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ABSTRACT

A study was conducted to evaluate the final outcome of the Section 98 writing project, a 3-year collaboration between the School District of the City of Saginaw and the University of Michigan, and to successfully employ the gap reduction design with the pre- to post-test results stemming from the writing project. Students in six sections of 10th-grade American literature, inquiry and expression, were chosen as subjects to field test the writing curriculum during year 3 of the project. The treatment represented writing techniques found successful from study and piloting over the first 2 years of the project. The treatment had two different levels of intensity: a single teacher level (97 students) and a team teacher level (50 students). The 1985 national norming group from the California Achievement Test (CAT) served as the comparison group. Overall, it was found that the writing project produced notable achievement gains in excess of the national norming group in the areas of total reading, language mechanics, language expression, total language, and spelling. Results indicated that the single teacher situation was as good as, and in a couple instances even better than, the team teacher condition. (Three figures and four tables of data are included. Appendixes include components of field testing, graphs of the relative growth indexes, calculations of the relative growth indexes, and comparisons of the number tested for the comparison and experimental groups.) (MG)

# EVALUATION REPORT



COLLABORATIVE WRITING PROJECT
PRODUCT EVALUATION
1988-1989

## *DEPARTMENT OF EVALUATION SERVICES*

- PROVIDING ASSESSMENT, PROGRAM EVALUATION AND RESEARCH SERVICES -

## *Saginaw Public Schools*

## *Saginaw, Michigan*

# COLLABORATIVE WRITING PROJECT
# PRODUCT EVALUATION
# 1988-1989

An Approved Report of the

DIVISION OF ADMINISTRATION AND PERSONNEL

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October, 1989

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## INTRODUCTION

This study was designed to achieve two primary goals. The first goal was to evaluate the final outcome of the Section 98 writing project, which was a three year collaboration between the School District of the City of Saginaw and the University of Michigan. This project began in February, 1986 and will conclude its Professional Staff Development Competitive Grant funding in February, 1989. The intent of the project was to create and evaluate professional and organizational growth in the area of writing instruction and to promote the position that writing ability relates directly to learning and thinking. Year one activities were related to addressing ways to assess and improve writing abilities of students. Year two activities sought to pilot some of the techniques to improve writing in classrooms. The final year's activity (the focus of this study) was to employ a field test of the treatment(s) in a number of classrooms employing an experimental or quasi-experimental design.

A second goal (of the Evaluation, Testing and Research staff) was to successfully employ the gap reduction design with the pre- to post-test results stemming from the writing project. Tallmadge, et al. (1987, Volume I, p. 79,) has recommended that while the non-equivalent comparison group design, the grade-cohort design, and regression - discontinuity design (all quasi-experimental designs) may yield better estimates of project impact if properly executed under ideal conditions, none was judged to be as easy to implement or interpret as the gap reduction design. This ease of implementation stems from the design's focus on achieving project objectives rather than estimating the size of the treatment effect. One major goal of the writing

project was to close the gap in language proficiency between project students and their peers nationally.

The third year field testing for the Section 98 writing project took place in six classrooms of tenth grade American literature, inquiry and expression. This treatment involved two different levels of delivery - two classrooms (N=50) where team teaching was employed and four classrooms (N=97) where a single teacher in each classroom was involved in the teaching-learning process.

Within this context, the remainder of this evaluation will describe in greater detail the design of the study and the outcomes related to the treatments.

## STUDY DESIGN

Students in six sections of tenth grade American literature, inquiry and expression were chosen as subjects to field test the writing curriculum during year three of this project. The treatment represented writing techniques found successful from study and piloting over the first two years of the project (see Appendix A for the techniques used). The treatment had two different levels of intensity. A single teacher level (four classrooms) where a teacher had approximately 24 students per classroom and applied the writing techniques found in Appendix A. The other level was a team teacher level (two classrooms) where two teachers worked together with the same size class as the single teacher condition again using the writing techniques found in Appendix A.

The concept for the team was in part that the greater individual attention possible in the team condition would bring about greater writing and language arts improvements. This two teachers working as a team were to learn from each other, act as a support group, participate as "teachers as researcher", and provide two different instructional dimensions in the classroom. The additional cost of the team condition (twice as much per student) seemed to make it reasonable to expect twice the growth academically from these students.

Students enrolled in the American literature course as a way to achieve English credits required for their graduation. According to one assistant principal there was an attempt to randomize students that entered the six classrooms such that they represented the normal range of students found in required courses at Arthur Hill and Saginaw High.

In the Spring of 1988 ninth grade students were tested as part of the district-wide testing on the California Achievement Test, Form E (CAT) normed

1985. These scores served as the student participants pre-test scores. In the spring of 1989 tenth grade student participants were post-tested on CAT. Both testings occurred within ± two weeks of the empirical norming date. Improved scores on reading vocabulary, reading comprehension, total reading, language mechanics, language expression, total language, and spelling were to be analyzed. While student growth as measured by a standardized test battery such as CAT is an indication of the success of the program, such growth was not the only aim of the project. As important are measures of growth in student interest and participation in writing activities. Instruments to gauge these variables were to be employed in this year's field test (conducted during year three) and will be analyzed in another report. In addition, a content analysis of writing samples during the course of school year is also contemplated.

For this study the authors originally intended to use a comparison group. Since none was identified from the ranks of Saginaw's tenth graders a national group was sought. It was decided that the 1985 national norming group from CAT would serve as the comparison group. To use this group, the gap reduction design was employed using the data at hand.

This design requires the calculation of a Relative Growth Index (RGI). The index indicates the percentage increase or decrease of the writing treatment group and a group with no prior participation (comparison group) between the mean pre- and post-test achievement levels. It is expected that the gap will stay the same or be reduced as a result of writing program participation and thus there will be the same or smaller gap at post-test time than there was at pre-test time. Figure 1 below illustrates the reduced gap expected between treatment (T) and comparison (C) groups.

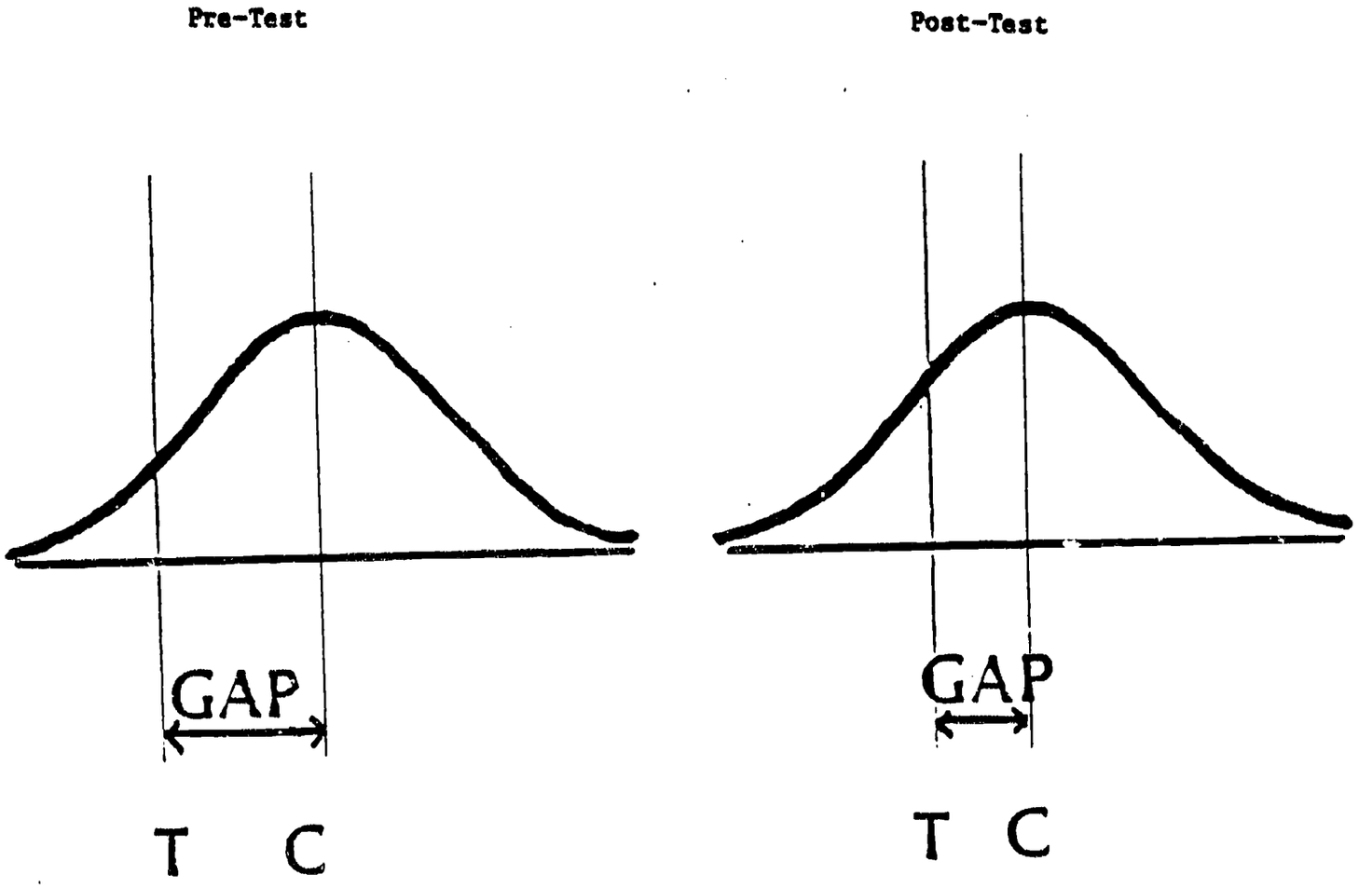


Figure 1. Gap Reduction Design.

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 (experimental) 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 C for the steps involved in the calculation of this index.) RGI's less than 100% indicate that writing students fell further behind the non-participants during the one year study period. RGI's equal to 100% indicate that the project group grew at the same rate as students nationally in the CAT norming group and RGI's greater than 100% indicate that project participants out gained the non-participants.

The effect of the entire treatment group (total group) will be explored through testing the stated hypotheses. In addition, the two levels of the treatment (single or team teachers) are fundamental to the statement of other study hypotheses. The study hypotheses stated below are layed out in terms of RGI's explained earlier.

1. There will be a Relative Growth Index (RGI) of 100% or greater in vocabulary, reading comprehension, total reading, language mechanics, language expression, total language, spelling (subsequently referred to as language arts' areas) as measured by CAT for total group writing participants.

2. There will be a RGI of 100% or greater in language arts areas as measured by CAT for single teacher writing participants.

3. There will be a RGI of 100% or greater in language arts' areas as measured by CAT for team teachers writing participants.

4. For language arts' areas where RGI's are 100% or greater, the team teacher writing participants' RGI's will be in excess of the single teacher RGI's by 100% or more.

## PRESENTATION OF DATA

What follows is a presentation of data stemming from the writing study during its third year of operation as a field test in six tenth grade American literature classrooms. The discussion will begin with the composition of the experimental groups, followed by the findings relative to the four hypotheses, and end with some further details that put the Relative Growth Index (RGI) in perspective to the actual CAT data in the experiment.

### STUDENT PARTICIPANTS

Pre- to post-test results were obtained from 147 students in the six classrooms involved in the writing project. Table 1 presents the gender and racial ethnic background of these students for comparison purposes.

**TABLE 1. COMPARISON OF DEMOGRAPHIC VARIABLES FOR THE TWO TREATMENT LEVELS (SINGLE AND TEAM) AND TOTAL.**

| Demographic Variables | Experimental Groups | | | | | |
|---|---|---|---|---|---|---|
| | Single Teacher | | Team Teacher | | Total | |
| | # | % | # | % | # | % |
| GENDER | | | | | | |
| Male | 41 | 42.3 | 24 | 48.0 | 65 | 44.2 |
| Female | 56 | 57.7 | 26 | 52.0 | 82 | 55.8 |
| TOTAL | 97 | 100.0 | 50 | 100.0 | 147 | 100.0 |
| RACIAL ETHNIC | | | | | | |
| American Indian | 0 | 0.0 | 1 | 2.0 | 1 | 0.7 |
| Caucasian | 31 | 32.0 | 14 | 28.0 | 45 | 30.6 |
| Latino/Hispanic | 12 | 12.4 | 3 | 6.0 | 15 | 10.2 |
| Black | 52 | 53.6 | 31 | 62.0 | 83 | 56.5 |
| Asian/Oriental | 2 | 2.0 | 1 | 2.0 | 3 | 2.0 |
| TOTAL | 97 | 100.0 | 50 | 100.0 | 147 | 100.0 |

Reviewing the data contained in Table 1 it can be seen that:

- Approximately equal percentages of males 42.3% versus 48.0% and females 57.7% versus 52.0% for single and team teacher treatments respectively.
- Of the two largest racial ethnic groups (Black and Caucasian) approximate equal percentages of both 53.6% versus 62.0% and 32.0% versus 28.0% made up single and team teacher groups respectively.

The chart below contrasts the 1988-89 fourth Friday high school (grades 10-12) count expressed as a percentage with the total experimental group. It appears that both groups were very identical in representation in terms of both gender and racial ethnic background.

| Gender | High School Fourth Friday | Total Experimental Group |
|---|---|---|
| Male | 49.2% | 44.2% |
| Female | 50.8% | 55.8% |
| Total | 100.0% | 100.0% |
| **Racial Ethnic** | | |
| American Indian | 1.0% | 0.7% |
| Caucasian | 32.6% | 30.6% |
| Latino/Hispanic | 10.9% | 10.2% |
| Black | 54.7% | 56.5% |
| Asian/Oriental | 0.6% | 2.0% |
| Total | 100.0% | 100.0% |

## RELATIVE GROWTH INDEX (RGI) CRITERION

The 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 (total experimental, single, or team teacher groups) is catching up to, keeping up with, or falling behind the comparison group (national norming group for the CAT). The gap measured is the gap between the mean achievement level of the treatment group and the mean achievement level of the national comparison

group. It is hypothesized that the gap between the writing treatment and national comparison groups will remain the same or be reduced between pre- and post-testing. To evaluate this hypothesis the national norming 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 comparison group's growth, thus providing an easy-to-interpret RGI (see Appendix C 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 writing project group) is falling behind the comparison group. When the RGI equals 100% it signifies the project group is keeping equal to the national norming comparison group. A RGI greater than 100% means the project group is catching up to the national comparison group. Figure 2 puts this interpretation in graphic form relative to the gap between the project and comparison group.

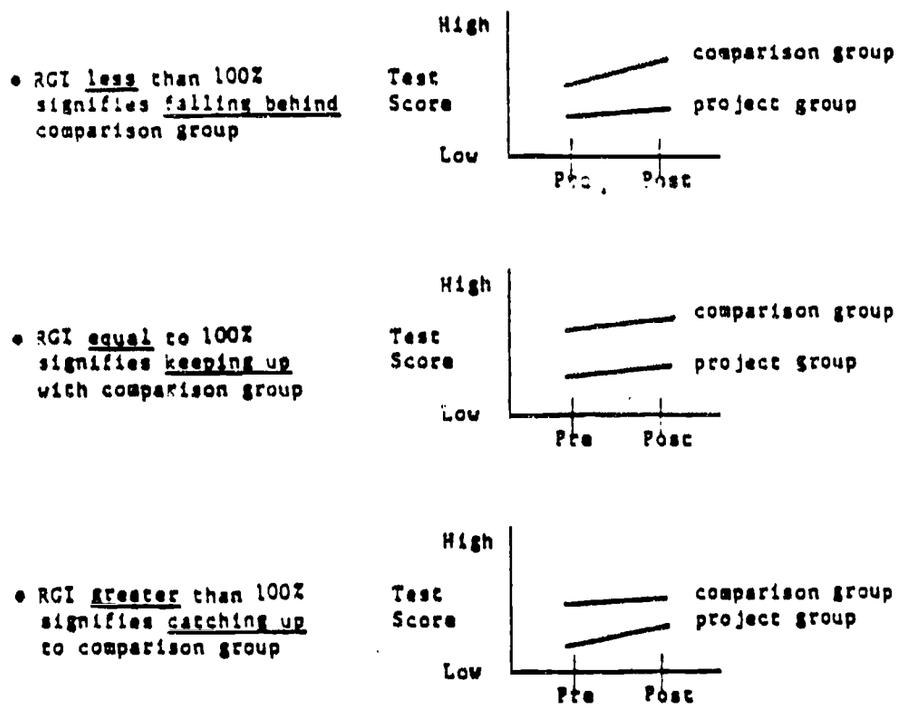


**Figure 2. Interpretation of Relative Growth Indices (RGI's).**

Table 2 below presents the RGI's for the language arts CAT score areas by single, team, and total experimental groups.

**TABLE 2. RELATIVE GROWTH INDICES (RGI's) ACCORDING TO CALIFORNIA ACHIEVEMENT TESTS (CAT) SCORE AREAS FOR THE EXPERIMENTAL GROUPS OF SPRING, 1988 TO SPRING, 1989.**

| CAT Language Arts Score Areas | Relative Growth Indices for Experimental Groups | | |
|---|---|---|---|
| | Single | Team | TOTAL |
| Vocabulary | -63.2% | -15.8% | -34.8% |
| Reading Comprehension | 17.4% | 73.9% | 34.8% |
| Total Reading | 138.1% | 157.1% | 157.1% |
| Language Mechanics | 407.7% | 323.1% | 376.9% |
| Language Expression | 212.5% | 231.2% | 218.8% |
| Total Language | 307.1% | 307.4% | 318.4% |
| Spelling | 329.2% | 250.9% | 300.4% |

A review of Table 2 reveals that neither single, team, or their total group students equaled or exceeded (100% or greater) the growth of the national norming comparison group in vocabulary and reading comprehension. All three groups (single, team, and total) equaled or exceeded the growth of the comparison group in total reading, language mechanics, language expression, total language, and spelling. The best performance in exceeding the 100% RGI criterion was shown in language mechanics with RGI's of 407.7%, 323.1%, and 376.9% respectively for single, team, and total conditions.

