] entitled Academic Achievement (A^2). The purpose of this program is to improve the reading and mathematics achievement of a designated number of educationally disadvantaged students. The Chapter 1 funded A^2 program served approximately 2,000+ students in grades K-9 each of the six years since 1979[3].

Both product and process evaluations of the program have been conducted for the past six years. The product evaluation reports describe the academic achievement of A^2 students fully and are available upon request from the Department of Evaluation, Testing and Research. Grade level achievement of A^2 students according to the performance standard are summarized for both subject areas in the chart below for the six school years of interest.

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[2]The 1985-86 school year was the first year the compensatory education program was evaluated under the name of Academic Achievement (A^2). Our prior evaluation reports have referred to the same program as the Supplemental Teacher Participation (STP).

[3]Eighth grade students were served since the 1981-82 school year and ninth grade students have been served since the 1982-83 school year.

Overall Record of Chapter 1 Program Attainments from 1979 to 1985

Grade	Subject	Attainment of Performance Standard[1] 1979-1980	1980-1981	1981-1982	1982-1983	1983-1984	1984-1985
K	Reading	Yes	No	Yes	Yes	--	--
	Mathematics	Yes	No	Yes	No	--	--
1	Reading	Yes	Yes	Yes	Yes	Yes	Yes
	Mathematics	Yes	Yes	Yes	Yes	Yes	Yes
2	Reading	Yes	Yes	Yes	Yes	Yes	No
	Mathematics	Yes	Yes	Yes	Yes	Yes	No
3	Reading	Yes	No	Yes	Yes	Yes	Yes
	Mathematics	Yes	No	Yes	Yes	Yes	Yes
4	Reading	Yes	Yes	Yes	Yes	Yes	No
	Mathematics	Yes	Yes	Yes	Yes	Yes	Yes
5	Reading	Yes	No	Yes	Yes	Yes	Yes
	Mathematics	Yes	Yes	Yes	Yes	Yes	Yes
6	Reading	Yes	Yes	Yes	Yes	No	Yes
	Mathematics	Yes	Yes	Yes	Yes	Yes	Yes
7	Reading	Yes	No	No	No	Yes	No
	Mathematics	Yes	No	No	No	No	No
8	Reading	--	--	Yes	Yes	Yes	No
	Mathematics	--	--	Yes	Yes	Yes	Yes
9	Reading	--	--	--	Yes	Yes	Yes
	Mathematics	--	--	--	Yes	Yes	Yes
Summary of Performance Standard Attainment		16-Yes (100.0%) 0-No (0.0%)	9-Yes (56.2%) 7-No (43.8%)	16-Yes (88.9%) 2-No (11.1%)	17-Yes (85.0%) 3-No (15.0%)	16-Yes (88.9%) 2-No (11.1%)	12-Yes (66.7%) 6-No (33.3%)

[1]Attainment of performance standard is defined as an improvement of the mean post-test percentile score over mean pre-test percentile score.

Overall, the achievement levels in terms of the attainment of the performance standard for the A^2 program have been very positive[4]. Achievement of the performance standard was the best during 1979-80 with 100% positive attainment followed by 1981-82 and 1983-84 with 88.9% positive attainment, 1982-83 with 85.0% positive attainment, 1984-85 with 66.7% positive attainment, and 1980-81 with 56.2% positive attainment. Student achievement levels for reading and mathematics seemed quite similar in terms of attaining the performance standard over the six year period. One definite pattern, despite overall success, is the lack of achievements of the program at the seventh grade level.

It is in this context that the Department of Evaluation, Testing, and Research has attempted to implement an investigation into the sustained effectiveness of its Chapter 1 A^2 program on participants who obtained differential lengths of service from the A^2 program.

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[4]Mullin and Summers (1983) studied all the "major" compensatory education studies through 1982. Generally their review indicated that compensatory education programs have a positive though small effect on the achievement of disadvantaged students. Our findings locally through our first sustained effects study showed much larger positive gains (at or above "normal growth") across the majority of grade levels studied.

STUDY DESIGN

The cohort of Chapter 1 pupils who had been in the A^2 program as third graders during 1979-80 school year, fourth graders during 1980-81 school year, and/or fifth graders during the 1981-82 school year were chosen as the subjects for the study. The choice was made for the following reasons: 1) many of these same pupils were in the original sustained effects study, 2) test data on the majority of the pupils would exist at the end of the three year period because district-wide testing occurs both in the spring of fifth and eighth grades, and 3) the junior high years typically are where accumulative academic deficits are the most pronounced in Chapter 1 programs. Academic achievement gains even for the regular K-12 education population are among the smallest during this period. The decision to save data for this study was made during the 1982-83 school year but the exact nature of the study was not finalized until the Summer of 1987.

