

PROGRAM EVALUATION
(FULL YEAR EFFICACY STUDY):
***HOLT BIOLOGY* ©2008**

Report Number 344

July 2008

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Program Evaluation (Full Year Efficacy Study): *HOLT BIOLOGY* ©2008

EXECUTIVE SUMMARY

Overview of the Study

Holt, Rinehart and Winston contracted with the Educational Research Institute of America (ERIA) to conduct a study to evaluate the instructional efficacy of *HOLT BIOLOGY* © 2008, a secondary level biology program, as evidenced by achievement following implementation of the program.

The study supports the assertion that the HOLT BIOLOGY © 2008 program is instructionally effective. The HOLT BIOLOGY program significantly increased students' performance on a test designed to determine knowledge and understanding of the content. Test performance for the total sample of students increased approximately one standard deviation.

A total of ten teachers who taught twenty-three different classes were included in the *HOLT BIOLOGY* study sample. These teachers taught in ten different schools in seven different states. They provided the sample of 437 students who took both a pretest and a posttest as part of the study and whose scores could be analyzed. Ninety-six of the students who participated in the study were in grade 9 at the time of the study; 315 were in grade 10; 25 were in grade 11; and one was in grade 12. Two of the teachers taught four classes each; two of the teachers taught three classes each; three of the teachers taught two classes each; and three of the teachers taught one class each.

All of the teachers who took part in the study had used another biology program prior to their participation in the study. The teachers received no special training in the use of the program materials or related assessment.

In addition to an analysis for the total group, researchers at ERIA evaluated the pretest to posttest performance of five subgroups of the total sample based on

1. socio-economic status (SES);
2. minority classification;
3. receipt of special education services;
4. English proficiency; and
5. pretest performance level (high, middle, and low).

Overview of the Analyses

Analysis for the Total Group

Score gains for the whole group increased approximately one standard deviation.

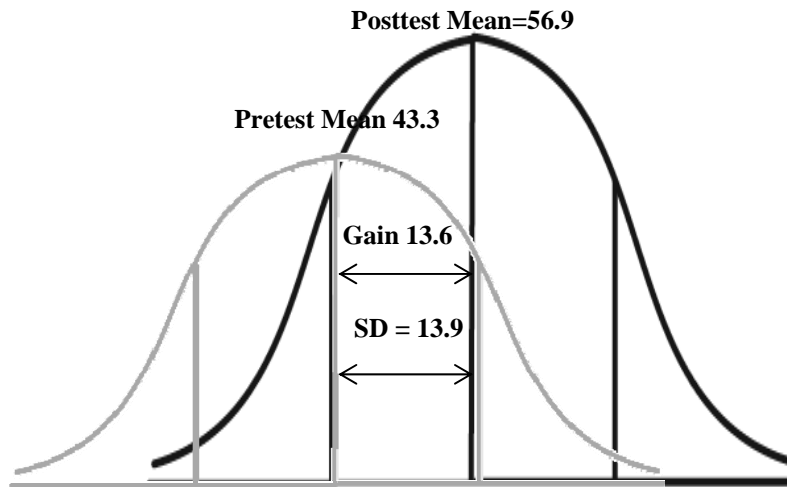
Table 1 shows the increases for the total group from pretesting to posttesting. The average score increase was 13.6 percentage points from a pretest mean of 43.3 percent correct to a posttest mean of 56.9 percent correct. The increase was statistically significant. As Figure 1 shows, the gain was approximately one full standard deviation of

the pretest score average. The increase was not only statistically significant, but the effect size demonstrates that it was also large.

Table 1
Paired Comparison *t*-test of Pretest/Posttest Scores
HOLT BIOLOGY

2007-2008 Academic Year Study						
<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>
Pretest	Total	437	43.3%	13.9%	23.073	<.0001
Posttest	Total	437	56.9%	16.1%		

Figure 1
HOLT BIOLOGY
Pretest to Posttest Comparison of Mean Percentages Correct
for Total Sample of 437 Students