When Table 2 is reviewed for the areas the team group exceeded the single group by 100% or more, it is evident that no such gains were shown. The team group did out gain the single group in positive percentage points in reading comprehension (73.9 - 17.4 = 56.5%), total reading (157.1 - 138.1 = 19.0%), language expression (231.2 - 212.5 = 18.7%), and total language (307.4 -

307.1 = 0.3%) subtest areas. Interestingly, the single group out gained the team group in positive percentage points in language mechanics (407.7 - 323.1 = 84.6%) and spelling (329.2 - 250.9% = 78.3%) subtest areas.

The following chart specifies the hypotheses relating to the RGI's and their status in the language arts areas of CAT.

| Hypothesis Number | Hypothesis | Results Which Equal or Exceed Gains Hypothesized: | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Voc | Comp | TR | LM | LE | TL | Sp |
| 1 | Total $\bar{>}$ 100% | No | No | Yes | Yes | Yes | Yes | Yes |
| 2 | Single $\bar{>}$ 100% | No | No | Yes | Yes | Yes | Yes | Yes |
| 3 | Team $\bar{>}$ 100% | No | No | Yes | Yes | Yes | Yes | Yes |
| 4 | Team - Single $\bar{>}$ 100% | No | No | No | No | No | No | No |

As indicated above in hypotheses 1, 2, and 3, the combined group as well as its two treatment levels (single and team) were successful in equaling or exceeding hypothesized gains in the areas of total reading, language mechanics, language expression, total language, and spelling. The team group failed to exceed by 100 points the single writing group in all seven areas.

## PUTTING RGI'S INTO BETTER FOCUS

In each case compared, the reader should realize that the experimental group growth is contrasted the national norming group growth. Thus the RGI statistic provides an index to gauge the relative change from pre- to post-testing of the gap between the experimental and comparison group.

As already explained the gap reduction design is easy to calculate (see Appendix C for the calculations of the 21 RGI's already presented). The basic mean and standard deviation data are calculated using their general formulas and these results are presented in Appendix D. As can be seen by

reviewing the work sheets in Appendix C of the calculations and the table in Appendix D of the means and standard deviations that the units being compared are scale score units. Thus the gaps that are initially calculated are expressed in scale score units before they are standardized by the pooled pre- and post-test standard deviation of the comparison group.

Table 3 below presents the gains in scale score units along side the RGI's obtained for the three experimental groups. Please note that the comparison group serves as the baseline to calculate the RGI's for the three experimental groups and thus no RGI is given for the comparison group.

**TABLE 3. COMPARISON OF PRE- TO POST-TEST SCALE SCORE GAINS ON CAT TO RELATIVE GROWTH INDICES (RGI'S) FOR COMPARISON AND EXPERIMENTAL GROUPS.**

| CAT Language Arts Score Areas | GROUP | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Comparison | | Single | | Team | | TOTAL | |
| | SS Gain | RGI | SS Gain | RGI | SS Gain | RGI | SS Gain | RGI |
| Vocabulary | 4 | N.A. | 2 | - 63.2% | 0 | - 15.8% | 1 | - 34.8% |
| Reading Comprehension | 9 | N.A. | 2 | 17.4% | 7 | 73.9% | 4 | 34.8% |
| Total Reading | 6 | N.A. | 9 | 138.1% | 10 | 157.1% | 9 | 157.1% |
| Language Mechanics | 6 | N.A. | 24 | 407.7% | 19 | 323.1% | 22 | 376.9% |
| Language Expression | 9 | N.A. | 19 | 212.5% | 21 | 231.2% | 19 | 218.8% |
| Total Language | 7 | N.A. | 21 | 307.1% | 21 | 307.4% | 22 | 318.4% |
| Spelling | 6 | N.A. | 20 | 329.2% | 15 | 250.9% | 18 | 300.4% |

A single example from Table 3 should be very instructive. Let's examine spelling for the total group with a RGI = 300.4%. As can be seen it has a comparison group gain of six scale score units as its baseline for comparison.

If six is divided into 18 (the total group's gain in spelling) and then multipled by 100 with the resulting percentage equal to 300.

$$\frac{18}{3} \times 100 = 3 \times 100 = 300\%$$

Thus even before the pooled standard deviation is used, the RGI can roughly be estimated. So in the case above our estimate of 300% is really 300.4%.

Overall from Table 2, we can see that generally students in the national norming group of CAT gain from 4 (vocabulary) to 9 (reading comprehension and language expression) scale score units. In addition, our experimental writing groups gain two to four times these amounts in language mechanics, language expression, total language, and spelling. The largest gains were in language mechanics of approximately four times or 407.7%, 3.2 times or 323.1%, and 3.7 times or 376.9% for the single, team, and total group respectively when compared to the six scale score point gain of the national norming group.

Thus the gap reduction design is both easy to calculate using scale scores and also easy to interpret in terms of reducing the pre- to post-test gap of the treatment in relation to a comparison group. This change is expressed as a Relative Growth Index (RGI) with RGI's less than 100% signifying falling behind, RGI's equal to 100% signifying keeping up, and RGI's greater than 100% signifying catching up to the comparison. A graph is provided to allow the reader to see the general nature of RGI's. Using the calculations of the RGI's (see Appendix C), all 21 RGI's were graphed such that a visual interpretation of findings is also available in Appendix B. For the illustration of the most growth shown by a group, the language mechanics results for the single teacher condition are shown in Figure 3 below.

(RGI = 407.7%)

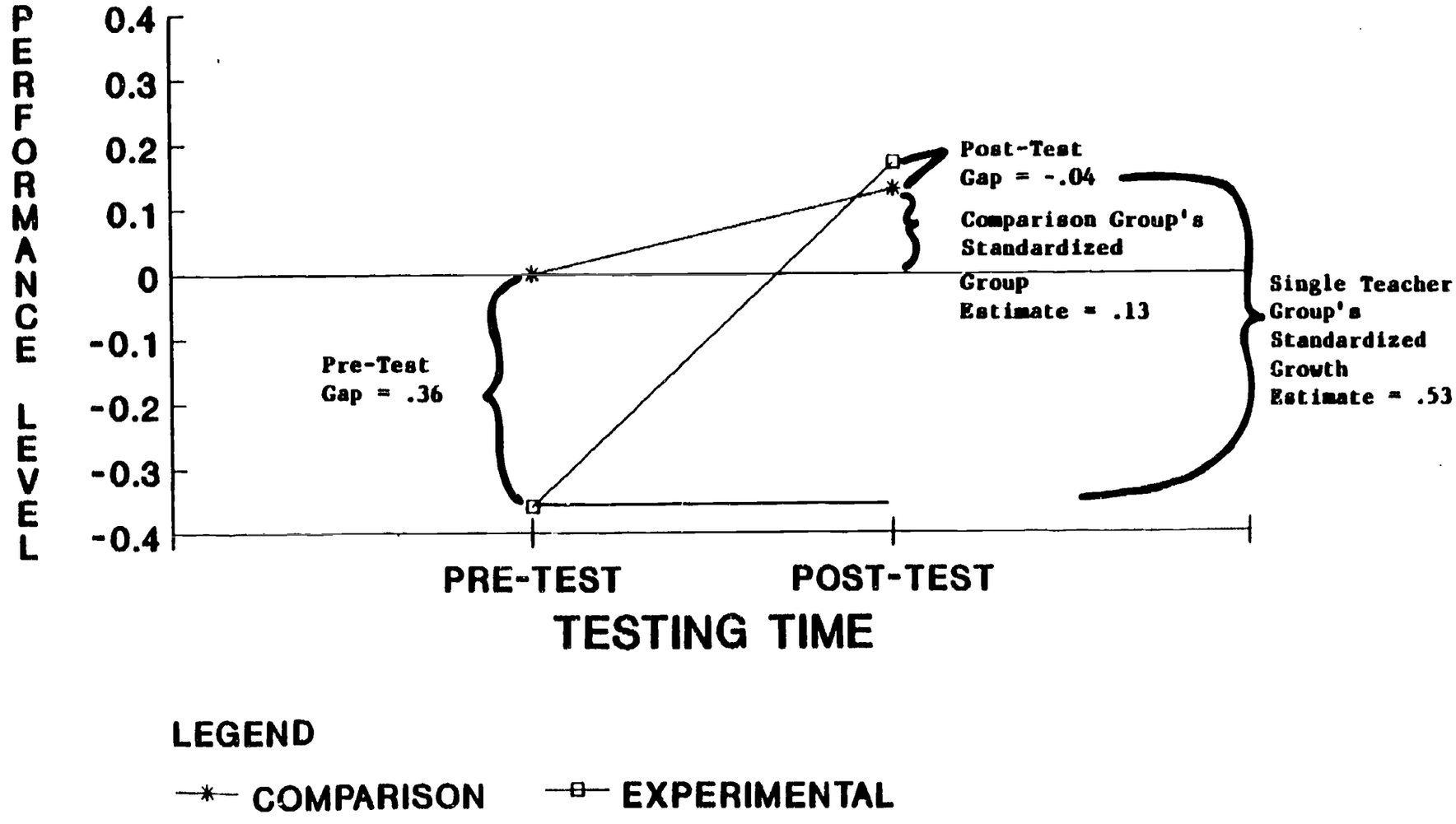


FIGURE 3. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE MECHANICS SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) [ALSO LABELED FIGURE B.4. IN APPENDIX B].

As can be seen in Figure 3, the experimental single teacher writing group started out .36 performance level points apart from the national norming group at pre-testing and a year later the single teacher group had surpassed the comparison group by .04 performance level points. These results expressed as a Relative Growth Index (RGI) are equal to 407.7%. Thus the graphs shown in Appendix B should give another look at the meaning of RGI's. The RGI's standardize the gap between the treatment and comparison groups by using the pooled standard deviations of the comparison group which gives meaning to the performance level shown in each of the figures.

Scale scores are one of a number of standard score scales. Scale scores are units of a single, equal-interval scale. This scale is applied across all levels of CAT regardless of grade or time of year of testing. These scores are expressed as numbers that may range from 0 through 999. The equal-interval property of the scale makes scale scores especially appropriate for various statistical purposes. The principal limitation of scale scores is that they are not well suited to direct interpretation of individual performance. Therefore, the primary use of CAT scale scores is to permit direct comparison among classes as in the writing study.

Another type of standard score which may help in defining individual performance is the normal curve equivalent (NCE) score. NCE's have many of the characteristics of percentile ranks but have the additional advantage of being based on an equal-interval scale. That is, the difference between two successive scores on the scale has the same meaning throughout the scale. The normal curve is represented on a scale of 1 through 99 with a mean of 50 and a standard deviation of approximately 21. The use of NCE's allows meaningful comparisons between different achievement test batteries and between different tests within the same test battery.

Table 4 below provides a look at the NCE gains of the comparison and experimental groups along with the RGI's associated with each treatment. Since the NCE scale has 1-99 points instead of 0-999 points as scale scores, it is apparent that some of the fineness of the scale score will not be reflected in NCE's; however, the same trends should be evident. In addition, it should be remembered that RGI's were calculated using scale score units. This procedure is recommended by Tallmadge, et al. (1987) and the CAT technical manuals.

**TABLE 4. COMPARISON OF PRE- TO POST-TEST NORMAL CURVE EQUIVALENT (NCE) SCORE GAINS ON CAT TO RELATIVE GROWTH INDICES (RGI'S) FOR COMPARISON AND EXPERIMENTAL GROUPS.**

| CAT Language Arts Score Areas | GROUP | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Comparison | | Single | | Team | | TOTAL | |
| | NCE Gain | RGI | NCE Gain | RGI | NCE Gain | RGI | NCE Gain | RGI |
| Vocabulary | -3 | N.A. | - 5 | - 63.2% | -5 | - 15.8% | - 5 | - 34.8% |
| Reading Comprehension | 8 | N.A. | - 2 | 17.4% | 3 | 73.9% | 1 | 34.8% |
| Total Reading | 1 | N.A. | 3 | 138.1% | 3 | 157.1% | 3 | 157.1% |
| Language Mechanics | 1 | N.A. | 8 | 407.7% | 6 | 323.1% | 7 | 376.9% |
| Language Expression | 0 | N.A. | 4 | 212.5% | 5 | 231.2% | 4 | 218.8% |
| Total Language | 0 | N.A. | 6 | 307.1% | 6 | 307.4% | 6 | 318.4% |
| Spelling | 0 | N.A. | 14 | 329.2% | 8 | 250.9% | 12 | 300.4% |

Comparing the results in Table 4 with Table 3, it seems very apparent that they look much alike. Again, sizeable gains (4 to 12 NCE's) were made in the language arts areas of language mechanics, language expression, total language, and spelling when compared to the national norming group. With NCE gains the spelling area looks as if it made the largest gains rather than language mechanics (as shown in Table 3 earlier). In large part this variation is due to the short NCE scale compared to the scale score scale. To some extent this variation is also due to the lower reliability of the spelling subtest on CAT compared to the other language arts CAT score areas. Thus Tables 3 and 4 substantiate the fact that gains two times or greater were made by the experimental writing groups when compared to the national norming group as a control.

## SUMMARY, CONCLUSIONS, AND DISCUSSION

A study of the impact of a writing project on tenth graders taking an American literature course for credit during the 1988-89 school year was undertaken. A total of 147 students had pre- to post-test CAT language arts' scores. Fifty students were in the team teacher condition and 97 were in the single teacher condition. The 1985 national norming group for the California Achievement Tests, Form E (CAT) with over 1,000+ students in each grade level served (a total of 2,000+) as the comparison group. The treatment categories examined were the following: single teacher, team, and total group.

The statistical analysis of results involved the calculation of a Relative Growth Index (RGI). This index indicates the percentage increase or decrease of the treatment (study groups) in comparisons to the 1985 national norming sample of the CAT (comparison group) between the mean pre- and post-test achievement levels. The single teacher, team, and total groups decreased the gap between themselves and the national norming group in five of the seven language arts' areas between pre- and post-testing. The decreased gap (or the RGI in excess of 100%) for all three groups occurred in total reading, language mechanics, language expression, total language, and spelling (single: 138.1%, 407.7%, 212.5%, 307.1%, and 329.1%; team: 157.1%, 323.1%, 231.2%, 307.4%, and 250.9%; and total: 157.1%, 376.9%, 218.8%, 318.4%, and 300.4% respectively).

In addition, it was predicted that the team teacher treatment would decrease the gap by 100% points in comparison to the single teacher treatment. This prediction stemmed from the additional costs of the two teachers in the classroom. The team condition failed to show this result across all seven language arts' areas. The team condition had other predicted outcomes related

to teacher behaviors and/or attitudes to be explored in other research stemming from this project.

Overall, it was found that the writing project produced notable achievement gains in excess of the national norming group in the areas of total reading, language mechanics, language expression, total language, and spelling.

Saginaw tenth grade students in American literature had demonstrated an academic deficit in language arts on entry compared to CAT's 1985 national norming group. Participation in a one school year writing program stemming from state funding of a Section 98 grant was provided to students in the hopes to reduce the observed academic deficit. Since standardized test results were available for almost all of the participants upon entry in the fall, the use of test results was considered as a source of information to determine academic progress. Other data has been collected and other studies are being contemplated.

A structured process was developed over the first two years of the project as the means for classroom instruction (see Appendix A for a description of this process). Two experimental conditions were used as means of delivery of the treatment, a single teacher and a team of teachers (two teachers) situation. It was hypothesized that since the teacher cost per student would almost be doubled in the team condition then academic achievement should be a 100% or more greater in the team teacher classrooms when compared to the single teacher classrooms. Other benefits beyond academic achievement of the students from the team condition will be explored and commented upon in other research related to the writing project.

The gap reduction design was chosen to evaluate whether gains of the treatments would exceed the national norming group of CAT. It was found that this expectation was exceeded in five (total reading, language mechanics,

language expression, total language, and spelling) of seven language arts areas. These positive results occurred for both the single and team treatments. The team condition failed to produce more positive results ($\bar{>}$ 100%) than the single teacher. It may be that the team situation failed to increase student achievement but had other positive effects to be explored. The single teacher condition substantially out performed the team teacher condition when compared to the comparison group in language mechanics (407.7 - 323.1 = 84.6%) and spelling (329.2 - 250.9 = 78.3%). Overall, it appears that the single teacher situation was as good and in a couple instances even better than the team teacher condition.

# APPENDICES

APPENDIX A

Components Ready for Field Testing

The major component to be field tested during year three of the project is the systematic application of those approaches developed over the first year and one-half of project operations. These procedures will be employed at the two target sites over the course of an entire year and are described below.

After one and one-half years of work, the Project 98 participants may describe a process of composition and a set of criteria which seem to facilitate quantity and quality in student writing.

1. The teacher takes time to anticipate appropriate wording and context of the prompt students will write on.

   In a group or in isolation the teacher must be deliberate in his/her development and statement of the prompt. The teacher must be ready to generate discussion to delve into the prompt, to give a context into which the prompt can fit, and must provide the motivation that will sustain student writing for an extended period of time.

2. Present a context into which student writing may fit and which will instigate student writing.

   This presentation will be designed to help students get ideas down that relate to the prompt. At this point, the prompt has not been formalized for the class; they are just beginning to focus in on the general topic and generating ideas associated with it.

3. Small and Large Group discussions on initial writing.

   Pairs of students will react to each other's writing by explaining what they liked about it, what audiences it would be especially appropriate for, and what details seem to need to be expanded. In whole group discussion, word and concept lists would begin to emerge so that they can be used for the following day.

4. First Free-Write

   This is an essential step to allow students to get their ideas down without worrying about grammar and usage. Free-write will also begin to focus students, subtly, on the prompt, possible criteria and the effect on a real reader.

5. Students keep their own writing samples until the last day.

   In this way, students may look at what they've written, revise it, and prepare for the next day.

6. Teacher presents a new context into which student writing may fit and which will instigate student writing.

   The teacher's attempt here is to refine and narrow the focus of the topic, but not to the point of a formal statement of the prompt. Typically, the teacher will add details, description, and amplification to the anecdote or exposition that is told to the students.

7. Second Free-Write

   Students describe, tell, narrate a second experience related to the prompt perhaps one suggested or thought-up in small group discussion the day before.