The problem addressed by the study was to determine if the A^2 program made a long-term sustained impact in terms of reading and mathematics achievement as measured by the 1977 version of the California Achievement Tests--Form C (CAT). Three different standards were used as criteria to determine the presence or absence of a long-term sustained effect. All three criteria (NCE gains, normal growth, and gap reduction) deal with the concept of gain from a pre-test to a post-test measurement of reading and mathematics achievement.

The first criterion chosen was a normal curve equivalent (NCE) score gain equal to or greater than the gain of fifth grade pupils who were in the A^2 program from the Spring 1982 through Spring 1985 as eighth graders. Participants in the A^2 program had to have pre-test scores at or below the 44 NCE to remain eligible for one or more of the three prior years (1979-80, 1980-81,

and 1981-82). The sustaining effect pupils were pre-tested (Spring, 1982) and finally post-tested (Spring, 1985) on CAT.

The second criterion was "normal growth" (Echternacht, 1980). Normal growth is defined as an estimate of how well students will perform in the absence of any special program. Spring, 1982 CAT results served as the pre-test and Spring, 1985 CAT test results served as the post-test when the concept of "normal growth" was employed to determine the percent of gain beyond "normal growth". (See Appendix A for the calculation of normal growth in reading and mathematics.) The additional growth in comparison to "normal growth" was another standard chosen as a measure that growth was sustained.

The final criterion involved the calculation of a Relative Growth Index (RGI). This index indicates the percentage increase or decrease of the sustaining effect group (treatment group) and a regular education group with no prior compensatory education participation (comparison group) between the mean pre- and post-test achievement levels. It is expected (or at least hoped) that the gap will stay the same (sustaining) or be reduced as a result of prior A^2 program participation and thus will be the same or smaller at post-test time than it was at pre-test time. Figure 1 below illustrates the reduced gap expected between treatment (T) and comparison (C) groups.