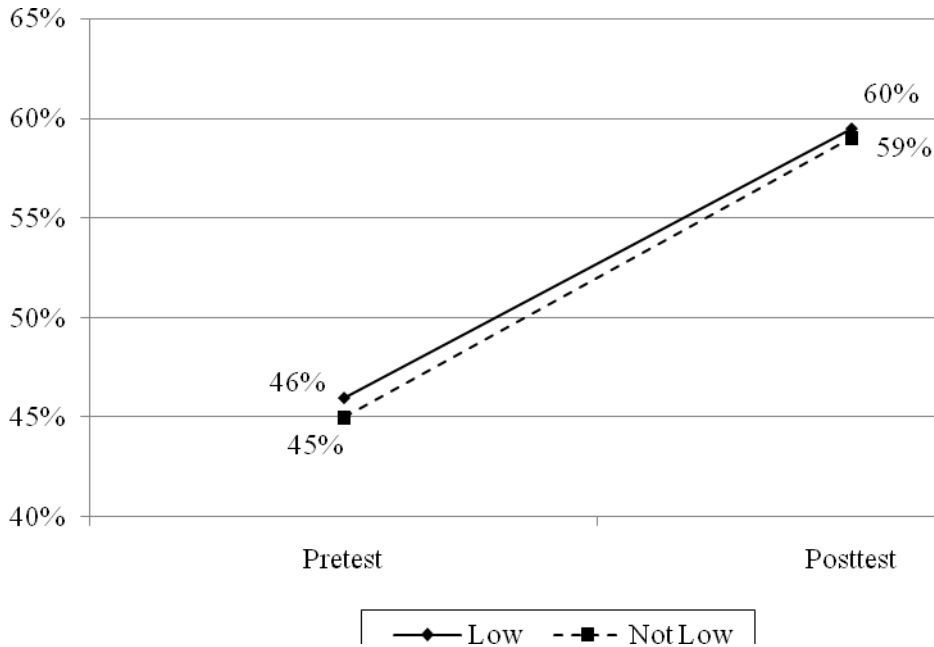
Socio-Economic Group Analysis

Score increases were significant for students identified as low socio-economic status as well as for those identified as not low socio-economic status.

ERIA sought to determine if *HOLT BIOLOGY* favored students from a particular socio-economic status background. Researchers asked teachers to identify students as coming from low socio-economic backgrounds or not low socio-economic backgrounds. Forty-one students were identified as coming from low socio-economic background compared to 284 categorized as having socio-economic backgrounds that were not low. (One-hundred and twelve students were not categorized into either group.) The scores of the two groups were then compared. Results are presented in Figure 2. The results revealed that both groups of students started out with approximately the same pretest scores and increased their scores the same number of percentage points (14 percentage points) from pretest to posttest.

The analysis suggests that HOLT BIOLOGY improves the performance among students regardless of socio-economic background and does not favor students classified as low socio-economic or not low socio-economic status.

Figure 2
HOLT BIOLOGY
Mean Percentages Correct from Pretest to Posttest
for Low Socio-Economic Students and Not Low Socio-Economic Students



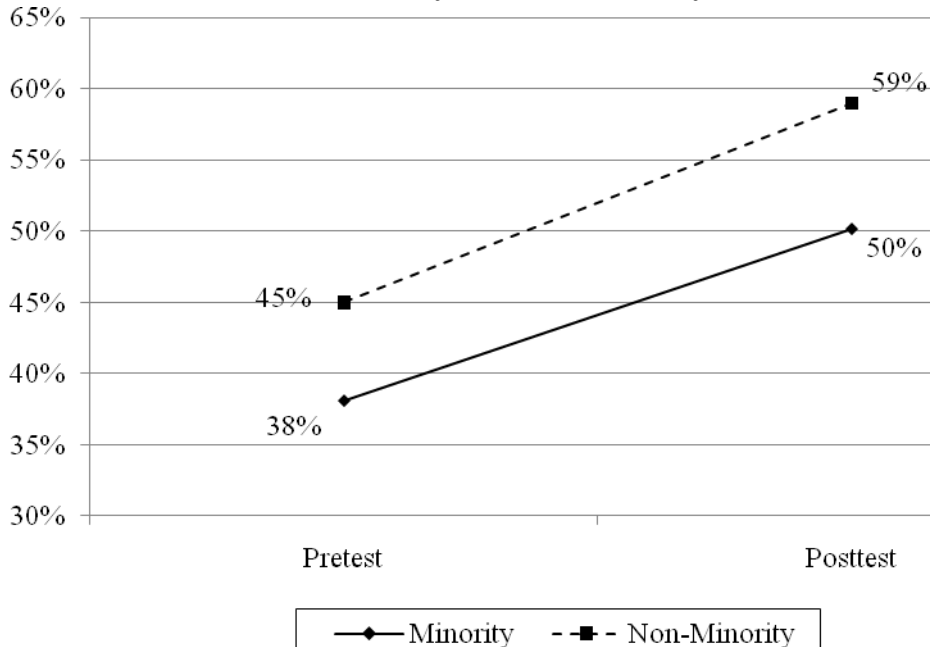
Minority Group Analysis

Score increases were significant for minority and non-minority students.