8. After writing the second day, Teacher follow-ups with whole-class discussion.

   This discussion will attempt to generate language lists and concept lists of words and concepts used in the stories that seem best to convey a feeling inherent in the prompt. When lists are complete, the teacher should ask questions that press students into the meaning of the concept to the prompt. This is a crucial step if students are to become authorities--authors on the subject of the prompt. The teacher should be on the look-out for statements that seem to be expressing themes and/or generalizations.

9. Students first try at Prompt.

   Students will write to the prompt by writing for all but the last ten minutes of the class. The teacher should tell the students that this is a first try, and they will have a chance for a second try on the following day. It is important to state here that the actual prompt must be closely related to the previous days' writing topics. In the last ten minutes of the class period, have students discuss how well they were able to respond to the prompt. Did they have problems? What problems did they find, if any?

10. Reading Pairs.

    Start the fourth day's writing by dividing the class into pairs. Each student will read his partner's paper silently. The readers should underline the parts the reader likes, for whatever reason. The reader should write brief questions that occur as she/he reads: questions he/she would like answered, or simply questions that demand more details or amplification from the writer.

11. Students react to what their readers have written or underlined.

12. Teacher presents students with criteria that will be used to judge writing. (This can also be done after the First Try.)

13. Students write Second Try.

14. Collect Student Writing Booklets.

15. Analyze Student Writing Booklets.

    a. What methods seemed to be practical for getting students' quality and quantity up with respect to writing?

    b. What was the inter-rater reliability among participants who also read the students' writing?

    c. What kinds of textual studies seemed implicit in the writing?

    d. What is the relationship between writing and literature?

    e. How can this be implemented at the junior high level?

    f. How can the positive results be verified through further study?

    g. How can the status of student writing in Saginaw be most positively represented to the Saginaw community?

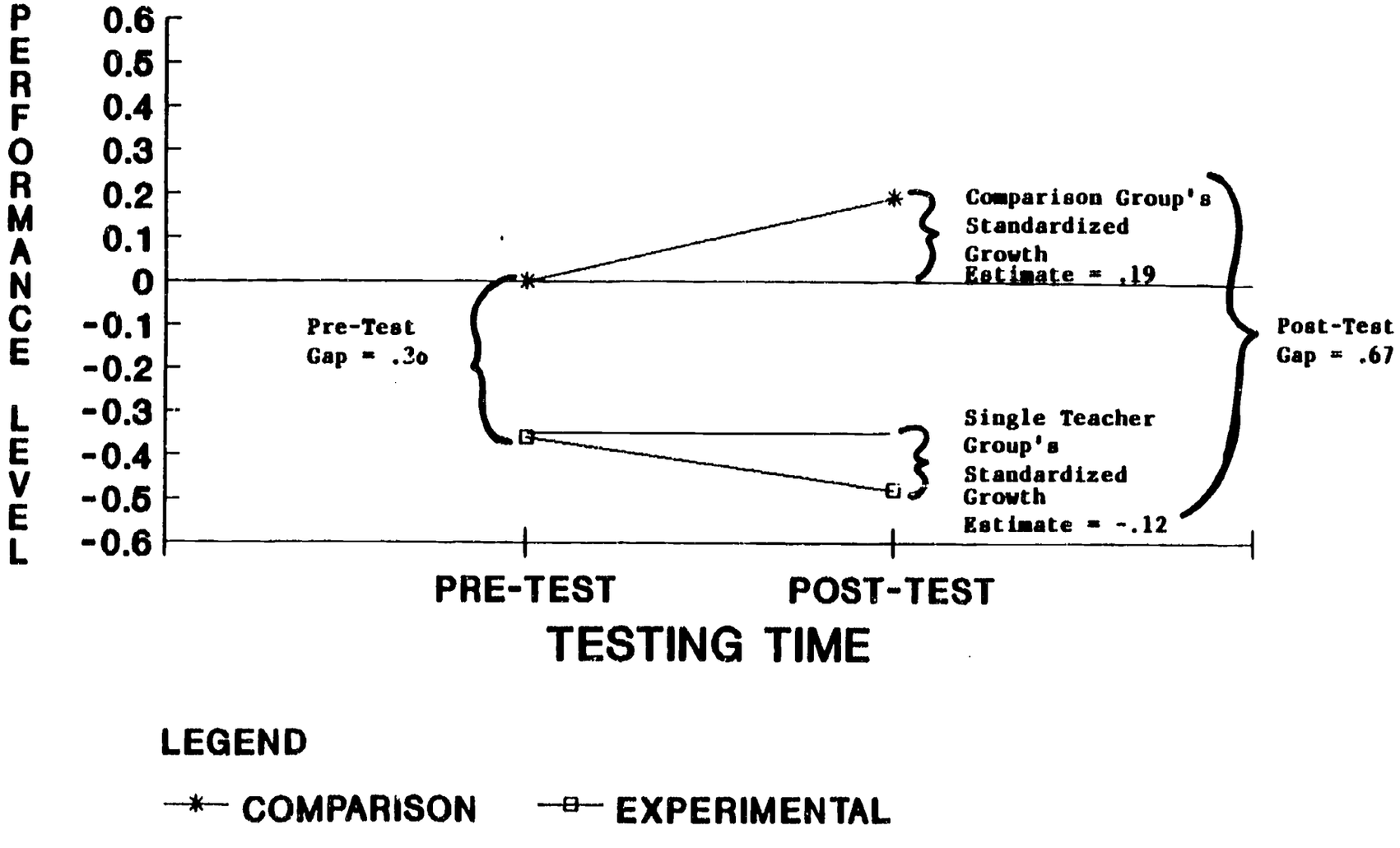


FIGURE B.1. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE VOCABULARY SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = -63.2%).

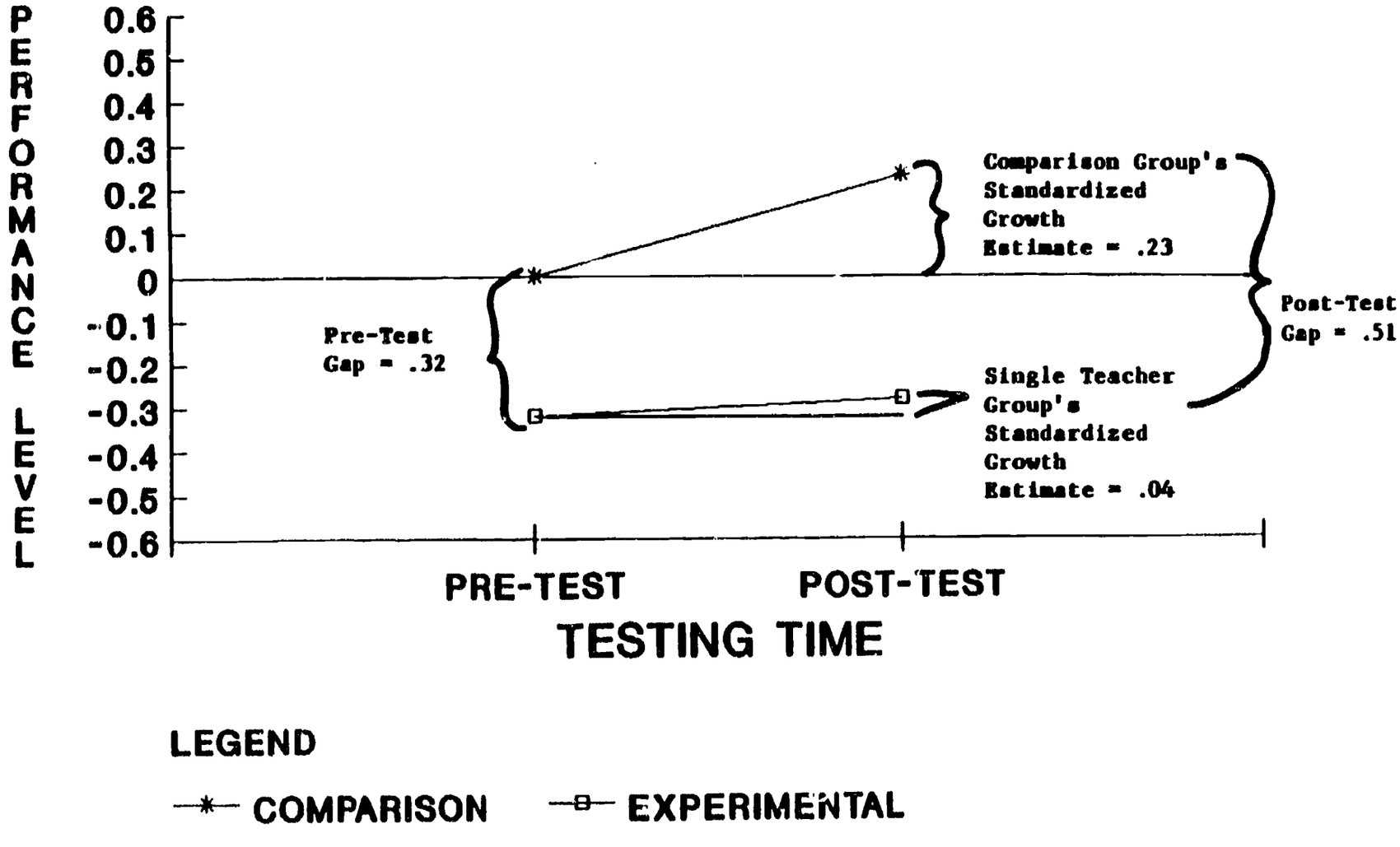


FIGURE B.2. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE READING COMPREHENSION SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 17.4%).

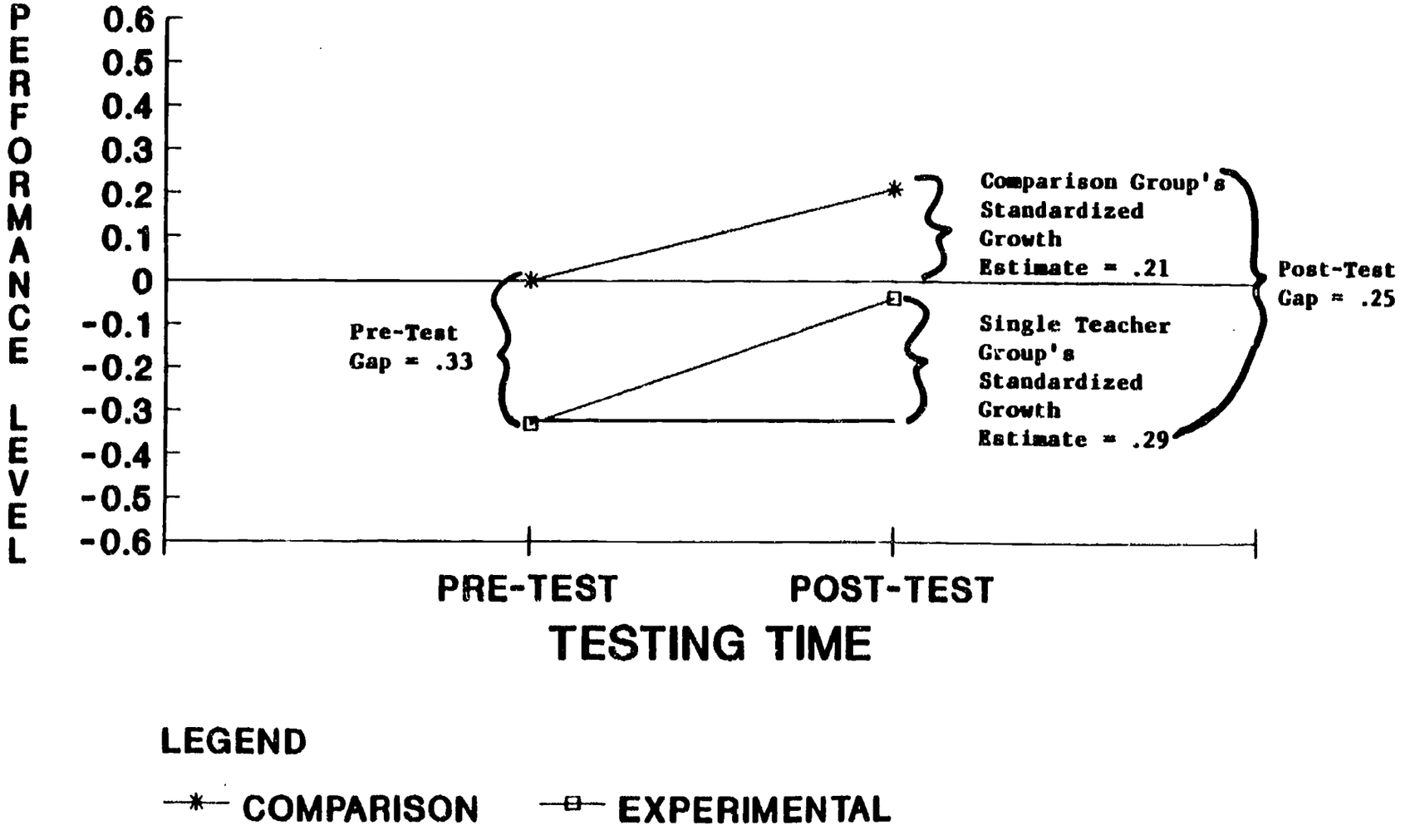


FIGURE B.3. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL READING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 138.1%).





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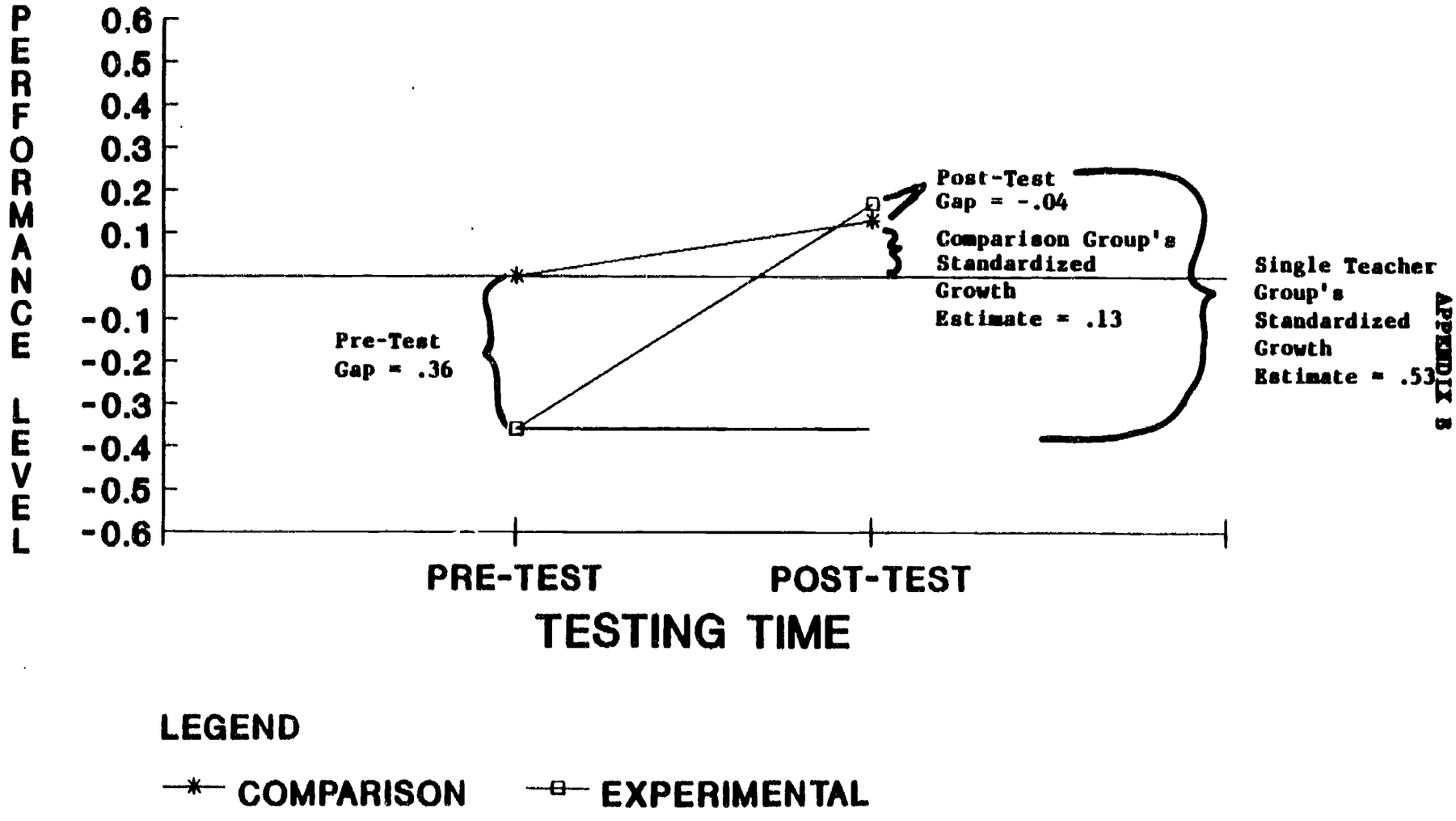


FIGURE B.4. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE MECHANICS SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 407.7%).