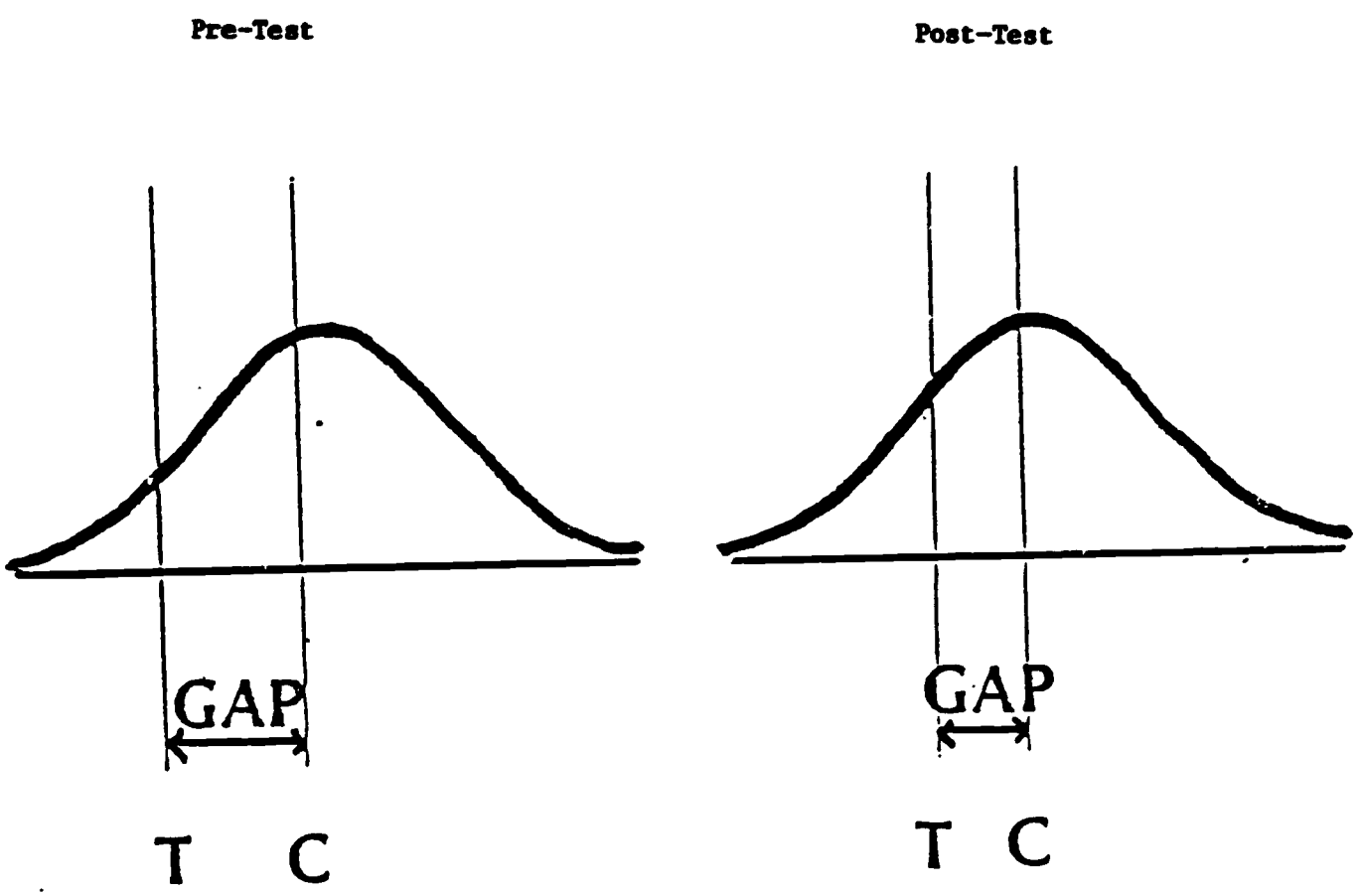

Figure 1. Gap Reduction Design.

To calculate the Relative Growth Index (RGI), the comparison group's pre- and post-test standard deviations are pooled. This pooled standard deviation is the metric in which growth estimates for the project and comparison groups are cast. Finally, the growth of the project group is expressed as a percentage of the growth of the comparison group, thus providing an easy-to-interpret Relative Growth Index (RGI). (See Appendix B for the steps involved in the calculation of this index.) RGI's less than 100% indicate that the former A^2 students fell further behind the non-participants during the three year study period. RGI's equal to 100% indicate that the project group grew at the same rate as regular education students, and RGI's greater than 100% indicate that former A^2 project participants out gained the non-participants.

The results of two different lengths of A^2 participation (multiple year and single year participation) and two different comparison groups (regular education students and continuous A^2 participants) were the primary focus of the study. The chart below illustrates the number of students in each group and their participation or lack of participation in the Chapter 1 program from 1979 to 1985.

Years of Participation of Various Groups Involved in the Sustained Effects Study

Group Name	Number of Students	School Year 1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
Multiple Year Sustained Effect Students	1	X*	X	X			
	5		X	X			
	16	X	X				
	2	X		X			
Single Year Sustained Effect Students	4			X	SUSTAINED PERIOD		
	44		X				
	31	X					
Regular Education Comparison Students	317						
Continuous Compensatory Education Students	43	X	X	X	X	X	X

*X = Year of participation in Chapter 1.

As can be seen in the chart above the multiple year sustaining effect, single year sustaining effect, regular education comparisons, and continuous compensatory education student groups consisted of 24, 79, 317, and 43 students respectively. It had been contemplated that the study deal with all the possible lengths of differential participation charted above, however, because of the lack of sufficient numbers in the seven groups these were collapsed into the multiple and single year of participation groups.

These two levels of participation (multiple or single) are fundamental to the statement of the study hypotheses. In addition, the effect of continuous participation for six years will be explored through the stated hypotheses. The study hypotheses stated below are grouped according to the criterion categories discussed earlier.

HYPOTHESES: NCE

1. There will be NCE growth equal to or exceeding the regular education comparison group students in reading and mathematics as measured by CAT for the multiple year participation group.[5]

2. There will be NCE growth equal to or exceeding the regular educational comparison group students in reading and mathematics as measured by CAT for the single year participation group.[6]

3. There will be NCE growth equal to or exceeding the continuous A^2 participant group students[7] in reading and mathematics as measured by CAT for the multiple year participant group.

4. There will be NCE growth equal to or exceeding the continuous A^2 participant group students in reading and mathematics as measured by CAT for the single year participant group.

5. There will be NCE growth equal to or exceeding the regular education comparison group students in reading and mathematics as measured by CAT for the continuous A^2 students.

HYPOTHESES: NORMAL GROWTH

1. There will be growth equal to or exceeding "normal growth" in reading and mathematics as measured by CAT for multiple year participants.

2. There will be growth equal to or exceeding "normal growth" in reading and mathematics as measured by CAT for single year participants.

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[5]Multiple years participation were those pupils with two or three years of A^2 participation from Fall, 1979 to Spring, 1982. They could have had additional years of participation prior to Fall, 1979.

[6]Single year participants were those pupils with a single year of participation from Fall, 1979 to Spring, 1982. They could have had additional years of participation prior to Fall, 1979.