ERIA sought to determine if *HOLT BIOLOGY* favored minority students over non-minority students. Researchers asked teachers to identify students as minority or non-minority. One hundred nine students were identified as minority students compared to 328 categorized as non-minority. The scores of the two groups were then compared. Results are presented in Figure 3. The results revealed that the students who were categorized as minority scored lower on the pretest, but increased their scores about the same from pretesting to posttesting (increase 12 percentage points) as the non-minority group (increase 14 percentage points).

The analysis suggests that HOLT BIOLOGY improves the performance among students regardless of ethnic background and does not favor students classified as minority or non-minority.

Figure 3
HOLT BIOLOGY
Mean Percentages Correct from Pretest to Posttest
for Minority and Non-Minority Students



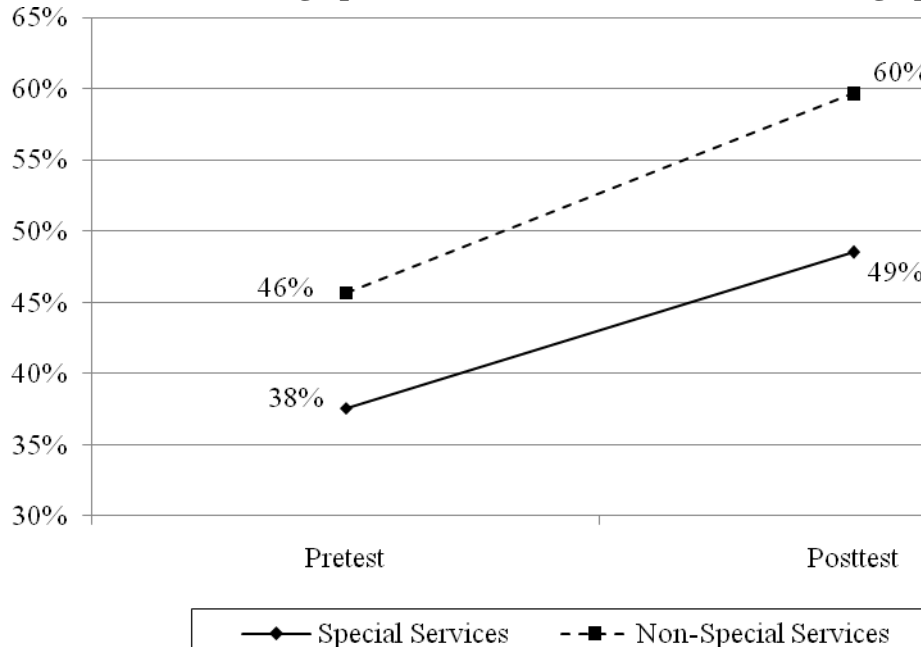
Special Services Group Analysis

Score increases were significant for students identified as receiving special services as well as for those identified as not receiving special services.

ERIA sought to determine if ***HOLT BIOLOGY*** favored students not receiving special services over those who were categorized as receiving special services. Researchers asked teachers to identify students receiving special services and those not receiving special services. Twenty students were identified as receiving special services compared to 307 categorized as not receiving special services. (One-hundred and ten students were not categorized into either group.) The scores of the two groups were then compared. Results are presented in Figure 4. The results revealed that the students who were categorized as receiving special services scored lower on the pretest, and increased their scores (11 percentage points) somewhat less than the students not receiving special services (14 percentage points). The special services group was, however, quite small and this may have accounted for the difference since small samples can often be biased in one direction or another.

The analysis suggests that HOLT BIOLOGY improves the performance among students regardless of special services designation.

Figure 4
HOLT BIOLOGY
Mean Percentages Correct from Pretest to Posttest
for Students Receiving Special Services and Those Not Receiving Special Services