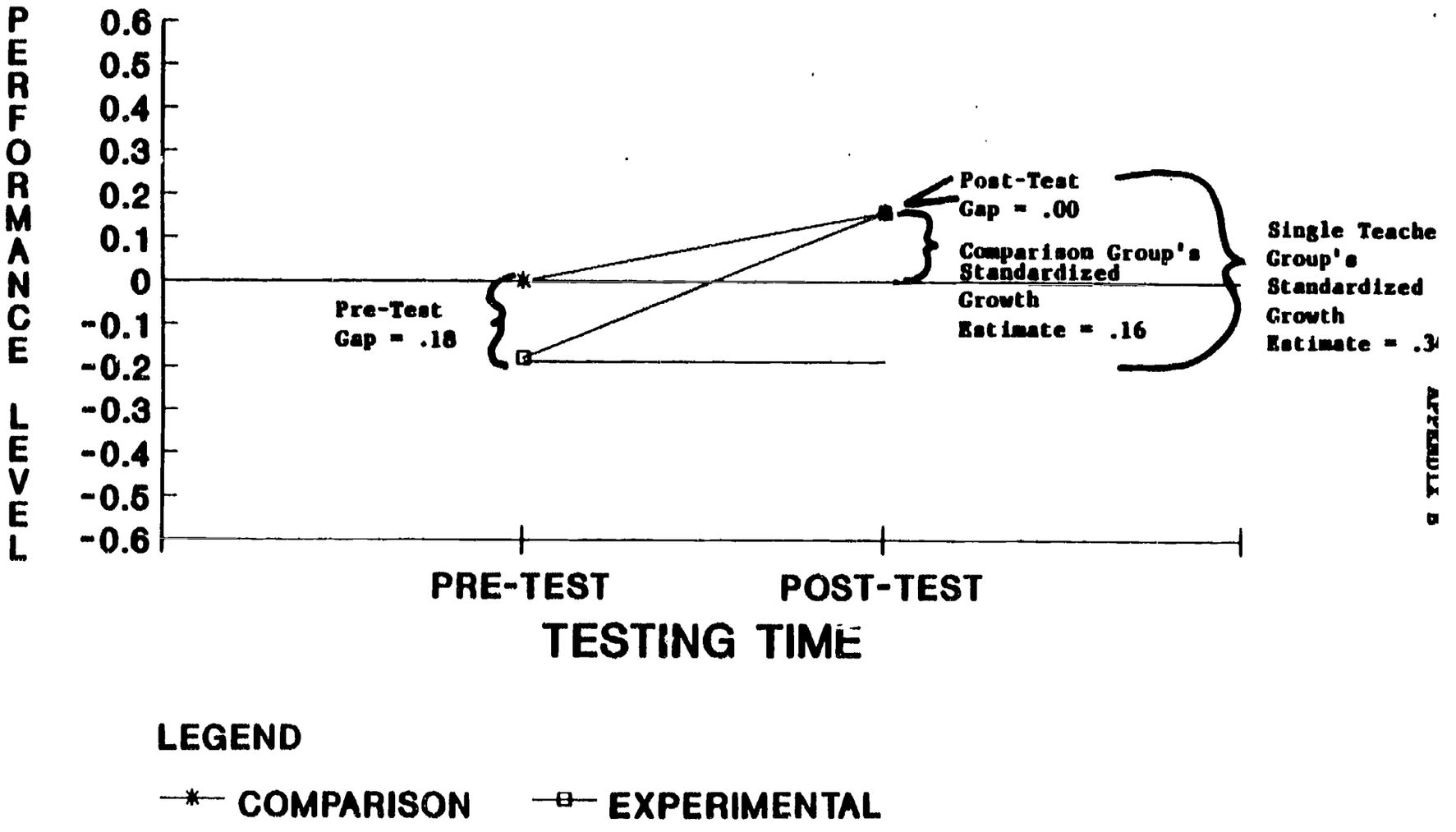


FIGURE B.5. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE EXPRESSION SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 212.5%).

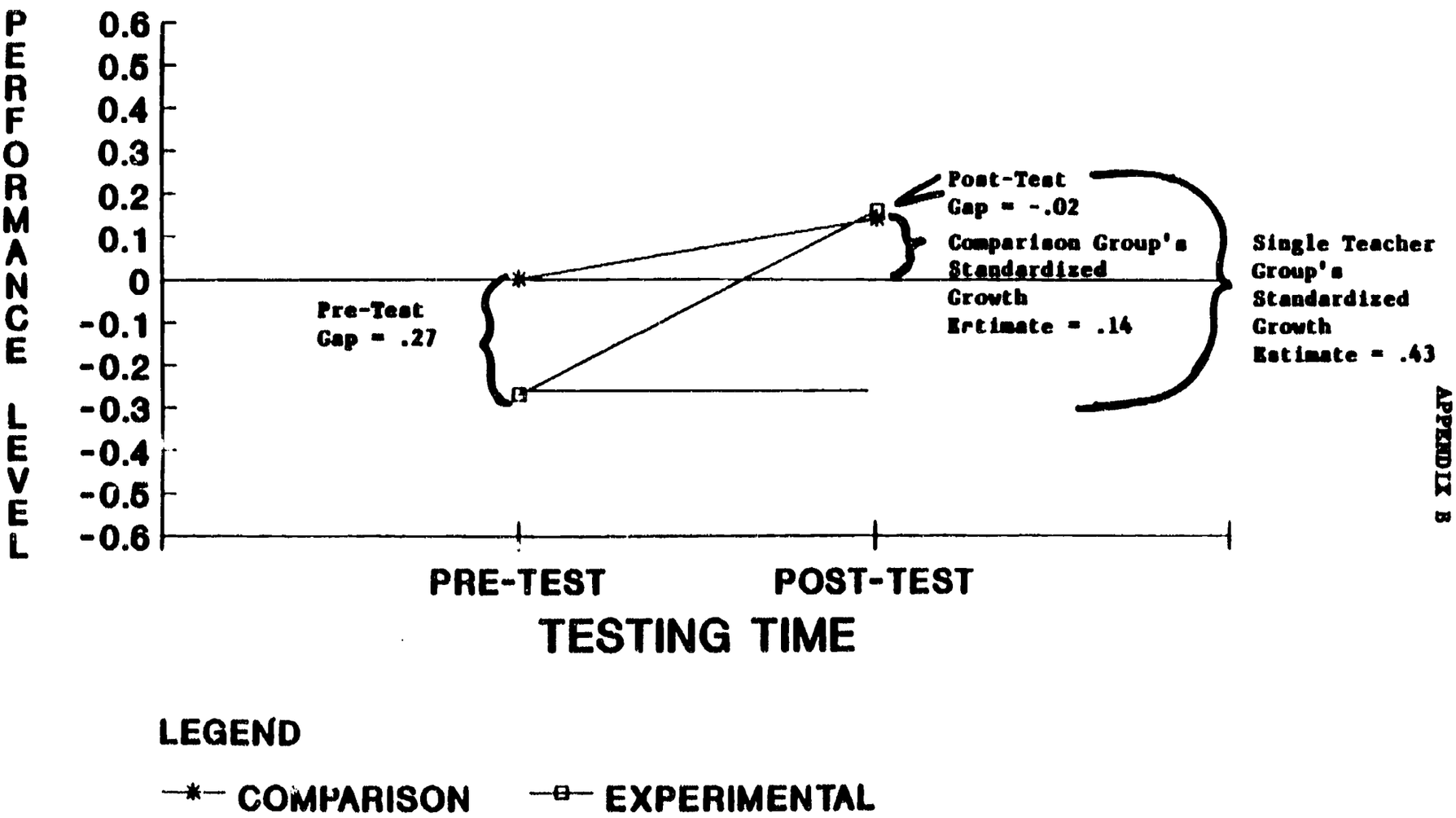


FIGURE B.6. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL LANGUAGE SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 307.2%).



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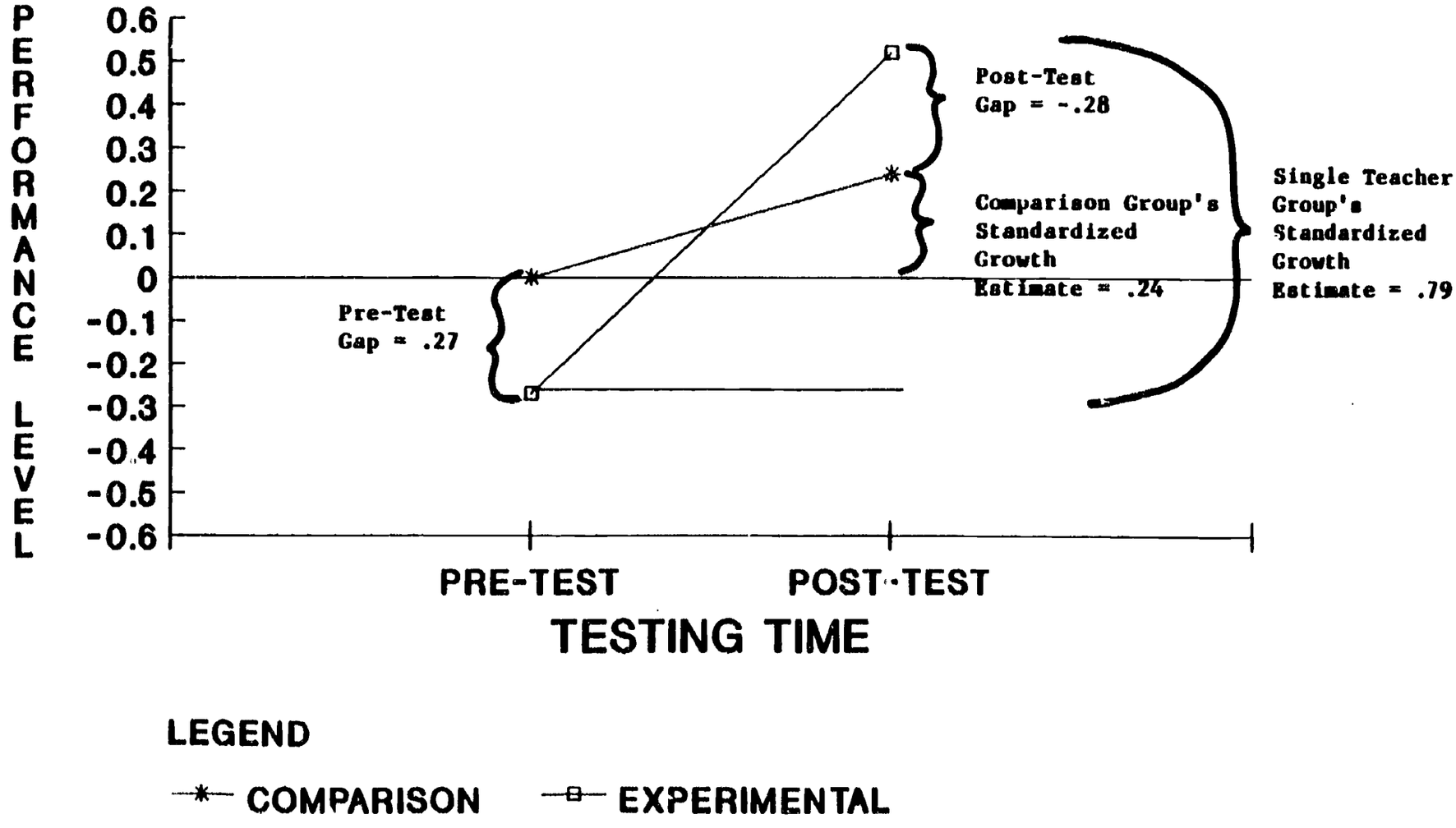


FIGURE B.7. RELATIVE GROWTH OF THE EXPERIMENTAL: SINGLE TEACHER GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE SPELLING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 329.2%).

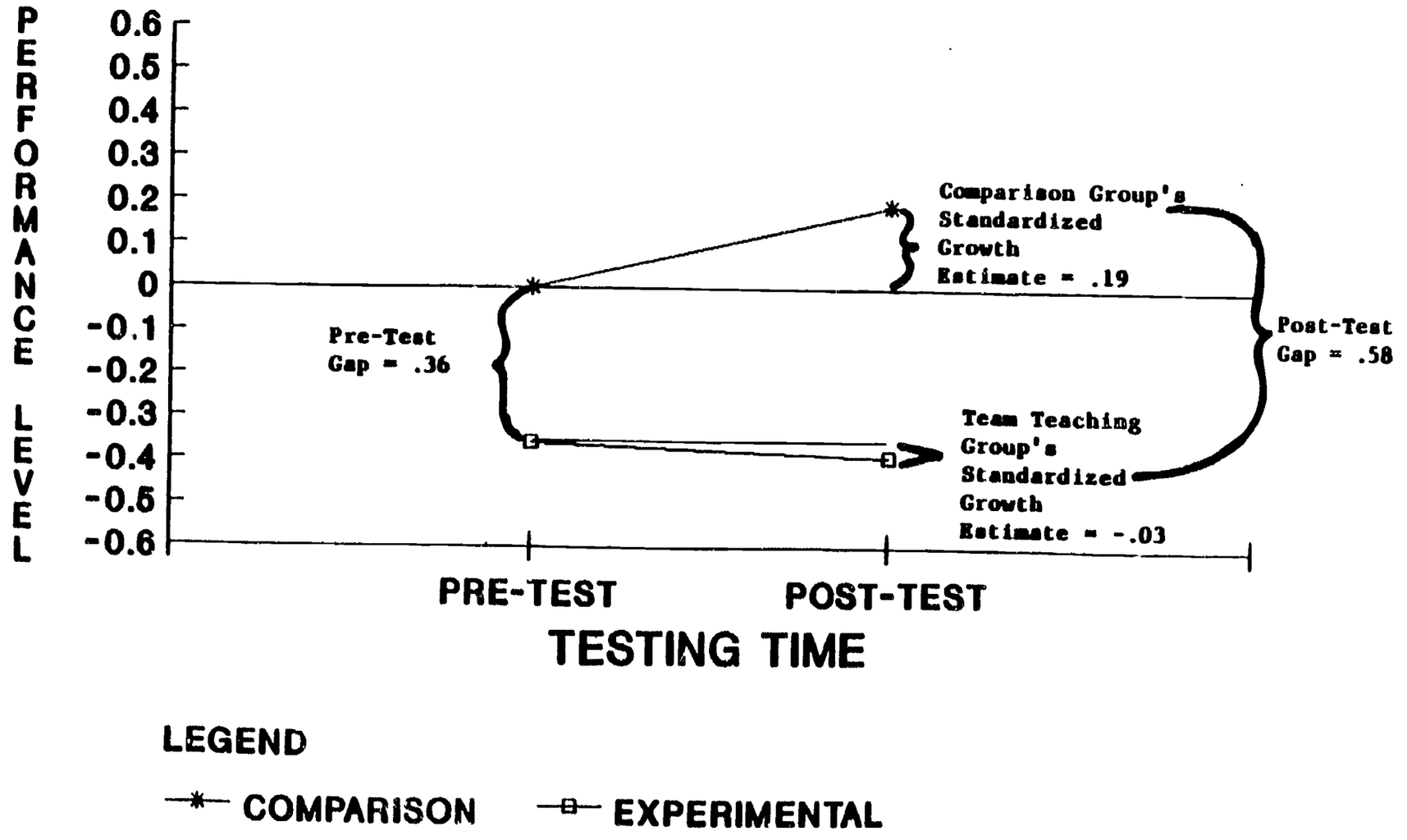


FIGURE B.8. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE VOCABULARY SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = -15.8%).



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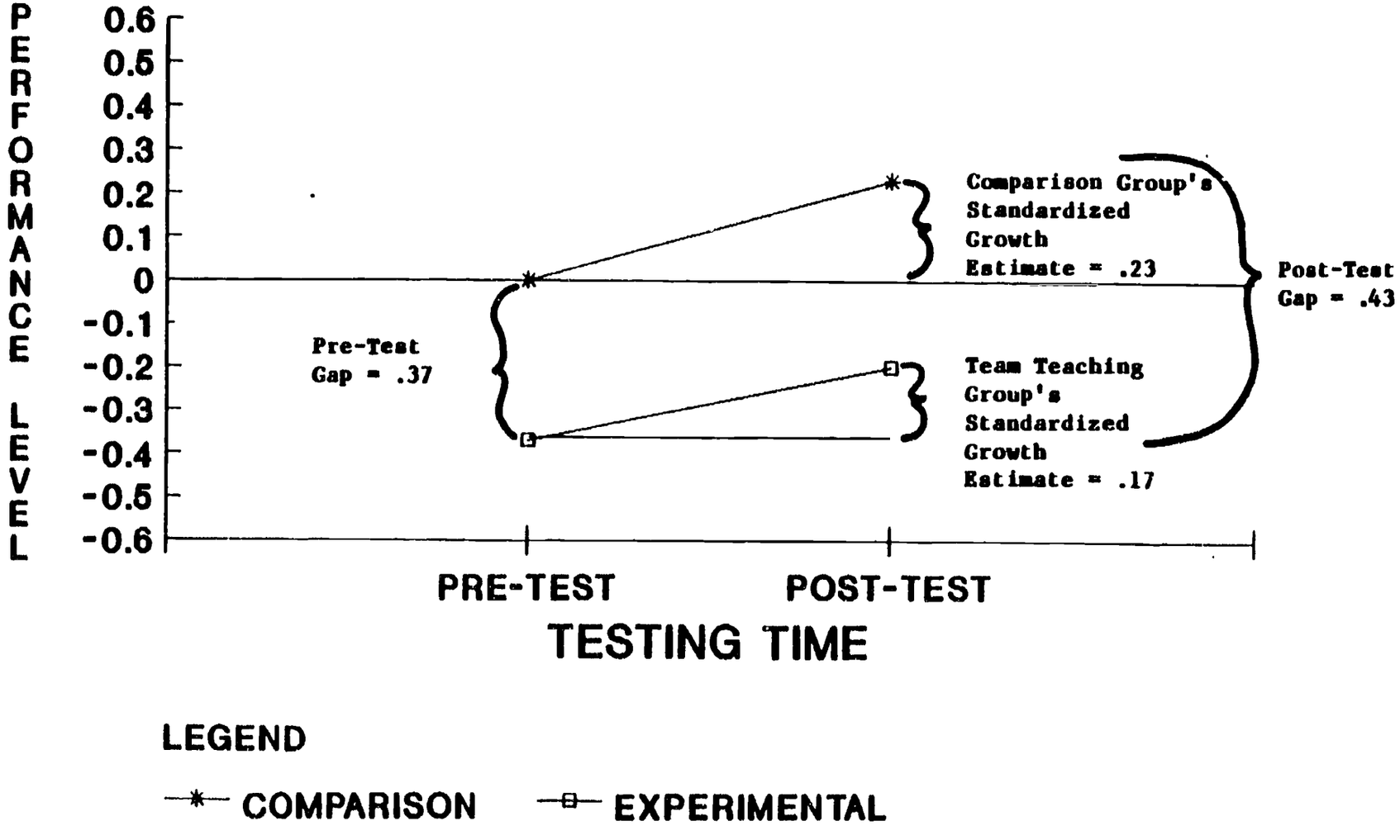


FIGURE B.9. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE READING COMPREHENSION SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 73.9%).