[7]Continuous A^2 participant group students were those pupils having participated in the A^2 program from Fall, 1979 to Spring, 1985 with six years of continuous A^2 participation. Again, they could have had additional years of participation prior to Fall, 1979.

HYPOTHESES: RELATIVE GROWTH INDEX

1. There will be a Relative Growth Index (RGI) of 100% or greater in reading and mathematics as measured by CAT for multiple year participants.

2. There will be a Relative Growth Index (RGI) of 100% or greater in reading and mathematics as measured by CAT for single year participants.

3. There will be a Relative Growth Index (RGI) of 100% or greater in reading and mathematics as measured by CAT for continuous compensatory education comparison group.

PRESENTATION OF DATA

What follows is a presentation of the CAT reading and mathematics results contrasted with the two different levels of A^2 participation according to the three growth standards. The first criterion used to contrast growth levels is NCE gains in terms of regular and continuous compensatory education comparison groups. The next criterion used to contrast growth levels is "normal growth". The third criterion was the Relative Growth Index (RGI).

NCE Gain Criterion Results

As NCE gains are used by the State and Federal government as the primary way to report annual Chapter 1 results, it would seem that such a measurement of academic growth is also viable for this study. Tables 1 and 2 below present another way to denote achievement gains by the compensatory education groups, using NCE gains by group for both reading and mathematics. Table 1 below presents the reading gains over the three year period of study.

TABLE 1. GAIN/LOSS IN NORMAL CURVE EQUIVALENT UNITS—READING.

Group	Number Tested	Normal Curve Equivalents		
		Pre-Test Mean Spring, 1982	Post-Test Mean Spring, 1985	Gain/ Loss
Multiple Year Sustaining Effect Students	24	53.67	47.04	- 6.63
Single Year Sustaining Effect Students	79	55.18	50.87	- 4.31
Regular Education Comparison Students	317	66.39	62.73	- 3.66
Continuous Compensatory Education Students	43	38.44	38.47	+ 0.03

An examination of Table 1 reveals that three groups--multiple year, single year, and regular education students experienced losses in reading of -6.63, -4.31, and -3.66 normal curve equivalent units. Only the continuous compensatory education student group experienced a gain of 0.03 normal curve equivalent units. Thus both single and multiple sustaining effect groups failed to match the NCE performance of either the regular or continuous compensatory education student groups. The continuous compensatory education group did out perform the regular education comparison groups in reading.

The mathematics results are presented in Table 2 below. The total net gain in NCE's of regular and continuous compensatory education groups again will serve as the criteria for comparison.

TABLE 2. GAIN/LOSS IN NORMAL CURVE EQUIVALENT UNITS--MATHEMATICS.

Group	Number Tested	Normal Curve Equivalents		
		Pre-Test Mean Spring, 1982	Post-Test Mean Spring, 1985	Gain/ Loss
Multiple Year Sustaining Effect Students	24	43.54	38.08	- 5.46
Single Year Sustaining Effect Students	79	50.57	44.97	- 5.60
Regular Education Comparison Students	317	62.14	58.59	- 3.55
Continuous Compensatory Education Students	43	32.28	28.98	- 3.30

A review of mathematics results reveals that all four groups--multiple year, single year, regular, and continuous education students--showed losses of -5.46, -5.60, -3.55, and -3.30 respectively. Again, both multiple and

single sustaining effects groups failed to match the NCE performance of either the regular or continuous compensatory education student groups. The continuous compensatory education student group performance (-3.30) did exceed the performance of the regular education group (-3.55) in mathematics.

The following chart summarizes which sustaining effect and continuous compensatory education groups grew at a rate equal to or exceeding the comparison group of interest in reading and mathematics. The chart also relates these questions back to the hypotheses stated earlier.

Hypothesis #		Hypothesis	Results Which Equal or Exceed Gains Hypothesized	
			Reading/Mathematics	
1	Multiple	$\bar{>}$ Regular Education	No	No
2	Single	$\bar{>}$ Regular Education	No	No
3	Multiple	$\bar{>}$ Continuous	No	No
4	Single	$\bar{>}$ Continuous	No	No
5	Continuous	$\bar{>}$ Regular Education	Yes	Yes

As indicated above both sustaining effect groups failed to equal or exceed the NCE gain/loss of the comparison groups in either reading or mathematics. The continuous A^2 compensatory education student group did exceed the growth of regular education students in mathematics and reading.

"Normal Growth" Criterion Results

Table 3 below compares Chapter 1 results in reading and math with normal growth for compensatory education students by category. The term "normal growth" is an index which standardizes the scores for an entire grade level, thereby allowing comparisons with any subgroup of interest (see Appendix A for

the calculation of normal growth). These data incorporate a time span of Spring, 1982 to Spring, 1985.