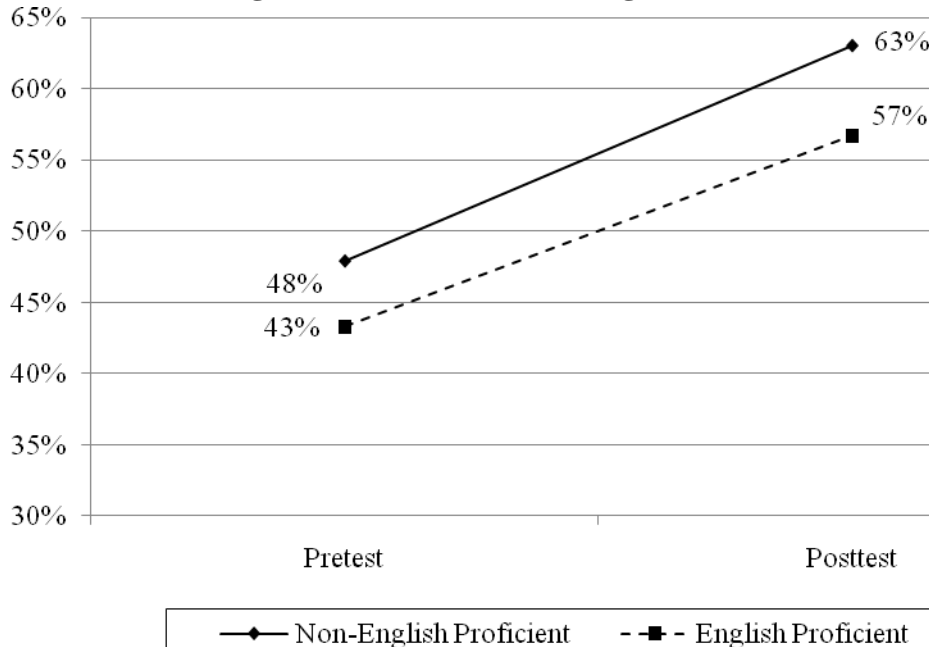
English Proficiency Group Analysis

Score increases were significant for students identified as not proficient in English as well as for those identified as English proficient.

ERIA sought to determine if ***HOLT BIOLOGY*** favored English proficient students over those who were categorized as not proficient in English. Researchers asked teachers to identify students as proficient in English or not proficient in English. Thirty-eight students were identified as being not proficient in English compared to 331 categorized as English proficient. (Sixty-eight students were not categorized into either group.) The scores of the two groups were then compared. Results are presented in Figure 5. The results revealed that the students categorized as English proficient scored somewhat lower on the pretests and increased their scores 14 percentage points. The non-proficient students had higher pretest scores and increased their scores almost exactly the same as the English proficient group (15 percentage points).

The analysis suggests that HOLT BIOLOGY improves the performance among students regardless of English proficiency and does not favor students classified as English proficient over those classified as not proficient.

Figure 5
HOLT BIOLOGY
Mean Percentages Correct from Pretest to Posttest
for English Proficient and Not English Proficient Students



Pretest Levels Group Analysis

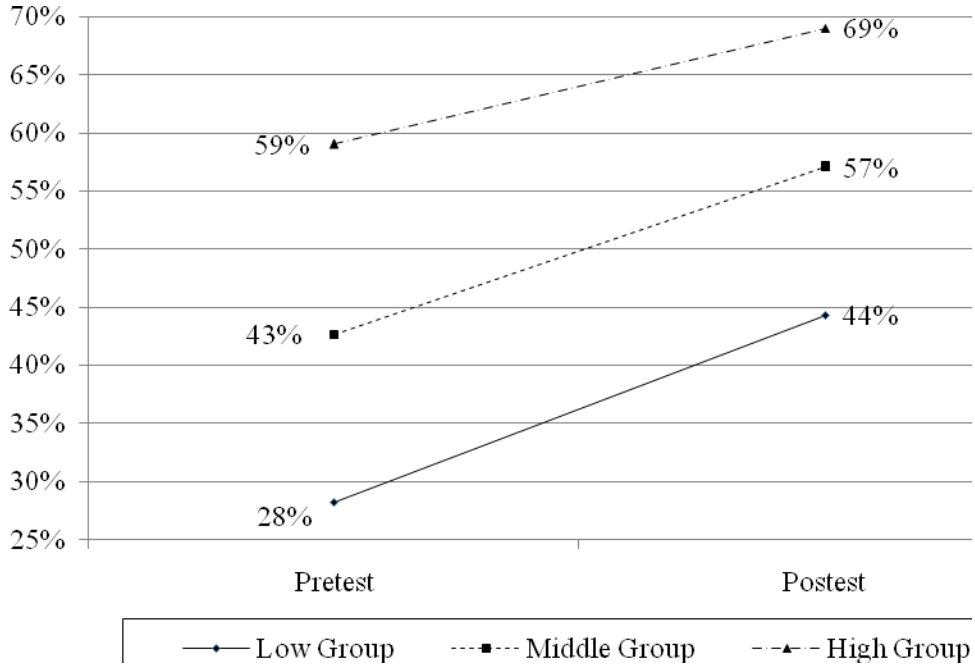
Score increases were significant for all groups when students were grouped according to low, middle, and high pretest scores.

ERIA sought to determine if the program favored students who scored low or high on the pretest. Researchers ranked the total group of students on the basis of their pretest scores and then divided the group into three approximately equal-sized groups of 146 students in the low and middle groups and 145 students in the high group.