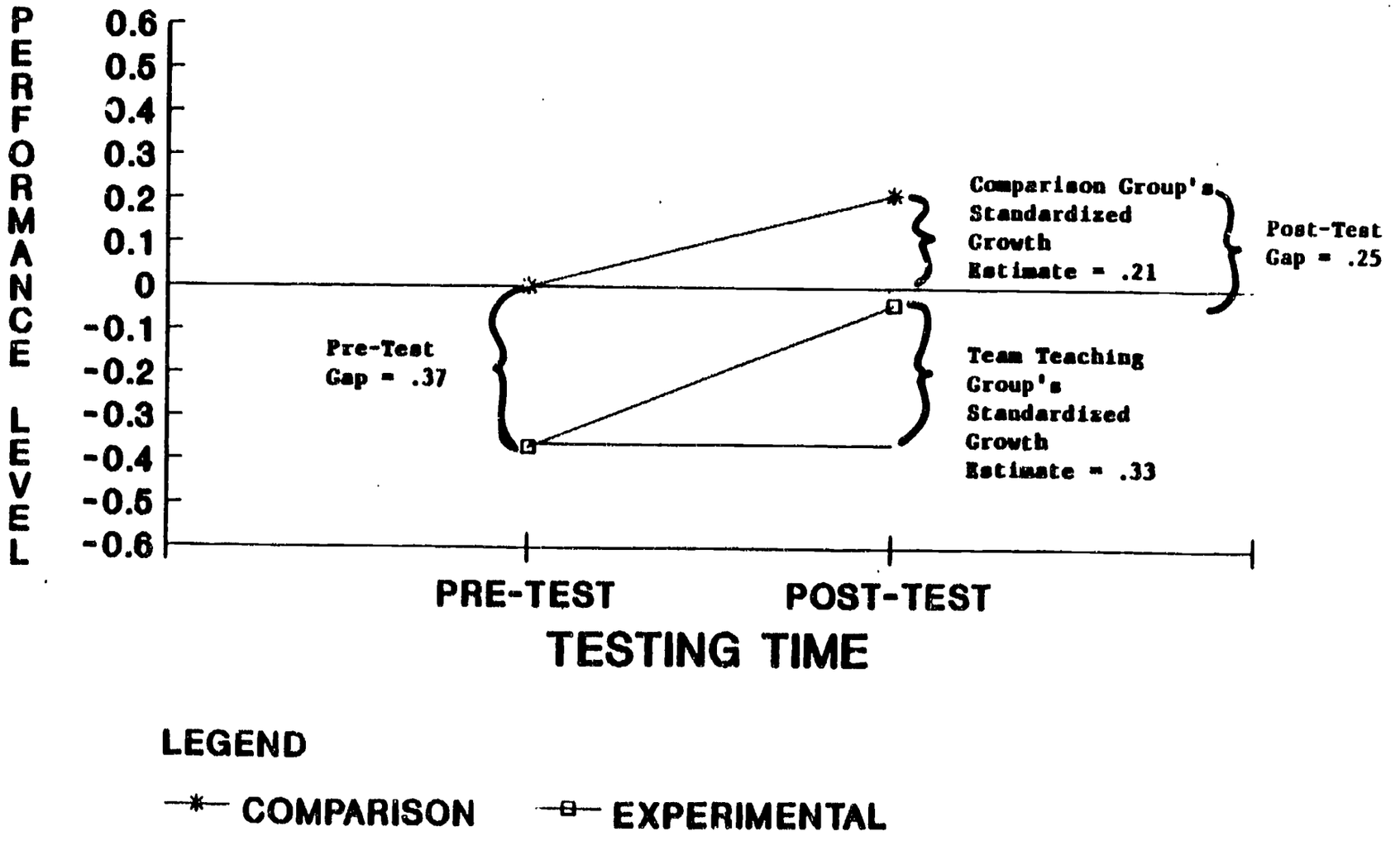


FIGURE B.10. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL READING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 157.1%).

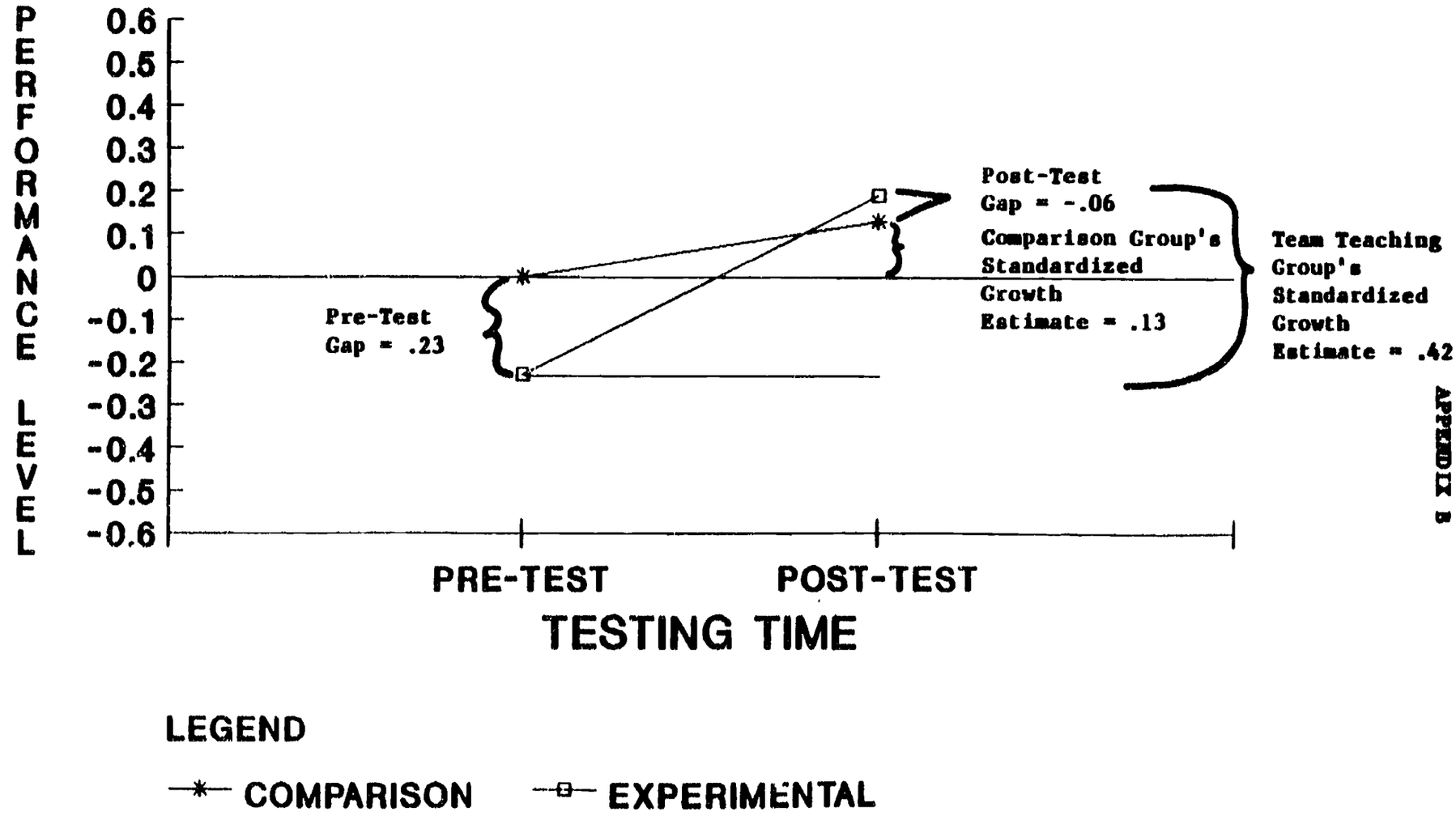


FIGURE B.11. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE MECHANICS SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 323.1%).

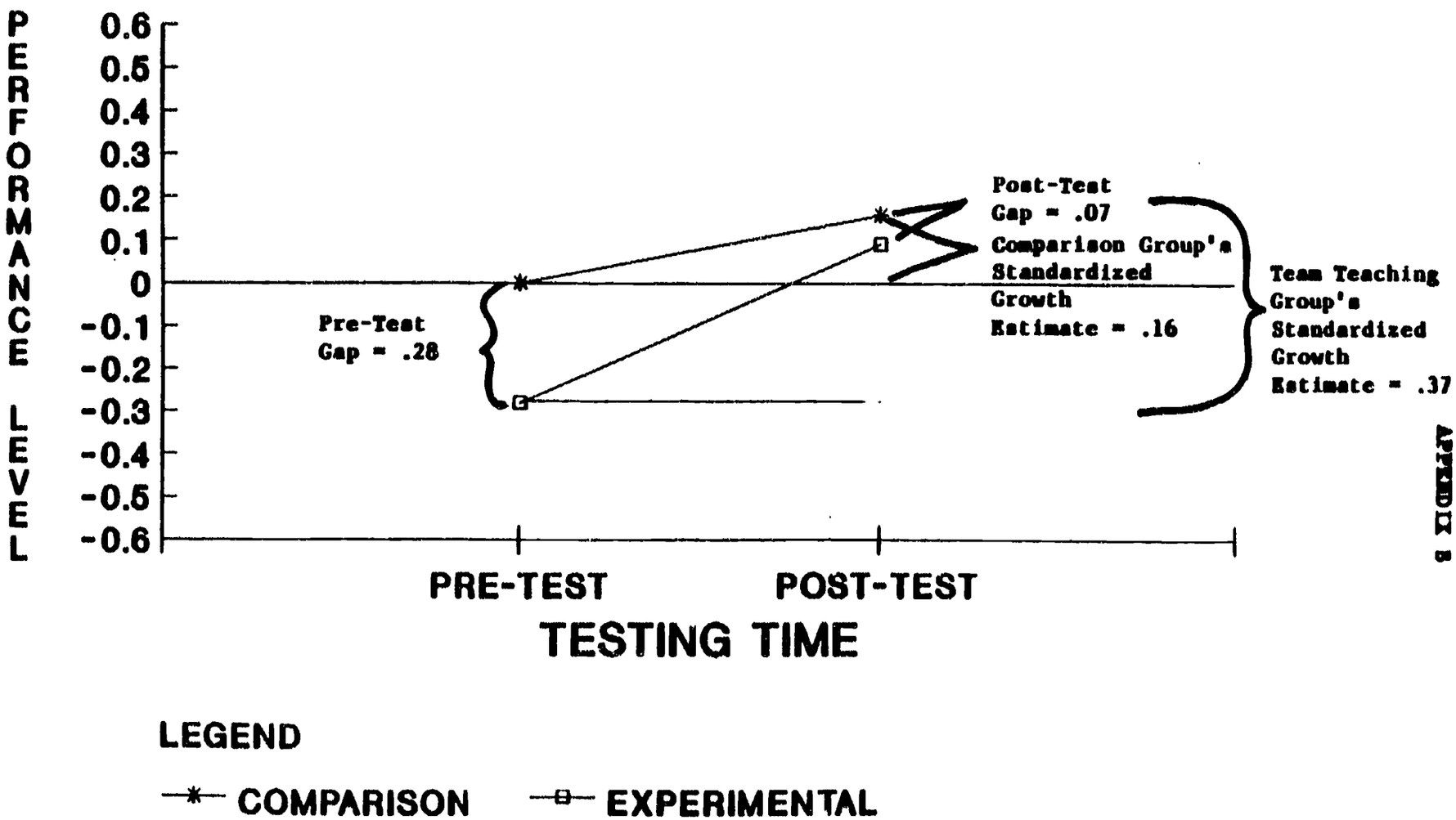


FIGURE B.12. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE EXPRESSION SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 231.2%).

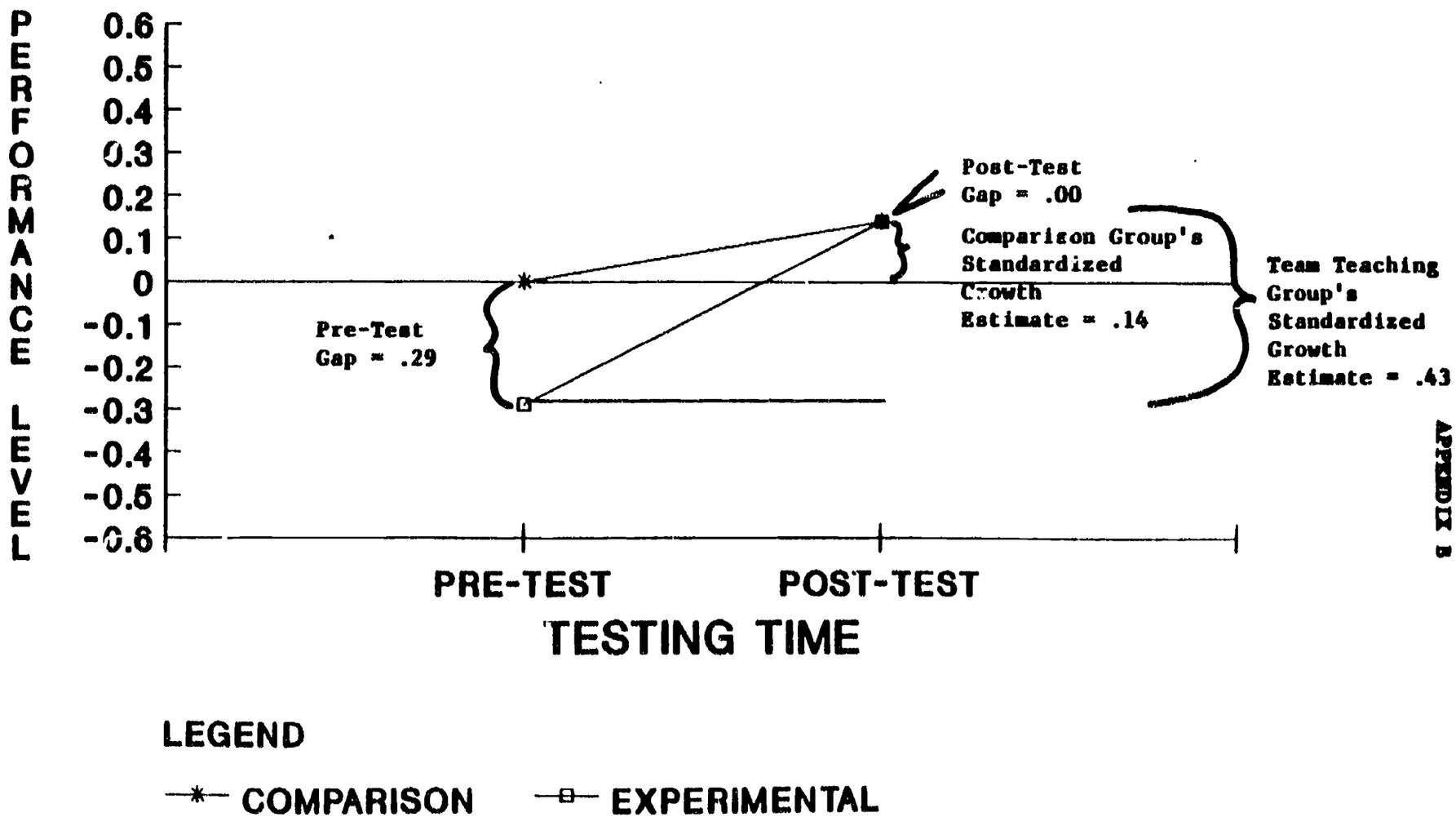


FIGURE B.13. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL LANGUAGE SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 307.1%).



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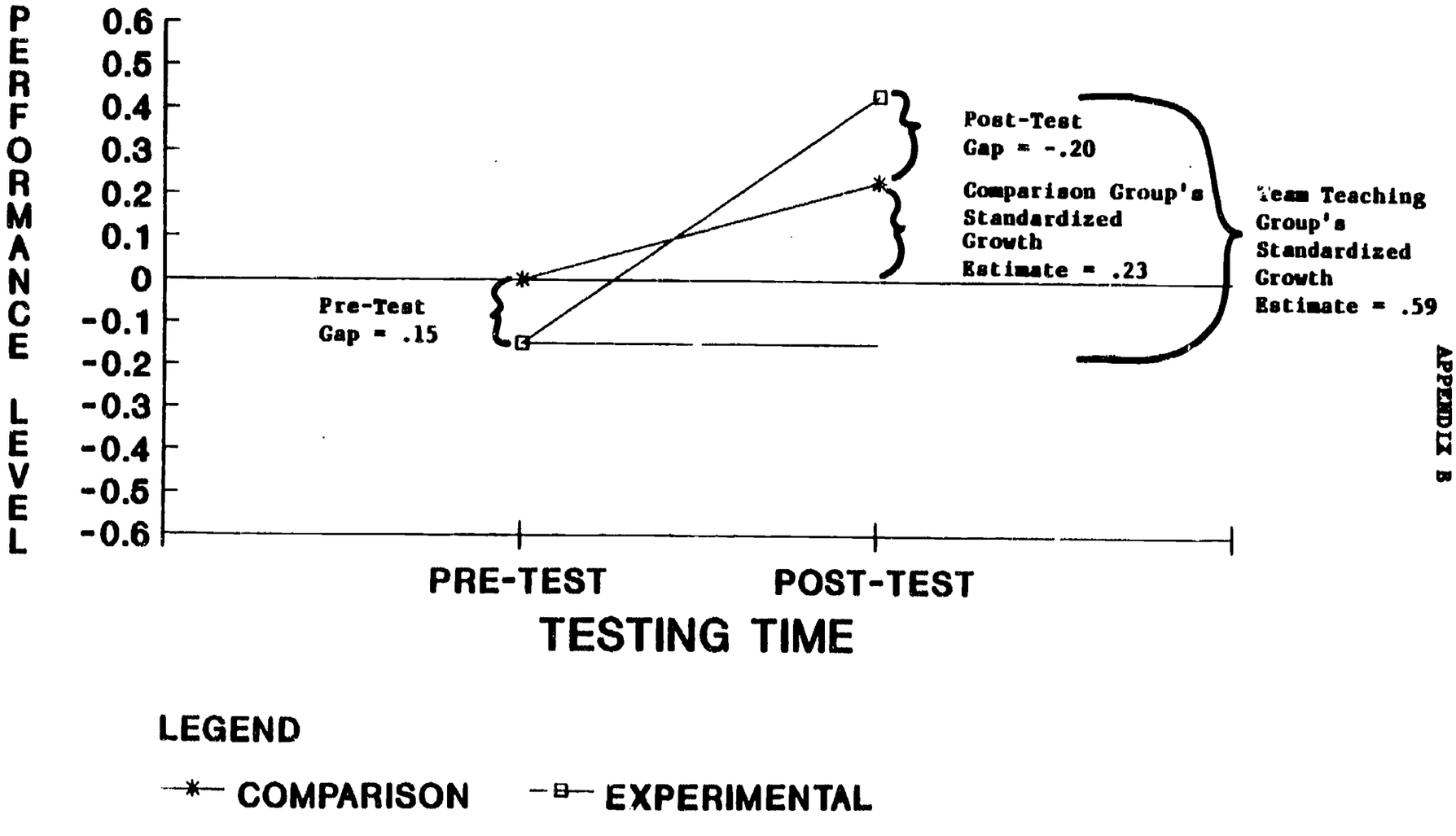


FIGURE B.14. RELATIVE GROWTH OF THE EXPERIMENTAL: TEAM TEACHING GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE SPELLING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 250.9%).