TABLE 3. COMPARISON OF CATEGORY GROUP GROWTH TO NORMAL GROWTH.

Subject Area/ Growth Category	Compensatory Education Category		
	Multiple (N=24)	Single (N=79)	Continous (N=43)
Reading			
Normal Growth	22.1	22.1	22.1
Category Group Growth	23.1	26.8	24.9
Normal - Category Group Growth	1.0	4.7	2.8
% Additional Growth	4.5%	21.3%	12.7%
Mathematics			
Normal Growth	25.3	25.3	25.3
Category Group Growth	21.4	22.3	21.3
Normal - Category Group Growth	- 3.9	- 3.0	- 4.0
% Additional Growth	-15.4%	-11.8%	-15.8%

As indicated in Table 3, normal growth for compensatory education students from fifth to eighth grade in reading attained a value of 22.1 NCE's. Using this number as our baseline, both multiple and single year sustaining effect pupils showed growth above normal growth of 1.0 NCE's (or 4.5%) and 4.7 NCE's (or 21.3%) respectively. The continuous compensatory education group showed growth above normal growth of 2.8 NCE's (or 12.7%).

Table 3 also presents the same information for mathematics. Again, normal growth is the standard for comparison. Normal growth had a value of 25.3 NCE's over the three year span. The multiple year sustaining effect students achieved a growth of 21.4 NCE's or 15.4% less than normal growth. The single year sustaining effect group showed a growth of 22.3 NCE's or 11.8% less than

normal growth. The continuous compensatory education group attained a growth of 21.3 NCE's or 15.8% less than normal growth.

The following chart designates which sustaining effect and continuous compensatory education groups grew at a rate equal to or exceeding normal growth in reading and mathematics. The chart also relates these questions back to the hypotheses stated earlier.

Hypothesis #	Hypothesis	Results Which Equal or Exceed Gains Hypothesized	
		Reading/Mathematics	
1	Multiple $\geq$ Normal Growth	Yes	No
2	Single $\geq$ Normal Growth	Yes	No
3	Continuous $\geq$ Normal Growth	Yes	No

As indicated above both sustaining effect groups and the continuous compensatory education groups equalled or exceeded normal growth in reading while all three groups failed to equal normal growth in mathematics.

Relative Growth Index (RGI) Criterion Results

The final criterion for comparison purposes was the Relative Growth Index (RGI). The RGI is the statistic used in the gap reduction evaluation model design. The research question posed is "Whether the project group (sustaining effect students) is catching up to, keeping up with, or falling behind the comparison group (students having no Chapter 1 services for a six year period)." The gap measured is the gap between the mean achievement level of the sustaining effect group and the mean achievement level of the regular education comparison group. It is hypothesized that the gap between the sustaining effect and regular education comparison groups will remain the same or be reduced between pre- and post-testing. To evaluate this hypothesis the

regular education group's pre- and post-test standard deviations are pooled. This pooled standard deviation is then used as the metric in which growth estimates for the project and comparison group are measured. Finally, the growth of the project group is expressed as a percentage of the growth of the comparison group, thus providing an easy-to-interpret RGI (see Appendix B for the exact steps to calculate the Relative Growth Index).

The interpretation of the RGI deserves a bit of an explanation. A RGI less than 100% indicates the project group (or in our case the sustaining effect group) is falling behind the comparison group. When the RGI equals 100% it signifies the project group is keeping equal to the regular education comparison group. A RGI greater than 100% means the project group is catching up to the regular education comparison group. Figure 2 puts this interpretation in graphic form relative to the gap between the project and comparison group.