The pretest and posttest scores of these three pretest groups were compared. Results are presented in Figure 6. The results revealed that the students in the low pretest group increased their scores 16 percentage points; the middle pretest group increased their scores 14 percentage points; and the high pretest group increased their scores 10 percentage points. The low pretest group increased their scores to a greater extent than the middle and high pretest groups. However, as will be shown in the full report that follows, all three groups’ score increases were statistically significant.

The analysis suggests that HOLT BIOLOGY improves the performance of all students statistically significantly, regardless of their performance level on the pretest.

Figure 6
HOLT BIOLOGY
Mean Percentages Correct from Pretest to Posttest
for Low, Middle, and High Pretest Groups



Program Evaluation (Full Year Efficacy Study): *HOLT BIOLOGY* ©2008

FULL REPORT

The executive summary (see previous pages) provides an overview of the findings; more detailed information about the procedures, data analysis and conclusions are provided below in the full report.

Background Information

Holt, Rinehart and Winston contracted with the Educational Research Institute of America (ERIA) to conduct a study to evaluate the instructional efficacy of *HOLT BIOLOGY* © 2009, a secondary level biology program, as evidenced by achievement following implementation of the program.

Research Question

The following research question guided the design of the study and the data analysis:

Is the *HOLT BIOLOGY* ©2008 program effective in increasing students' knowledge and understanding of biology?

Design of the Study

A quasi-experimental pretest/posttest research design was used for this instructional efficacy study. To determine achievement resulting from using the program, various statistical analyses were conducted; these are described more fully below. Additionally, the validity and reliability of the testing instrument was analyzed.

Timeline of the Study

Following is the timeline for the study:

- June to August 2007: Recruitment for secondary level biology teachers nationwide resulted in the securing of a sample.
- September 2007: Study materials, including detailed directions for the administration of testing instruments, were shipped to sites. Pretesting completed.
- May 2008: Instruction of program content and posttesting completed.
- June 2008: Data returned to ERIA for analysis.

Description of Sample

A total of ten teachers who taught twenty-three different classes were included in the *HOLT BIOLOGY* study sample. These teachers taught in ten different schools in seven different states. They provided the sample of 437 students who took both a pretest and a posttest as part of the study and whose scores could be analyzed. Ninety-six of the students who participated in the study were in grade 9 at the time of the study; 315 were in grade 10; 25 were in grade 11; and one was in grade 12. Two of the teachers taught four classes each; two of the teachers taught three classes each; three of the teachers taught two classes each; and three of the teachers taught one class each.

Table 2 provides a demographic summary of the schools included in the study sample. This school data does not provide a description of the make-up of each of the classes that participated in the study. However, the table does provide a general description of each of the schools and, thereby, an estimate of the make-up of the classes that comprised the sample.

The average enrollment in the ten schools in the *HOLT BIOLOGY* sample was 952 students with an average of 23% of the students enrolled in free/reduced lunch programs. The minority enrollments ranged from 2% to 74% with an average of 17%.

Table 2
Demographic Characteristics of Schools Included
in the *HOLT BIOLOGY* Study

	<i>State</i>	<i>Location</i>	<i>Grades</i>	<i>Students</i>	<i>% Free/Reduced Lunch</i>	<i>% Minority</i>	<i>% Special Education</i>
1	AR	Urban Fringe of Mid-Size City	9 to 12	888	28%	4%	14%
2	NE	Rural	7 to 12	304	23%	3%	17%
3	AZ	Large Central City	9 to 12	2014	22%	21%	11%
4	NE	Urban Fringe of Large City	9 to 12	705	11%	2%	16%
5	MI	Mid-Size Central City	9 to 12	1444	4%	20%	10%
6	NV	Small Town	9 to 12	923	17%	26%	0%
7	KS	Urban Fringe of Mid-Size City	9 to 12	559	7%	5%	9%
8	AR	Urban Fringe of Mid-Size City	10 to 12	1142	28%	15%	13%
9	IL	Rural	9 to 12	310	18%	3%	16%
10	IL	Mid-Size Central City	9 to 12	1229	67%	74%	19%
AVERAGES				952	23%	17%	13%

Instructional Content

Following is a description of the program under study, as provided by its publisher:

<<INSERT DESCRIPTION>>

Outcome Assessment

The measurement instrument used in this study was the end-of-book assessment for the program. The same test was used as a pretest and a posttest. The *HOLT BIOLOGY* test included 45 multiple-choice items.

An analysis was conducted with the posttest results to determine the test's reliability and validity. The test was designed to comprehensively assess this edition of the program. Reviewers evaluated the test to determine the match of test items to the test's content—i.e., whether the content of the test was considered valid. The reviewers were in general agreement that each test item matched the content of the corresponding edition of the program, and assessed the important content and objectives of the program.