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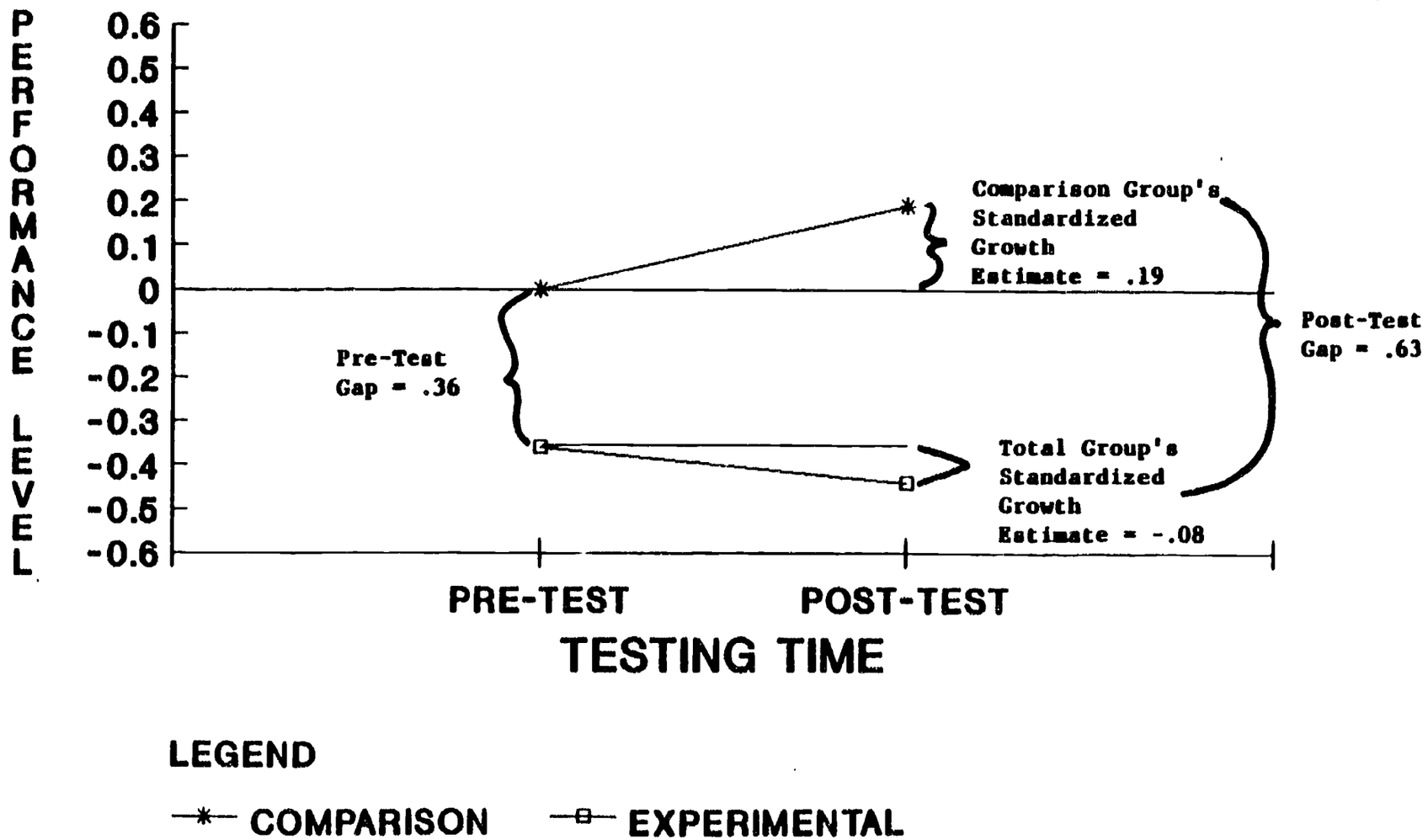


FIGURE B.15. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE VOCABULARY SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = -34.8%).

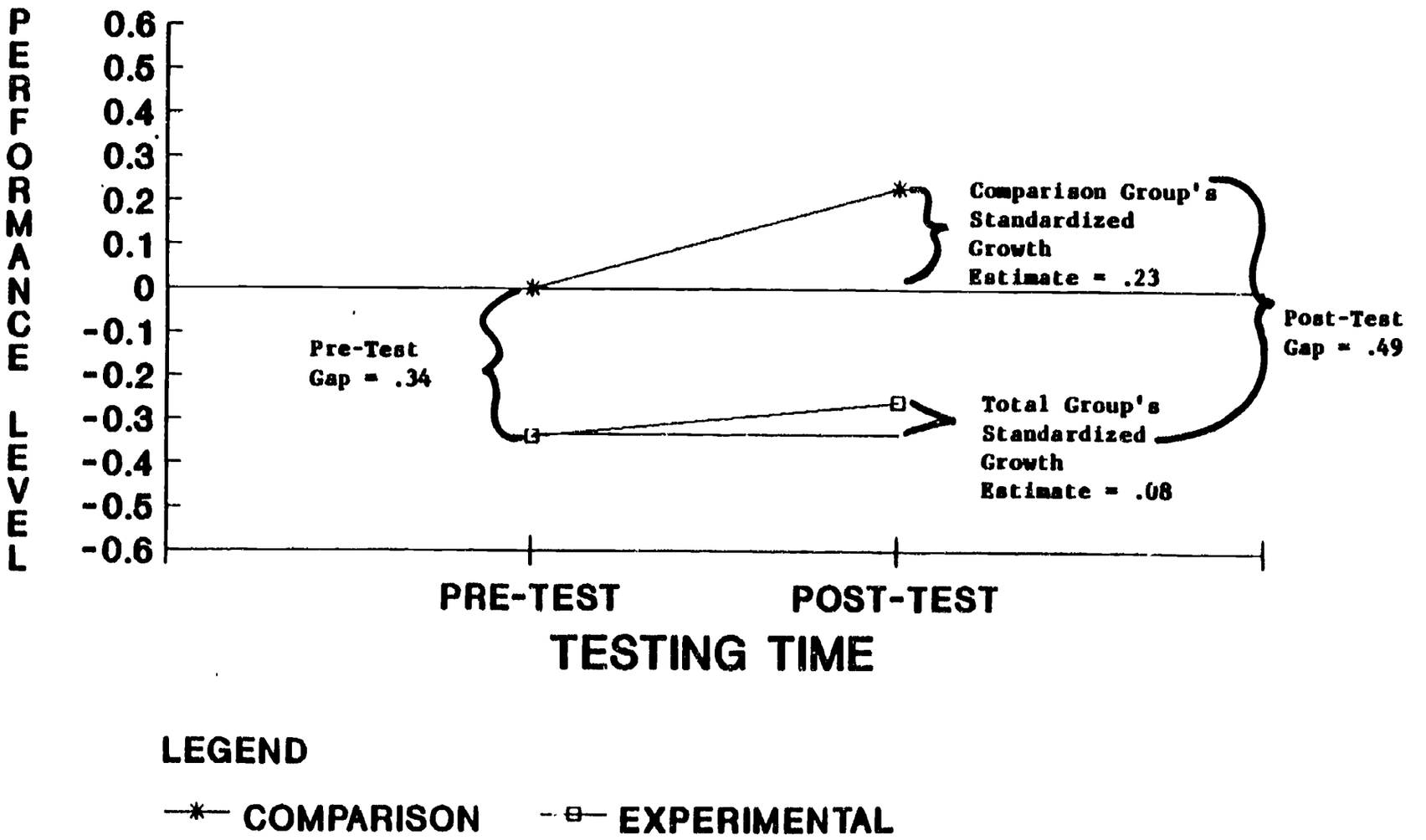


FIGURE B.16. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE READING COMPREHENSION SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 34.8%).

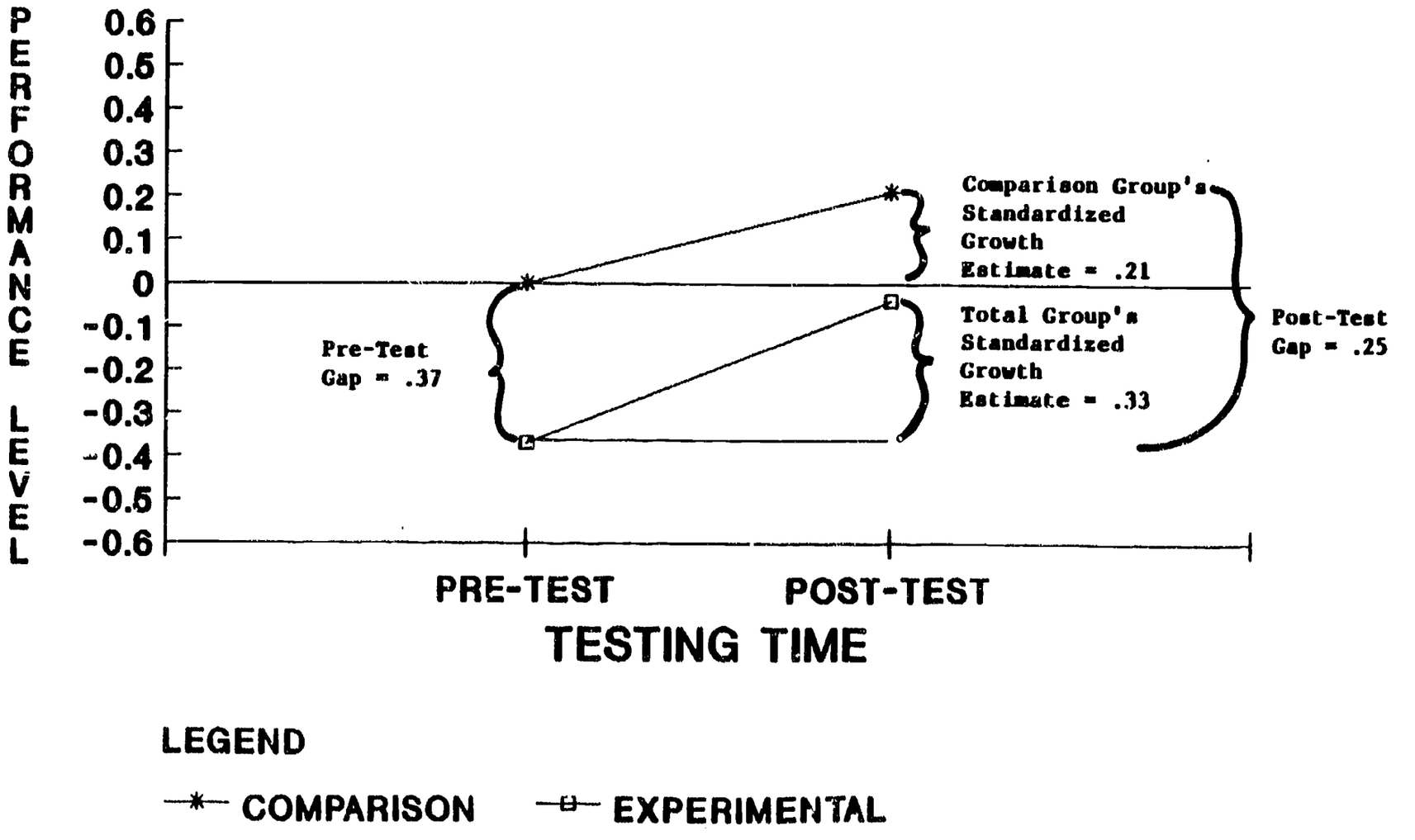


FIGURE B.17. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL READING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 157.1%).

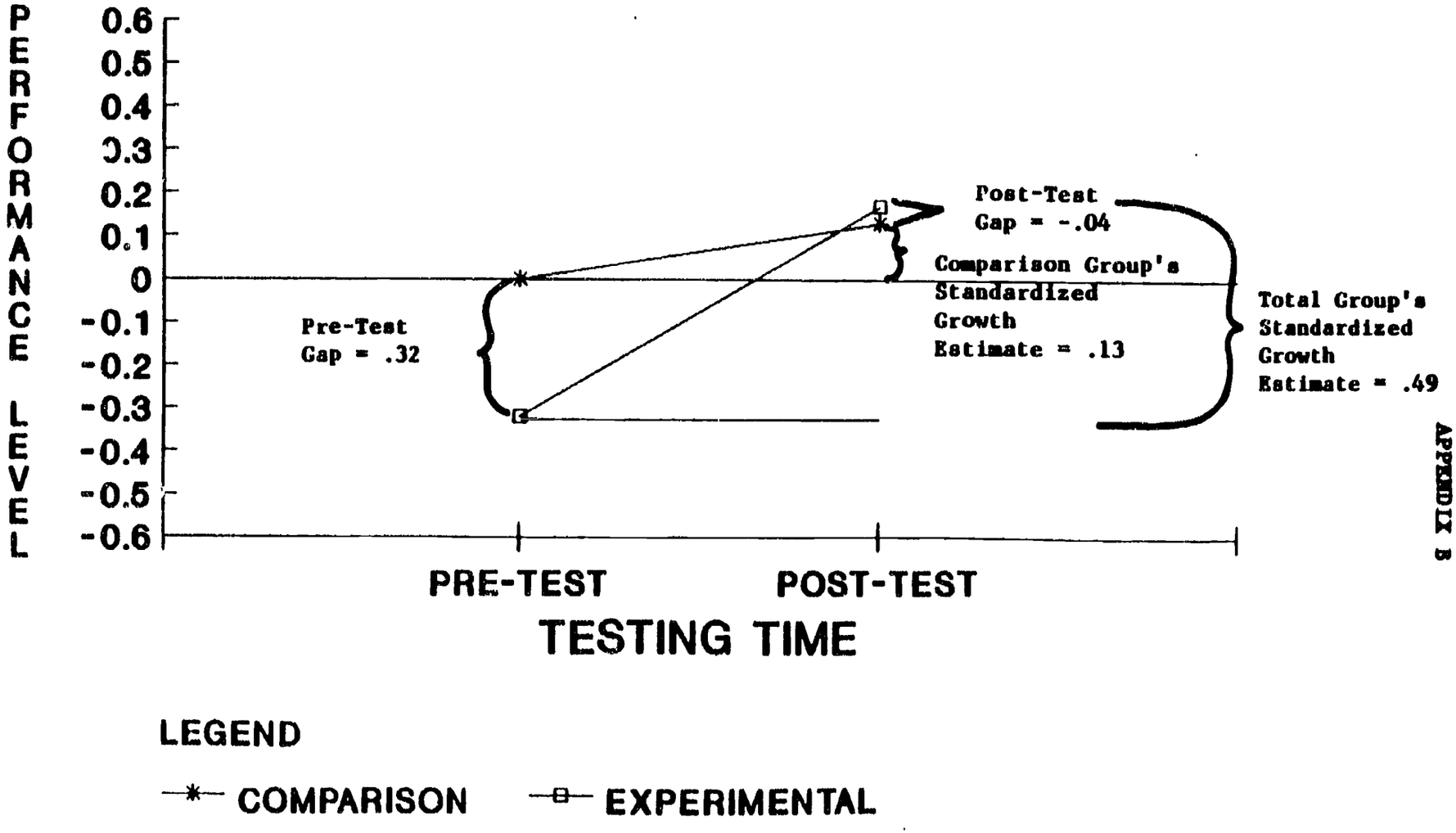


FIGURE B.18. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE MECHANICS SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 376.9%).