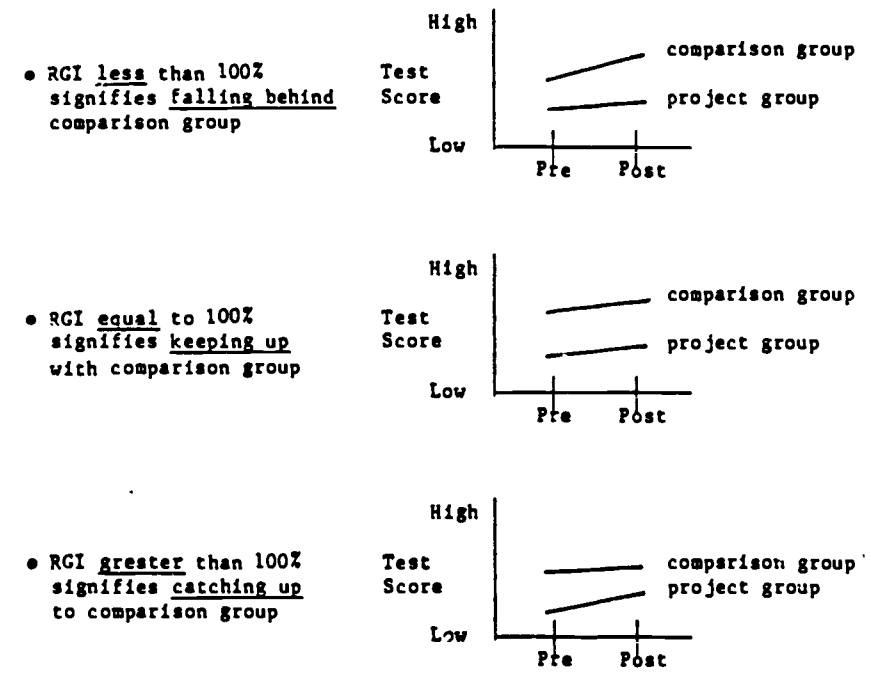

Figure 2. Interpretation of Relative Growth Indices (RGIs).

Table 4 below presents the RGIs for the multiple and single year sustaining effect groups plus the continuous compensatory education students for both reading and mathematics.

TABLE 4. RELATIVE GROWTH INDICES (RGIs) BY GROUP IN READING AND MATHEMATICS.

Group	Relative Growth Indices	
	Reading	Mathematics
Multiple Year Sustaining Effect Students	86.85%	93.60%
Single Year Sustaining Effect Students	95.20%	90.25%
Continuous Compensatory Education Students	131.82%	102.70%

A review of Table 4 reveals that both the multiple and single year sustaining effect students failed to equal or exceed the growth of the regular education students. Sustaining effect single year students did the best in reading (RGI = 95.20%) and then in mathematics (RGI = 90.25%). Multiple year sustaining effects students did the best in mathematics (RGI = 93.60%) and then reading (RGI = 90.25%). The continuous compensatory education group exceeded the regular education comparison group in both reading (RGI = 131.82%) and mathematics (RGI = 102.70%).

The following chart specifies the hypotheses relating to the RGI's and their status in the areas of reading and mathematics.

Hypothesis #	Hypothesis	Results Which Equal or Exceed Gains Hypothesized	
		Reading/Mathematics	
1	Multiple $\bar{>}$ 100% RGI	No	No
2	Single $\bar{>}$ 100% RGI	No	No
3	Continuous $\bar{>}$ 100% RGI	Yes	Yes

As indicated above both sustaining effect groups failed to equal or exceed the specified RGI of the regular education comparison group in either reading or mathematics. The continuous A^2 participants exceeded the 100% RGI in both reading and mathematics.

DISCUSSION

The data presented on the preceding pages provided three standards used for comparison of the continuous and sustained effects of Chapter 1 participation. What follows is an interpretation of the analyses presented earlier.

Chapter 1 students have demonstrated an academic deficit in reading and/or mathematics. Participation in the program is provided to students who score at or below the 44 NCE on CAT. Since standardized testing provides the district with a means to identify potential students, the use of test results should be considered as a source of information to document long-term effectiveness. As eligibility is reassessed each year, those who remain eligible continue to exhibit the greatest need. Consequently, continuous (those students who remain in the Chapter 1 program the longest), multiple year, and then single year participants do show a constant lower level of absolute achievement in comparison to each other and regular education students. The expectation might then be, that these students would also show smaller increments of growth. However, it can be seen (see Tables 1 and 2) that Chapter 1 continuous participants show the greatest percentage of growth[8] in comparison to the other A^2 groups studied the longer they remain in the program without interruption. The presumption that academically disadvantaged children who continue to be placed in compensatory education programs grow at lower rates than normal may be erroneous according to the data in Table 4. Succinctly

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[8]The authors acknowledge that a small amount of net gain (0.5 NCE or less) reported by the various groups may be due to the regression effect (Roberts; 1980, pp. 78-80). However, the magnitude of the error is relatively small so that resultant gains still reflect a positive effect of A^2 program participants. Linn (1980) and Burton (1980) address the regression effect topic in greater detail for the interested reader.

stated, our present expectation is that Chapter 1 participants experience greater gains the longer they continuously participate in the A^2 program.

The issue of sustained effects after Chapter 1 participation stops was the other question examined. It appears from 2 of the 3 criteria used that growth is not sustained by either former single or multiple year A^2 participants. However, those students who do continue to participate in Chapter 1 tend to show the greatest percentage of growth in comparison to other groups.