For the reliability measurement, the multiple-choice items were analyzed using a traditional item-analysis technique. Each of the test items was judged to be a single item with one point for each correct response. Thus, a total of 45 points was used as the top score in the item analysis. The results are presented in Table 3.

A total of 529 tests were available from the posttest administration. (Note that this number does not match that used as the sample total in the analyses for the full group because the analyses include only those students who completed both a pretest and a posttest.) Table 3 shows that the reliability of the posttest was .85. The reliability index for the outcome assessment was very high and indicates that one can place confidence in the test results. In addition, the posttest reliability indicates the test is a reliable assessment for determining students' learning.

Table 3
HOLT BIOLOGY
Outcome Assessment: Test Reliability Analysis

	<i>Posttest Results</i>
Number of Students	529
Total Points Possible	45
Average Score	25
Highest Score	42
Lowest Score	7
Mean Difficulty of Test Items	.56
Mean Point Biserial	.37
Alpha Reliability	.85

Data Analyses

All of the pretests and posttests were returned to ERIA for analysis.

The total test raw scores were converted to z-scores prior to any analysis. A z-score is a score in which the mean of a set of scores is converted to 0 and the standard deviation is converted to 1. This conversion provides a normal distribution of scores and a standard score scale. Paired comparison analyses were computed using raw scores, converted z-scores, and percent correct scores. There were only very slight differences between the three analyses and therefore only the percent correct score comparisons are provided in

this report. The percent correct scores were also used to develop graphs to show the changes in scores for the various groups.

The converted pretest and posttest scores were analyzed using a paired comparison *t*-test. The <.05 level of significance was used as the level to accept or reject the hypothesis that scores increased statistically significantly.

In addition to the paired comparison *t*-tests, an effect-size analysis was computed for each of the paired comparisons. Cohen’s *d* statistic was used to determine the effect size. This statistic provides an indication of the *strength* of the effect of the treatment regardless of the statistical significance. Cohen’s *d* statistic is interpreted as follows:

- .2 = small effect
- .5 = medium effect
- .8 = large effect

In addition to an analysis for the total group, researchers at ERIA evaluated the pretest to posttest performance of five subgroups of the total sample based on

1. socio-economic status (SES);
2. minority classification;
3. receipt of special education services;
4. English proficiency; and
5. pretest performance level (high, middle, and low).

Results of the Analyses

Total Group Results

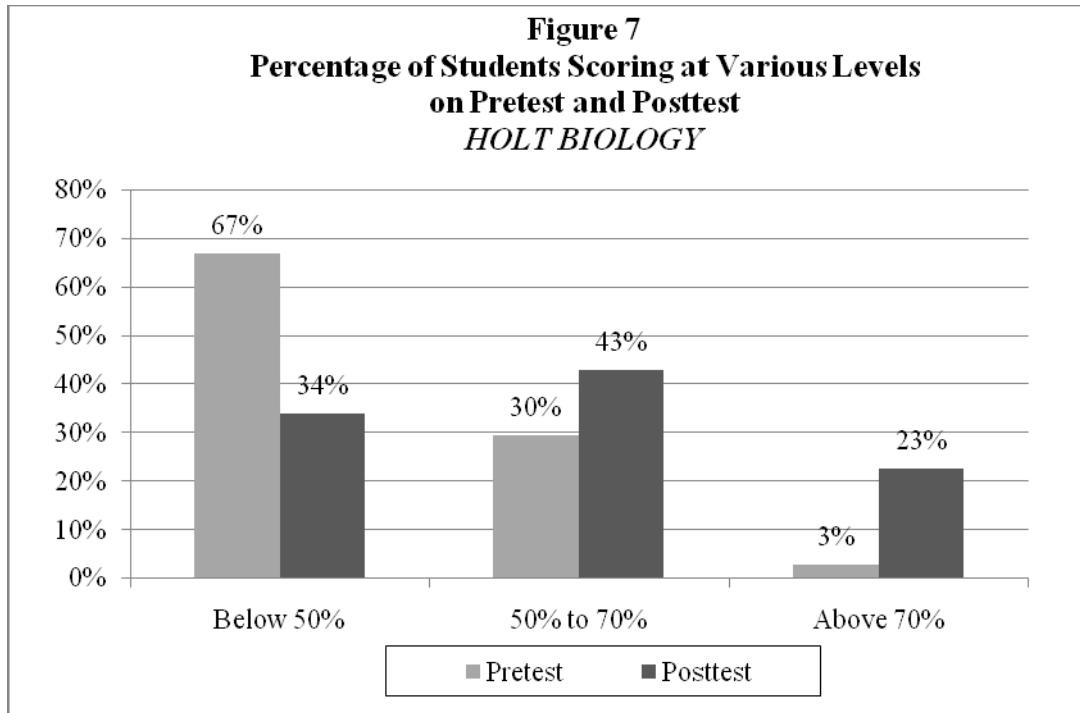
A total of 437 students were included in the total group sample. Eliminated from the analyses were those students who had only a pretest score or a posttest score.