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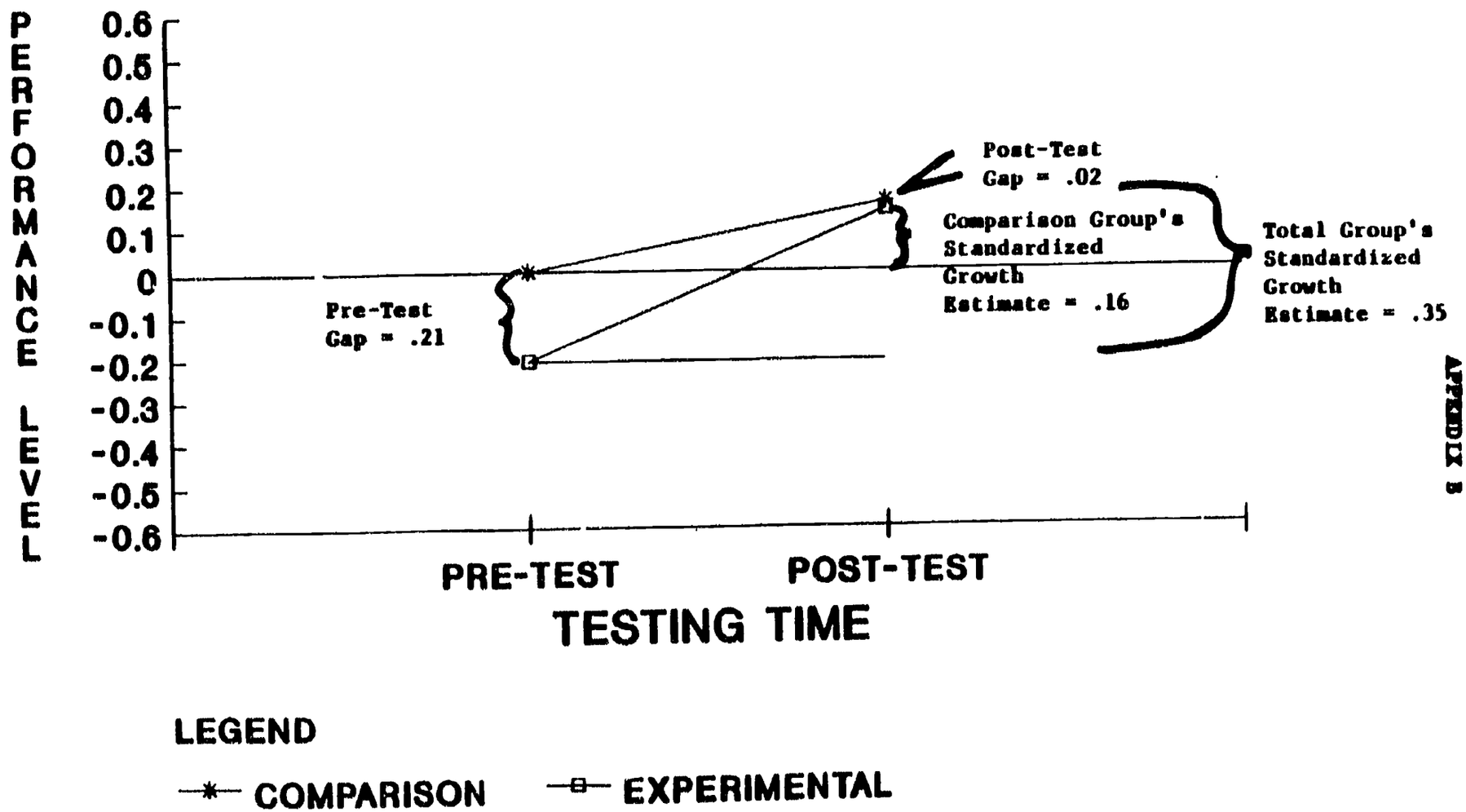


FIGURE B.19. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE LANGUAGE EXPRESSION SUBTEST FROM THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 218.8%).

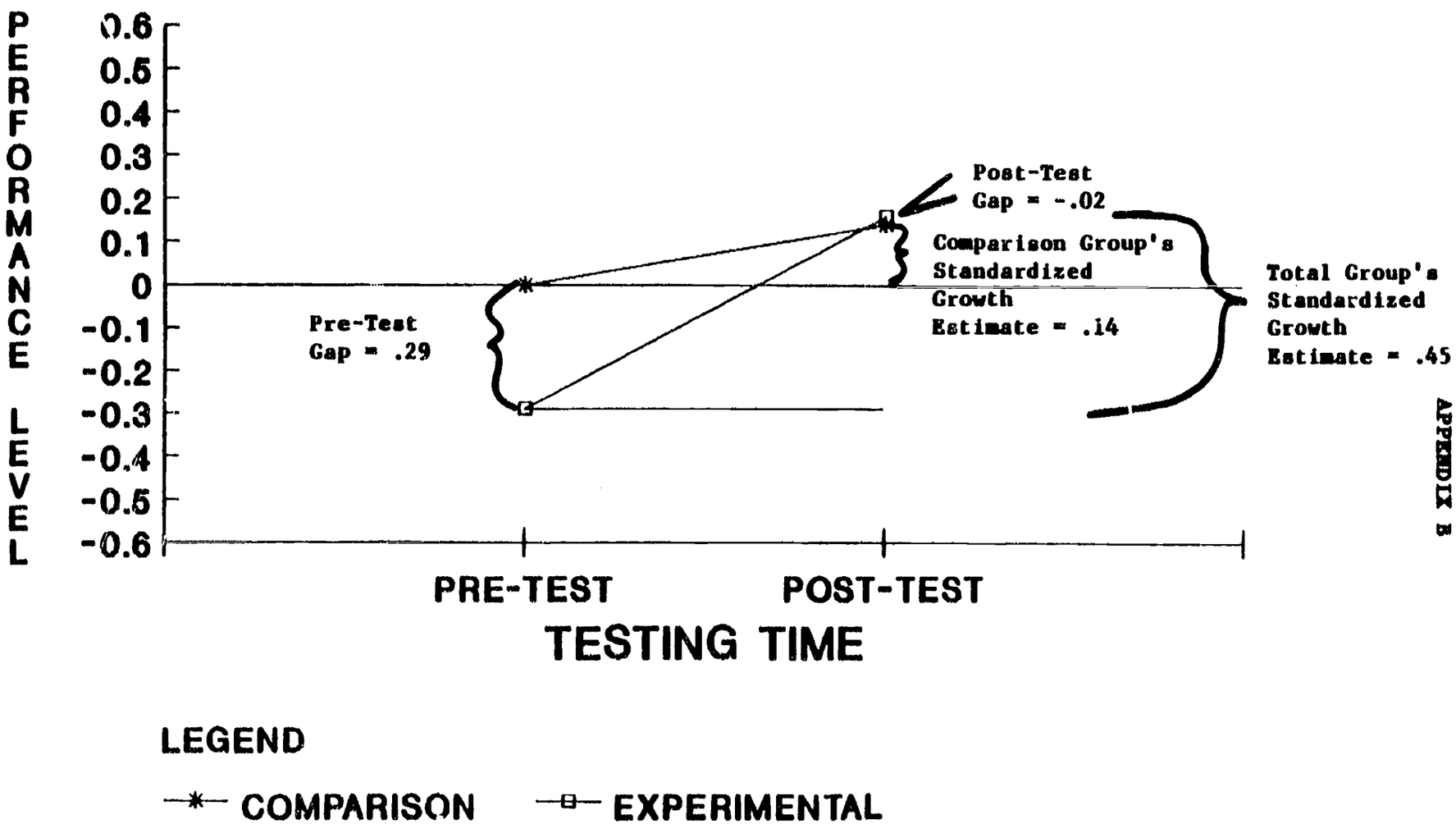


FIGURE B.20. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE TOTAL LANGUAGE SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 318.4%).

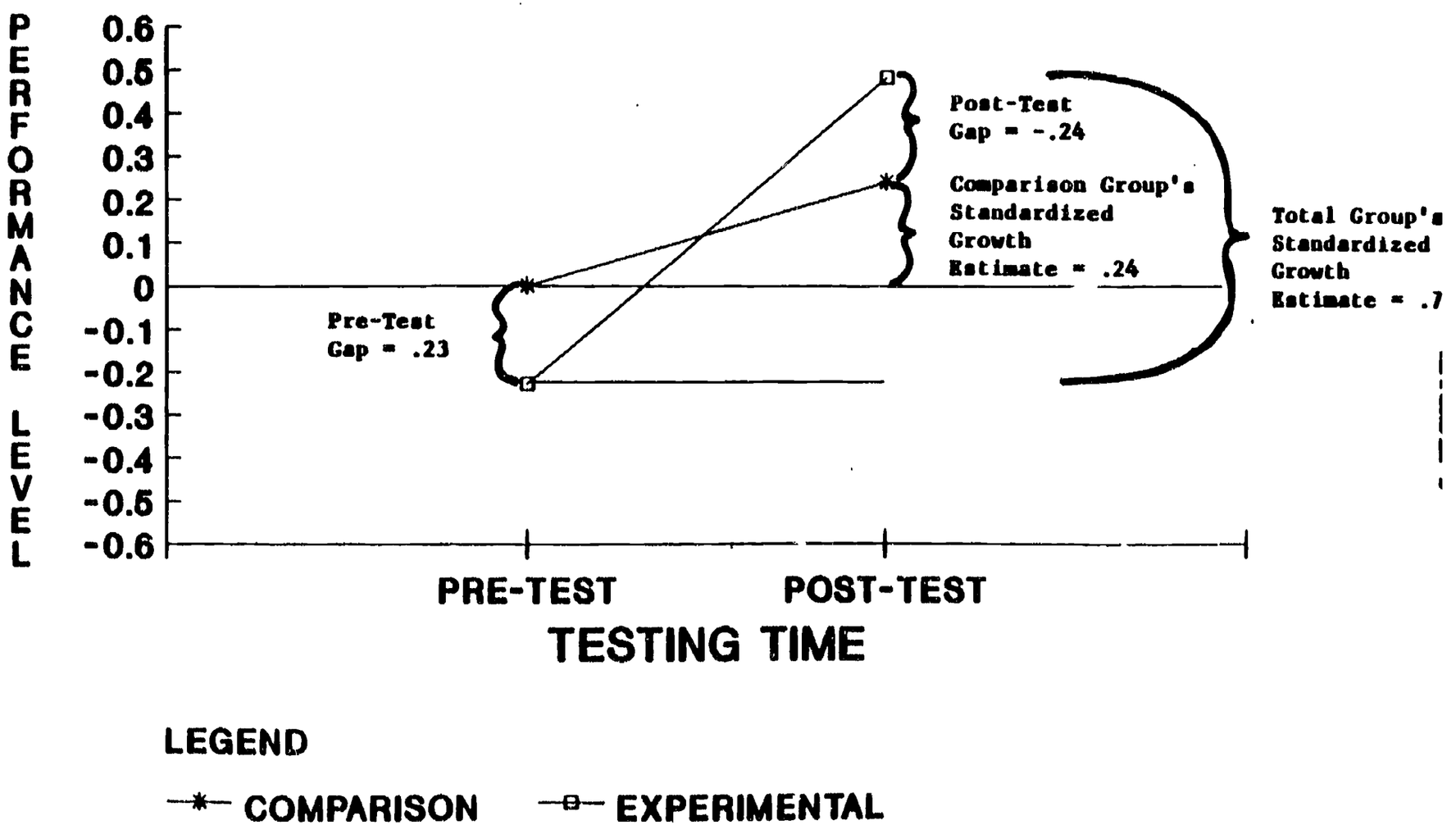


FIGURE B.21. RELATIVE GROWTH OF THE EXPERIMENTAL: TOTAL GROUP VERSUS THE COMPARISON GROUP FROM PRE- TO POST-TESTING ON THE SPELLING SUBTEST OF THE CALIFORNIA ACHIEVEMENT TESTS (CAT) (RGI = 295.8%).

## APPENDIX C

### WORKSHEET C.1. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE VOCABULARY SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 753 | 761 |
| Pre-Test Standard Deviation | N/A | 22.0 |
| Post-Test Mean | 751 | 765 |
| Post-Test Standard Deviation | N/A | 20.8 |

**STEP 5:** $(761 - 753) \div 22.0 = .36 \div 22.0 = .36$ = the pre-test gap.

**STEP 6:** $(765 - 751) \div 20.8 = .67 \div 20.8 = .67$ = the post-test gap.

**STEP 7:** $.36 - .67 = -.31$ = the gap reduction.

**STEP 8:** $765 - 761 = 40$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(22.0)^2 + (20.8)^2}{2}} = \sqrt{\frac{484 + 432.64}{2}} =$$

$$\sqrt{458.32} = 21.408$$ = the comparison group's pooled standard deviation.

**STEP 10:** $4.0 \div 21.408 = 19$ = the comparison group's standard growth estimate.

**STEP 11:** $19 + (-31) = -12$ = the project group's standardized growth estimate.

**STEP 12:** $(-.12 \div .19)100 = -63.16\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.2. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE READING COMPREHENSION SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 757 | 770 |
| Pre-Test Standard Deviation | N/A | 40.7 |
| Post-Test Mean | 759 | 779 |
| Post-Test Standard Deviation | N/A | 39.1 |

**STEP 5:** ( 770 - 757 ) ÷ 40.7 = .32 ÷ 40.7 = .32 = the pre-test gap.

**STEP 6:** ( 779 - 759 ) ÷ 39.1 = .51 ÷ 39.1 = .51 = the post-test gap.

**STEP 7:** .32 - .51 = -.19 = the gap reduction.

**STEP 8:** 779 - 770 = 9.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(40.7)^2 + (39.1)^2}{2}} = \sqrt{\frac{1656.49 + 1528.81}{2}} =$$

$$\sqrt{1592.65} = 39.908 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 9.0 ÷ 39.908 = .23 = the comparison group's standard growth estimate.

**STEP 11:** .23 + (-.19) = .04 = the project group's standardized growth estimate.

**STEP 12:** ( 04 ÷ .23 )100 = 17.39 % = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.3. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE TOTAL READING SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 756 | 766 |
| Pre-Test Standard Deviation | N/A | 30.0 |
| Post-Test Mean | 765 | 772 |
| Post-Test Standard Deviation | N/A | 28.5 |

**STEP 5:** $(766 - 756) \div 30.0 = 10 \div 30.0 = .33$ = the pre-test gap.

**STEP 6:** $(772 - 765) \div 28.5 = 7 \div 28.5 = .25$ = the post-test gap.

**STEP 7:** $.33 - .25 = .08$ = the gap reduction.

**STEP 8:** $772 - 766 = 6.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(30.0)^2 + (28.5)^2}{2}} = \sqrt{\frac{900 + 812.25}{2}} =$$

$$\sqrt{856.125} = 29.259$$ = the comparison group's pooled standard deviation.

**STEP 10:** $6.0 \div 29.259 = .21$ = the comparison group's standard growth estimate.

**STEP 11:** $.21 + (.08) = .29$ = the project group's standardized growth estimate.

**STEP 12:** $(.29 \div .21)100 = 138.10\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.4. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE LANGUAGE MECHANICS SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 708 | 724 |
| Pre-Test Standard Deviation | N/A | 44.2 |
| Post-Test Mean | 732 | 730 |
| Post-Test Standard Deviation | N/A | 46.3 |

**STEP 5:** $( 724 - 708 ) \div 44.2 = 16 \div 44.2 = .36$ = the pre-test gap.

**STEP 6:** $( 730 - 732 ) \div 46.3 = -2 \div 46.3 = -.04$ = the post-test gap.

**STEP 7:** $.36 - (-.04) = .40$ = the gap reduction.

**STEP 8:** $730 - 724 = 6.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(44.2)^2 + (46.3)^2}{2}} = \sqrt{\frac{1953.64 + 2143.69}{2}}$$

$$\sqrt{2048.665} = 45.262$$ = the comparison group's pooled standard deviation.

**STEP 10:** $6.0 \div 45.262 = .13$ = the comparison group's standard growth estimate.

**STEP 11:** $.13 + ( .40 ) = .53$ = the project group's standardized growth estimate.

**STEP 12:** $( .53 \div .13 )100 = 407.69\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.5. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE LANGUAGE EXPRESSION SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 731 | 741 |
| Pre-Test Standard Deviation | N/A | 56.8 |
| Post-Test Mean | 750 | 750 |
| Post-Test Standard Deviation | N/A | 58.6 |

**STEP 5:** ( 741 - 731 ) ÷ 56.8 = 10 ÷ 56.8 = .18 = the pre-test gap.

**STEP 6:** ( 750 - 750 ) ÷ 58.6 = 0 ÷ 58.6 = .00 = the post-test gap.

**STEP 7:** .18 - .00 = .18 = the gap reduction.

**STEP 8:** 750 - 741 = 9.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(56.8)^2 + (58.6)^2}{2}} = \sqrt{\frac{3226.24 + 3433.96}{2}} =$$

$$\sqrt{3330.1} = 57.707 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 9.0 ÷ 57.707 = .16 = the comparison group's standard growth estimate.

**STEP 11:** .16 + (.18 ) = .34 = the project group's standardized growth estimate.

**STEP 12:** ( .34 ÷ .16 )100 = 212.50 % = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.6. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE TOTAL LANGUAGE SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 720 | 733 |
| Pre-Test Standard Deviation | N/A | 48.1 |
| Post-Test Mean | 741 | 740 |
| Post-Test Standard Deviation | N/A | 50.2 |

**STEP 5:** ( 733 - 720 ) ÷ 48.1 = 13 ÷ 48.1 = .27 = the pre-test gap.

**STEP 6:** ( 740 - 741 ) ÷ 50.2 = -1 ÷ 50.2 = -.02 = the post-test gap.

**STEP 7:** .27 - (-.02)= .29 = the gap reduction.

**STEP 8:** 740 - 733 = 7.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(48.1)^2 + (50.2)^2}{2}} = \sqrt{\frac{2313.61 + 2520.04}{2}} =$$

$$\sqrt{2416.825} = 49.161 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 7.0 ÷ 49.161 = .14 = the comparison group's standard growth estimate.

**STEP 11:** .14 + (.29 ) = .43 = the project group's standardized growth estimate.

**STEP 12:** ( .43 ÷ .14 )100 = 307.14 % = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.7. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE SINGLE TEACHER GROUP ON THE SPELLING SUBTEST.

| | Single Teacher Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 747 | 754 |
| Pre-Test Standard Deviation | N/A | 26.4 |
| Post-Test Mean | 767 | 760 |
| Post-Test Standard Deviation | N/A | 24.6 |

**STEP 5:** ( 754 - 747 ) ÷ 26.4 = 7 ÷ 26.4 = .27 = the pre-test gap.

**STEP 6:** ( 760 - 767 ) ÷ 24.6 = -7 ÷ 24.6 = -.28 = the post-test gap.

**STEP 7:** .27 - (-.28) = .55 = the gap reduction.

**STEP 8:** 760 - 754 = 60 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(26.4)^2 + (24.6)^2}{2}} = \sqrt{\frac{696.96 + 605.16}{2}} =$$

$$\sqrt{651.06} = 25.515 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 6.0 ÷ 25.515 = .24 = the comparison group's standard growth estimate.

**STEP 11:** .24 + ( .55 ) = .7[illegible] = the project group's standardized growth estimate.

**STEP 12:** ( .79 ÷ .24 )100 = 329.27% = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.8. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE VOCABULARY SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 753 | 761 |
| Pre-Test Standard Deviation | N/A | 22.0 |
| Post-Test Mean | 753 | 765 |
| Post-Test Standard Deviation | N/A | 20.8 |

**STEP 5:** $(761 - 753) \div 22.0 = 8 \div 22.0 = .36$ = the pre-test gap.

**STEP 6:** $(765 - 753) \div 20.8 = 12 \div 20.8 = .58$ = the post-test gap.

**STEP 7:** $.36 - .58 = -.22$ = the gap reduction.

**STEP 8:** $765 - 761 = 4.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(22.0)^2 + (20.8)^2}{2}} = \sqrt{\frac{484 + 432.64}{2}} =$$

$$\sqrt{458.32} = 21.408$$ = the comparison group's pooled standard deviation.