This study represents the second effort by the Saginaw Public Schools to look at sustained effects of both Chapter 1 participants and former participants. Based on this second experience, it is apparent that a number of independent variables need to be controlled in subsequent studies. These variables include the following: variations among Chapter 1 program sites; history of students; participation in other compensatory education programs; better identification of participants; summer vacation effects; etc. Hopefully, this school district and others, with help from the Michigan State Department of Education will do other studies to more definitively determine the long-term continuous and sustained effects of Chapter 1 participation.

It was found that the when compensatory education services are stopped (or interrupted[9]), these students lose academically in both subject areas either due to not having a chance to further consolidate learnings or because the measurement of their achievement showed incorrectly high levels of attainment. The sustaining effect group (and the interrupted group), however, showed a smaller drop in reading than in mathematics possible due to the fact that reading skills are more likely to be dealt with on a regular basis

[9]The interrupted service issue was explored in Saginaw's first study of Long-Term Sustained Effects of Chapter 1 Participation, 1983-85.

outside the school environment. Consequently, incidental learning of reading related skills is more likely to take place. Thus, the best achievement results come from Chapter 1 students with continuous rather than interrupted participation. This is a conclusion consistent with the findings of the previous Chapter 1 sustained effects study.

A great deal of information has been shared with the reader thus far. At this point an effort will be made to summarize this information and formulate concluding statements.

SUMMARY AND CONCLUSIONS

A study of the long-term continuous and sustained impact of the Chapter 1 Academic Achievement (A^2) program on former third to fifth grade participants during the 1979-80 through 1981-82 school years was undertaken. A total of 463 students were tracked over the six year period of the study. One hundred forty students were in the treatment groups studied (single year = 79, multiple year = 24, and continuous = 43). The remaining 317 students were in the regular education comparison group. The participation categories were the following: single year, multiple year (2 or 3 years), and continuous (6 years).

Three different standards were used to gauge observed growth of groups in each category. The first criterion chosen was a normal curve equivalent (NCE) score gain equal to or greater than the gain of fifth grade pupils who were in the A^2 program from the Spring, 1982 through Spring, 1985 as eighth graders. The single and multiple groups failed the NCE gain criterion while the continuous compensatory student group exceeded the criterion in reading.

The second criterion was "normal growth" (Echternacht, 1980). Normal growth is defined as an estimate of how well compensatory education students will perform in the absence of any special program. All three groups (single, multiple, and continuous) out-performed normal growth in reading but failed to do so in mathematics.

The final criterion involved the calculation of a Relative Growth Index (RGI). This index indicates the percentage increase or decrease of the treatment (study groups) and the regular education group with no prior compensatory education participation (comparison group) between the mean pre- and post-test achievement levels. Only the continuous compensatory education group decreased the gap between themselves and the regular education students

between pre- and post-testing. The decreased gap (or the RGI in excess of 100%) for the continuous group occurred in both reading and mathematics (131.82% and 102.70% respectively).

Overall, it was found that the academic achievement of Saginaw's Chapter 1 population is associated positively with the amount of continuous time spent in the A^2 program.

RECOMMENDATIONS

Listed below are a series of recommendations based on the findings of this study. These recommendations are offered in an effort to improve the long-term implementation and impact of the Chapter 1 A^2 program.

1. Definite plans for any future long-term continuous and sustained effects studies should be outlined in advance to ensure that accurate longitudinal records of Chapter 1 participants are available. Such records would yield more comprehensive accounting of all aspects of participation (past history of participation, longitudinal test file linkage with unique student numbers for each student, determination of research/evaluation questions of interest, necessary testing points to answer questions posed, etc.) and ultimately make possible better understanding of the nature of any sustained effects through better controls.

2. Special study of higher scoring A^2 participants who test-out but still seem in need of compensatory education services in subsequent years should be planned for and undertaken. Such a study would focus on the following questions.[10]

   - Are higher achievers (relatively speaking) showing high scores because of a large error component to their test scores due to some testing related factor (e.g., guessing, improper test administration, etc.)?
   - Do higher achieving students possess any readily observable characteristics that set them apart as a group?
   - Do these students appear more frequently in certain buildings than in others?
   - How much and what type of additional help should this group of pupils be given (if they can be identified) to foster lasting achievements?

[10] This recommendation which comes from Saginaw's first Long-Term Sustained Effects Study and still seems relevant as of this writing.

- Can an alternate cut-off criterion score be established to ensure fewer false positives?

3. The Michigan Department of Education should collect the existing long-term continuous and sustained effects studies state-wide and summarized results should be shared with the rest of the State's educators. Also, suggestions on relevant issues and possible methodologies to use in such studies would be helpful to both small, medium, and large school districts.