Table 4 provides the paired comparison *t*-test results for the total group. The total test percent score average increased statistically significantly (<.0001). The level of significance indicates that such a change would occur by chance less than one time out of 10,000 repetitions. Cohen’s measure of effect size indicated a large achievement gain.

Table 4
Paired Comparison *t*-test of Pretest/Posttest Scores
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Total	437	43.3%	13.9%	23.1	<.0001	1.08
Posttest	Total	437	56.9%	16.1%			

Figure 7 provides a comparison from pretest to posttest of the percentage of students scoring below 50%, 50% to 70%, and above 70%. The percentage of students scoring below 50% dramatically decreased and the percentage of students scoring above 70% dramatically increased.



Socio-Economic Group Analysis

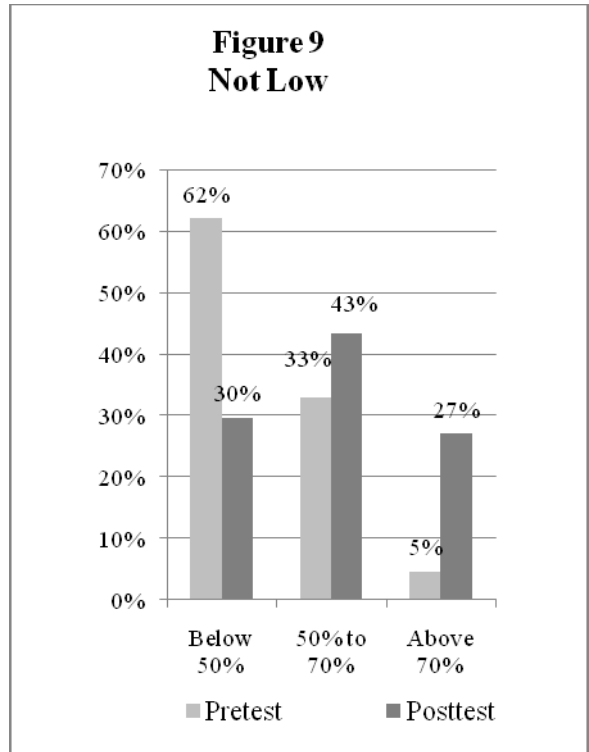
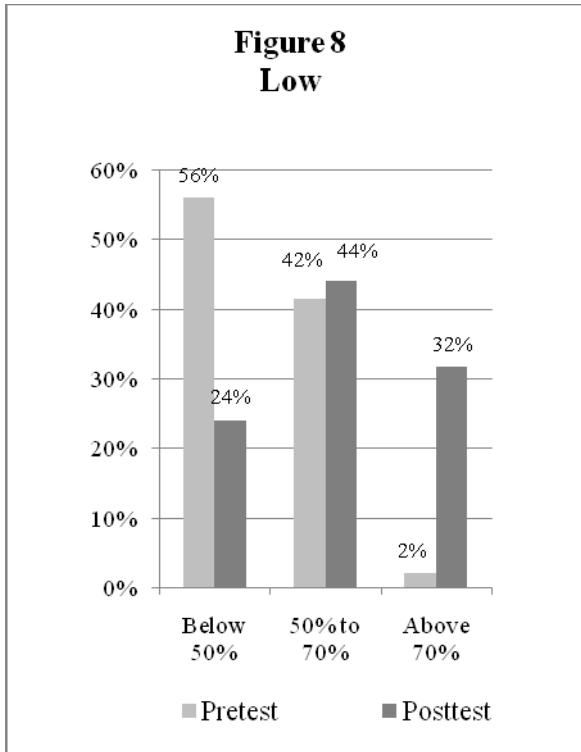
A second analysis was conducted to compare the performance of students who were identified as having a low socio-economic background to those who were identified as having a not-low socio-economic background. Teachers were asked to identify the socio-economic background that best described each student. The results for this analysis are shown in Table 5. The results indicate that the scores for both groups increased and the results for both groups were statistically significant ($<.0001$), indicating a difference that would occur by chance less than one out of 10,000 repetitions. Cohen's measure of effect size indicate large achievement gains for both groups.