**STEP 10:** $4.0 \div 21.408 = .19$ = the comparison group's standard growth estimate.

**STEP 11:** $.19 + (-.22) = -.03$ = the project group's standardized growth estimate.

**STEP 12:** $(-.03 \div .19)100 = -15.79\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.9. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP IN THE READING COMPREHENSION SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 755 | 770 |
| Pre-Test Standard Deviation | N/A | 40.7 |
| Post-Test Mean | 762 | 779 |
| Post-Test Standard Deviation | N/A | 39.1 |

**STEP 5:** ( 770 - 755 ) ÷ 40.7 = 15 ÷ 40.7 = .37 = the pre-test gap.

**STEP 6:** ( 779 - 762 ) ÷ 39.1 = 17 ÷ 39.1 = .43 = the post-test gap.

**STEP 7:** .37 - 43 = -.06 = the gap reduction.

**STEP 8:** 779 - 770 = 9.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(40.7)^2 + (39.1)^2}{2}} = \sqrt{\frac{1656.49 + 1528.81}{2}} =$$

$$\sqrt{1592.65} = 39.908 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 9.0 ÷ 39.908 = .23 = the comparison group's standard growth estimate.

**STEP 11:** .23 + (-.06) = .17 = the project group's standardized growth estimate.

**STEP 12:** ( .17 ÷ .23 )100 = 73.91% = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.10. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE TOTAL READING SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 755 | 766 |
| Pre-Test Standard Deviation | N/A | 30.0 |
| Post-Test Mean | 765 | [illegible] |
| Post-Test Standard Deviation | N/A | 28.5 |

**STEP 5:** $(766 - 755) \div 30.0 = 11 \div 30.0 = .37$ = the pre-test gap.

**STEP 6:** $(772 - 765) \div 28.5 = 7 \div 28.5 = .25$ = the post-test gap.

**STEP 7:** $.37 - .25 = .12$ = the gap reduction.

**STEP 8:** $772 - 766 = 6.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(30.0)^2 + (28.5)^2}{2}} = \sqrt{\frac{900 + 812.25}{2}} =$$

$$\sqrt{856.125} = 29.259$$ = the comparison group's pooled standard deviation.

**STEP 10:** $6.0 \div 29.259 = .21$ = the comparison group's standard growth estimate.

**STEP 11:** $.21 + (.12) = .33$ = the project group's standardized growth estimate.

**STEP 12:** $(.33 \div .21)100 = 157.14\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.11. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE LANGUAGE MECHANICS SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 714 | 724 |
| Pre-Test Standard Deviation | N/A | 44.2 |
| Post-Test Mean | 733 | 730 |
| Post-Test Standard Deviation | N/A | 46.3 |

**STEP 5:** ( 724 - 714 ) ÷ 44.2 = 10 ÷ 44.2 = .23 = the pre-test gap.

**STEP 6:** ( 730 - 733 ) ÷ 46.3 = -3 ÷ 46.3 = -.06 = the post-test gap.

**STEP 7:** .23 - (-.06) = .29 = the gap reduction.

**STEP 8:** 730 - 724 = 6.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(44.2)^2 + (46.3)^2}{2}} = \sqrt{\frac{1953.64 + 2143.69}{2}} =$$

$$\sqrt{2048.665} = 45.262 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 6.0 ÷ 45.262 = .13 = the comparison group's standard growth estimate.

**STEP 11:** .13 + (.29 ) = .42 = the project group's standardized growth estimate.

**STEP 12:** ( .42 ÷ .13)100 = 323.08 % = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.12. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE LANGUAGE EXPRESSION SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 725 | 741 |
| Pre-Test Standard Deviation | N/A | 56.8 |
| Post-Test Mean | 746 | 750 |
| Post-Test Standard Deviation | N/A | 58.6 |

**STEP 5:** $(741 - 725) \div 56.8 = 16 \div 56.8 = .28$ = the pre-test gap.

**STEP 6:** $(750 - 746) \div 58.6 = 4 \div 58.6 = .07$ = the post-test gap.

**STEP 7:** $.28 - .07 = .21$ = the gap reduction.

**STEP 8:** $750 - 741 = 9.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(56.8)^2 + (58.6)^2}{2}} = \sqrt{\frac{3226.24 + 3433.96}{2}} =$$

$$\sqrt{3330.1} = 57.707$$ = the comparison group's pooled standard deviation.

**STEP 10:** $9.0 \div 57.707 = .16$ = the comparison group's standard growth estimate.

**STEP 11:** $.16 + (.21) = .37$ = the project group's standardized growth estimate.

**STEP 12:** $(.37 \div .16)100 = 231.25\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.13. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE TOTAL LANGUAGE SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 719 | 733 |
| Pre-Test Standard Deviation | N/A | 48.1 |
| Post-Test Mean | 740 | 740 |
| Post-Test Standard Deviation | N/A | 50.2 |

**STEP 5:** $(733 - 719) \div 48.1 = 14 \div 48.1 = .29$ = the pre-test gap.

**STEP 6:** $(740 - 740) \div 50.2 = 0 \div 50.2 = .00$ = the post-test gap.

**STEP 7:** $.29 - .00 = .29$ = the gap reduction.

**STEP 8:** $740 - 733 = 7.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(48.1)^2 + (50.2)^2}{2}} = \sqrt{\frac{2313.61 + 2520.04}{2}} =$$

$$\sqrt{2416.825} = 49.161$$ = the comparison group's pooled standard deviation.

**STEP 10:** $7.0 \div 49.161 = .14$ = the comparison group's standard growth estimate.

**STEP 11:** $.14 + (.29) = .43$ = he project group's standardized growth estimate.

**STEP 12:** $(.43 \div .14)100 = 307.14\%$ = the Relative Growth Index (RGI).

## APPENDIX C

### WORKSHEET C.14. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TEAM TEACHING GROUP ON THE SPELLING SUBTEST.

| | Team Teaching Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 750 | 754 |
| Pre-Test Standard Deviation | N/A | 26.4 |
| Post-Test Mean | 765 | 760 |
| Post-Test Standard Deviation | N/A | 24.6 |

**STEP 5:** ( 754 - 750 ) ÷ 26.4 = 4 ÷ 26.4 = .15 = the pre-test gap.

**STEP 6:** ( 760 - 765 ) ÷ 24.6 = -5 ÷ 24.6 = -.20 = the post-test gap.

**STEP 7:** .15 - (-.20) = .35 = the gap reduction.

**STEP 8:** 760 - 754 = 6.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(26.4)^2 + (24.6)^2}{2}} = \sqrt{\frac{696.96 + 605.16}{2}} =$$

$$\sqrt{651.06} = 25.515 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 6.0 ÷ 25.515 = .23 = the comparison group's standard growth estimate.

**STEP 11:** .23 + ( .35 ) = .59 = the project group's standardized growth estimate.

**STEP 12:** ( .59 ÷ .23 )100 = 250.86% = the Relative Growth Index (RGI).

WORKSHEET C.15. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE VOCABULARY SUBTEST.

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 753 | 761 |
| Pre-Test Standard Deviation | N.A. | 22.0 |
| Post-Test Mean | 752 | 765 |
| Post-Test Standari Deviation | N.A. | 20.8 |

**STEP 5:** ( 761 - 753) ÷ 22.0 = 8 ÷ 22.0 = .36 = the pre-test gap.

**STEP 6:** ( 765 - 752 ) ÷ 20.8 = 13 ÷ 20.8 = .63 = the post-test gap.

**STEP 7:** .36 - .63 = -.27 = the gap reduction.

**STEP 8:** 765 - 761 = 4.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(22.0)^2 + (20.8)^2}{2}} = \sqrt{\frac{484 + 432.64}{2}} =$$

$$\sqrt{458.32} = 21.408 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 4.0 ÷ 21.408 = .19 = the comparison group's standard growth estimate.

**STEP 11:** .19 + (-.27 ) = -.08 = the project group's standardized growth estimate.

**STEP 12:** ( -.08 ÷ 23 )100 = -34.78% = the Relative Growth Index (RGI).

WORKSHEET C.16. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP IN THE READING COMPREHENSION SUBTEST.

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 756 | 770 |
| Pre-Test Standard Deviation | N.A. | 40.7 |
| Post-Test Mean | 760 | 779 |
| Post-Test Standard Deviation | N.A. | 39.1 |

**STEP 5:** ( 770 - 756 ) ÷ 40.7 = 14 ÷ 40.7 = .34 = the pre-test gap.

**STEP 6:** ( 779 - 760 ) ÷ 39.1 = 19 ÷ 39.1 = .49 = the post-test gap.

**STEP 7:** .34 - .49 = -.15 = the gap reduction.

**STEP 8:** 779 - 770 = 9.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(40.7)^2 + (39.1)^2}{2}} = \sqrt{\frac{1{,}656.49 + 1{,}528.81}{2}} =$$

$$\sqrt{1{,}592.65} = 39.908 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 9.0 ÷ 39.908 = .23 = the comparison group's standard growth estimate.

**STEP 11:** .23 + (-.15) = .08 = the project group's standardized growth estimate.

**STEP 12:** ( .08 ÷ .23 )100 = 34.78% = the Relative Growth Index (RGI).

**WORKSHEET C.17. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE TOTAL READING SUBJECT AREA.**

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 755 | 766 |
| Pre-Test Standard Deviation | N.A. | 30.0 |
| Post-Test Mean | 765 | 772 |
| Post-Test Standard Deviation | N.A. | 28.5 |

**STEP 5:** ( 766 - 755) ÷ 30.0 = 11 ÷ 30.0 = .37 = the pre-test gap.

**STEP 6:** ( 772 - 765) ÷ 28.5 = 7 ÷ 28.5 = .25 = the post-test gap.

**STEP 7:** .37 - .25 = .12 = the gap reduction.

**STEP 8:** 772 - 776 = 6.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(30.5)^2 + (28.5)^2}{2}} = \sqrt{\frac{900 + 812.25}{2}} =$$

$$\sqrt{856.125} = 29.259 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 6.0 ÷ 29.259 = .21 = the comparison group's standard growth estimate.

**STEP 11:** .21 + ( .12) = .33 = the project group's standardized growth estimate.

**STEP 12:** ( .33 ÷ .21 )100 = 157.14% = the Relative Growth Index (RGI).

**WORKSHEET C.18. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE LANGUAGE MECHANICS SUBTEST.**

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 710 | 724 |
| Pre-Test Standard Deviation | N.A. | 44.2 |
| Post-Test Mean | 732 | 730 |
| Post-Test Standard Deviation | N.A. | 46.3 |

**STEP 5:** ( 724 - 710 ) ÷ 44.2 = 14 ÷ 44.2 = .32 = the pre-test gap.

**STEP 6:** ( 730 - 732 ) ÷ 46.3 = -2 ÷ 46.3 = -.04 = the post-test gap.

**STEP 7:** .32 - (-.04) = .36 = the gap reduction.

**STEP 8:** 730 - 724 = 6.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(44.2)^2 + (46.3)^2}{2}} = \sqrt{\frac{1{,}953.64 + 2{,}143.69}{2}} =$$

$$\sqrt{2{,}048.665} = 45.262 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 6.0 ÷ 45.262 = .13 = the comparison group's standard growth estimate.

**STEP 11:** .13 + ( .36 ) = .49 = the project group's standardized growth estimate.

**STEP 12:** ( .49 ÷ .13 )100 = 376.92% = the Relative Growth Index (RGI).

WORKSHEET C.19. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE LANGUAGE EXPRESSION SUBTEST.

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 729 | 741 |
| Pre-Test Standard Deviation | N.A. | 56.8 |
| Post-Test Mean | 749 | 750 |
| Post-Test Standard Deviation | N.A. | 58.6 |

**STEP 5:** ( 741 - 729 ) ÷ 56.8 = 12 ÷ 56.8 = .21 = the pre-test gap.

**STEP 6:** ( 750 - 749 ) ÷ 58.6 = 1 ÷ 58.6 = .02 = the post-test gap.

**STEP 7:** .21 - .02 = .19 = the gap reduction.

**STEP 8:** 750 - 741 = 9.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(56.8)^2 + (58.6)^2}{2}} = \sqrt{\frac{3{,}226.24 + 3{,}433.96}{2}} =$$

$$\sqrt{3{,}330.1} = 57.707 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 9.0 ÷ 57,707 = .16 = the comparison group's standard growth estimate.

**STEP 11:** .16 + ( .19) = .35 = the project group's standardized growth estimate.

**STEP 12:** ( .35 ÷ .16 )100 = 218.75% = the Relative Growth Index (RGI).

WORKSHEET C.20. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE TOTAL LANGUAGE SUBJECT AREA.

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 719 | 733 |
| Pre-Test Standard Deviation | N.A. | 48.1 |
| Post-Test Mean | 741 | 740 |
| Post-Test Standard Deviation | N.A. | 50.2 |

**STEP 5:** ( 733 - 719 ) ÷ 48.1 = 14 ÷ 48.1 = .29 = the pre-test gap.

**STEP 6:** ( 740 - 741 ) ÷ 50.2 = -1 ÷ 50.2 = -.02 = the post-test gap.

**STEP 7:** .29 - (-.01) = .31 = the gap reduction.

**STEP 8:** 740 - 733 = 7.0 = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(48.1)^2 + (50.2)^2}{2}} = \sqrt{\frac{2{,}313.61 + 2{,}520.04}{2}} =$$

$$\sqrt{2{,}416.825} = 49.161 = \text{the comparison group's pooled standard deviation.}$$

**STEP 10:** 7.0 ÷ 49.161 = .14 = the comparison group's standard growth estimate.

**STEP 11:** .14 + ( .31 ) = .45 = the project group's standardized growth estimate.

**STEP 12:** ( .45 ÷ .14 )100 = 318.4 % = the Relative Growth Index (RGI).

## WORKSHEET C.21. CALCULATION OF THE RELATIVE GROWTH INDEX (RGI) IN THE GAP REDUCTION RESEARCH DESIGN FOR THE TOTAL GROUP ON THE SPELLING SUBTEST.

| | Total Group | Comparison Group |
|---|---|---|
| Pre-Test Mean | 748 | 754 |
| Pre-Test Standard Deviation | N.A. | 26.4 |
| Post-Test Mean | 766 | 760 |
| Post-Test Standard Deviation | N.A. | 24.6 |

**STEP 5:** $( 754 - 748 ) \div 26.4 = 6 \div 26.4 = .23$ = the pre-test gap.

**STEP 6:** $( 760 - 766 ) \div 24.6 = -6 \div 24.6 = -.24$ = the post-test gap.

**STEP 7:** $.23 - (-.24) = .47$ = the gap reduction.

**STEP 8:** $760 - 754 = 6.0$ = the comparison group's unstandardized growth estimate.

**STEP 9:**

$$\sqrt{\frac{(26.4)^2 + (24.6)^2}{2}} = \sqrt{\frac{696.96 + 605.16}{2}} =$$

$$\sqrt{651.06} = 25.515$$ = the comparison group's pooled standard deviation.

**STEP 10:** $6.0 \div 25.515 = .24$ = the comparison group's standard growth estimate.

**STEP 11:** $.24 + ( .47 ) = .71$ = the project group's standardized growth estimate.

**STEP 12:** $( .71 \div .24 ) 100 = 300.37\%$ = the Relative Growth Index (RGI).

## APPENDIX D

### TABLE D.1. COMPARISON OF NUMBER TESTED, PRE- AND POST-TEST MEANS AND STANDARD DEVIATION ON CAT OF THE COMPARISON GROUP, EXPERIMENTAL - SINGLE TEACHER, EXPERIMENTAL - TEACHER TEAM, AND EXPERIMENTAL TOTAL.

| GROUP | VOCABULARY | | | | | COMPREHENSION | | | | | TOTAL READING | | | | | LANGUAGE MECHANICS | | | | | LANGUAGE EXPRESSION | | | | | TOTAL LANGUAGE | | | | | SPELLING | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | Pre* Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD | N | Pre Mean | SD | Post Mean | SD |
| Comparison** | 1000 | 761 | 22.0 | 765 | 20.8 | 1000 | 770 | 40.7 | 779 | 39.1 | 1000 | 766 | 30.0 | 772 | 28.5 | 1000 | 724 | 44.2 | 730 | 46.3 | 1000 | 741 | 56.8 | 750 | 58.6 | 1000 | 733 | 48.1 | 740 | 50.2 | 1000 | 754 | 26.4 | 760 | 24.6 |
| Experimental - Single Teacher | 97 | 753 | 36.1 | 751 | 50.8 | 97 | 757 | 17.5 | 759 | 18.4 | 97 | 756 | 25.2 | 765 | 23.5 | 97 | 708 | 41.1 | 732 | 35.9 | 97 | 731 | 40.7 | 750 | 39.3 | 97 | 720 | 37.8 | 741 | 35.6 | 97 | 747 | 24.1 | 767 | 24.8 |
| Experimental - Team Teacher | 50 | 753 | 34.1 | 753 | 51.1 | 50 | 755 | 19.6 | 762 | 16.6 | 50 | 755 | 22.2 | 765 | 26.4 | 50 | 714 | 45.2 | 733 | 35.4 | 50 | 725 | 54.4 | 746 | 44.4 | 50 | 719 | 46.8 | 740 | 37.8 | 50 | 750 | 19.9 | 765 | 23.5 |
| Experimental - (Team & Single Teacher) | 147 | 753 | 35.3 | 752 | 50.8 | 147 | 756 | 18.3 | 760 | 17.8 | 147 | 755 | 25.1 | 765 | 24.4 | 147 | 710 | 42.5 | 732 | 35.7 | 147 | 729 | 45.8 | 748 | 41.0 | 147 | 719 | 40.9 | 741 | 36.3 | 147 | 748 | 22.7 | 766 | 24.3 |

*Means and Standard Deviations are expressed in scale score units.
**National Norming Group results from CAT Form E obtained from the Spring, 1985 testing.

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