APPENDICES

APPENDIX A

CALCULATION OF "NORMAL GROWTH"

		Reading = 16%ile	Mathematics = 23%ile
STEP 1:	Determine average percentile score of entering fifth grade pupils.		
STEP 2:	Look up the scale score that corresponds to this percentile in the spring of the year at both the eighth and fifth grade levels.	Reading 5th grade 16%ile = 406 8th grade 16%ile = 476	Mathematics 5th grade 23%ile = 429 8th grade 23%ile = 500
STEP 3:	Subtract the fifth grade scale score from the eighth grade scale score to obtain the amount of gain in scale score units.	476–406 = 70	500–429 = 71
STEP 4:	Divide this gain by the standard deviation of the eighth grade group in scale score units to obtain the pre- to post-test gap.	$\frac{70}{66.4} = 1.05$	$\frac{71}{59.1} = 1.20$
STEP 5:	Multiply this gap by the standard deviation of the NCE distribution, i.e., standard score system with standard deviation set equal to 21.06, to obtain the estimate of the amount of "normal growth" in NCE units between fifth and eighth grade for compensatory education students.	1.05 x 21.06 = 22.11	1.20 x 21.06 = 25.27

APPENDIX B

STEPS TO CALCULATE THE RELATIVE GROWTH INDEX IN THE GAP REDUCTION RESEARCH DESIGN

STEP 1: (For use with a standardized achievement test.) Convert each project and comparison group student's raw pre-test and post-test scores to scale scores using the correct conversion table for the form and level of the test used. If a non-standardized test was used skip this step.

STEP 2: Compute the mean pre-test and post-test (raw or, if the test has them, scale) scores of project students at each grade level.

STEP 3: Compute the mean pre-test and post-test scores of comparison group students at each grade level.

STEP 4: Compute the pre-test and post-test standard deviations of comparison group students at each grade level.

STEP 5: Subtract the project group's mean pre-test score from the comparison group's mean pre-test score. Divide the difference by the comparison group's pre-test standard deviation and label the result the pre-test gap.

STEP 6: Subtract the project group's mean post-test score from the comparison group's mean post-test score. Divide the difference by the comparison group's post-test standard deviation and label the result the post-test gap.

STEP 7: Subtract the post-test gap (from Step 6) from the pre-test gap (from Step 5) and label the difference the gap reduction. (The gap reduction may be negative. Be sure to keep track of the sign!)

STEP 8: Subtract the comparison group's mean pre-test score from its mean post-test score and label the difference the comparison group's unstandardized growth estimate.

STEP 9: Using the comparison group's pre- and post-test standard deviations, calculate the following value:

$$\sqrt{\frac{(\text{S.D.}_{\text{pre}})^2 + (\text{S.D.}_{\text{post}})^2}{2}}$$

Label this value the comparison group's pooled standard deviation.

STEP 10: Divide the comparison group's unstandardized growth estimate (from Step 8) by the comparison group's pooled standard deviation (from Step 9). Label this value the comparison group's standardized growth estimate.

STEP 11: Add the gap reduction (from Step 7) to the comparison group's standardized growth estimate (from Step 10). Label this sum the project group's standardized growth estimate.

STEP 12: Divide the project group's standardized growth estimate (from Step 11) by the comparison group's standardized growth estimate (from Step 10). Multiply the result by 100 to convert it to a percent and label it the Relative Growth Index (RGI).

APPENDIX B

CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN

An example may help operationalize the steps on the preceding two pages. Consider the following data set for a particular grade level.

	Project Group	Comparison Group
Pretest Mean	355.34	361.63
Pretest Std. Dev.	N/A	10.48
Posttest Mean	365.88	370.63
Posttest Std. Dev.	N/A	9.50

STEP 5: $(361.63 - 355.34) \div 10.48 = 6.29 \div 10.48 = .60$ = the pretest gap.

STEP 6: $(370.63 - 365.88) \div 9.50 = 4.75 \div 9.50 = .50$ = the posttest gap.

STEP 7: $.60 - .50 = .10$ = the gap reduction.

STEP 8: $370.63 - 361.63 = 9.00$ = the comparison group's unstandardized growth estimate.

STEP 9:

$$\sqrt{\frac{(10.48)^2 + (9.50)^2}{2}} = \sqrt{\frac{109.83 + 90.25}{2}} =$$

$\sqrt{100.04} = 10.00$ = the comparison group's pooled standard deviation.

STEP 10: $9.00 \div 10.00 = .90$ = the comparison group's standard growth estimate.

STEP 11: $.90 + .10 = 1.00$ = the project group's standardized growth estimate.

STEP 12: $(1.00 \div .90)100 = 111\%$ = the Relative Growth Index (RGI).

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