Table 5
Paired Comparison *t*-test of Pretest and Posttest Scores
for Students Identified as Coming From Low Socio-Economic Status (SES)
Backgrounds Compared to Those Not Coming From Low SES Backgrounds
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Low	41	46.0	12.7	7.3	<.0001	.91
Posttest	Low	41	59.5	16.4			
Pretest	Not Low	284	45.2	14.2	18.1	<.0001	.91
Posttest	Not Low	284	59.1	16.1			

Figures 8 and 9 provide a comparison from pretest to posttest of the percentage of students in both socio-economic background groups scoring below 50%, 50% to 70%, and above 70%. Both groups showed a dramatic decrease in the percentage of students scoring below 50% and a dramatic increase in the percentage of students scoring above 70%.

Figures 8 and 9
Percentage of Low Socio-Economic Students and Not Low Socio-Economic Students
Scoring at Various Levels on Pretest and Posttest
HOLT BIOLOGY



Minority Group Analysis

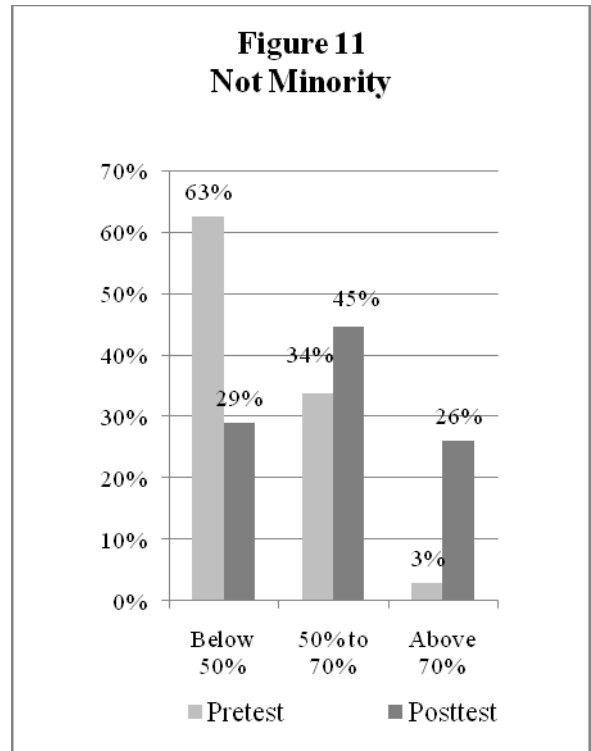
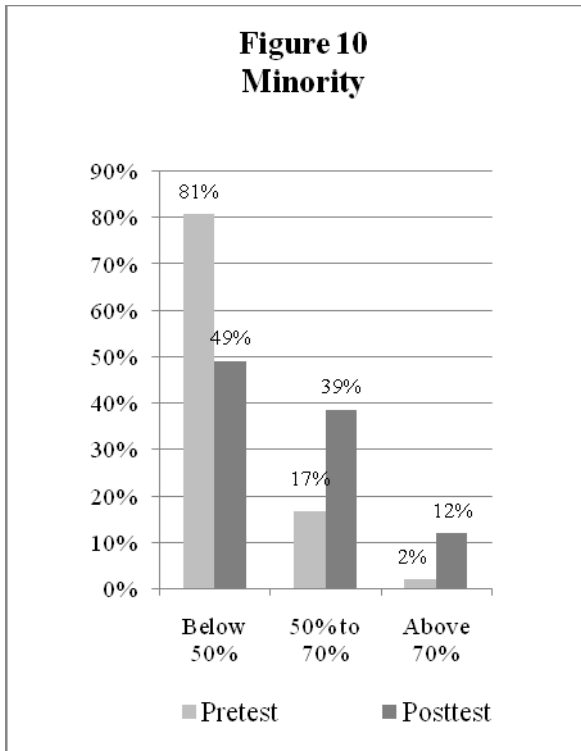
A third analysis was conducted to compare the performance of students who were classified as minority group students to the performance of those classified as non-minority group students. Teachers were asked to identify the ethnic group that best described each student. The results for this analysis are shown in Table 6. The results indicate that the scores for both the minority group students and the non-minority group students increased and the results for both groups were statistically significant (<.0001), indicating a difference that would occur by chance less than one out of 10,000 repetitions. Cohen’s measure of effect size indicated large achievement gains for both groups.

Table 6
Paired Comparison *t*-test of Pretest and Posttest Scores
for Students Identified as Minority Group
Compared to Those Identified as Non-Minority Group
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Minority	109	38.2	13.2	10.7	<.0001	.82
Posttest	Minority	109	50.3	16.0			
Pretest	Non-Minority	328	45.1	13.7	20.5	<.0001	.95
Posttest	Non-Minority	328	59.1	15.7			

Figures 10 and 11 provide a comparison from pretest to posttest of the percentage of students scoring below 50%, 50% to 70%, and above 70%. Both the minority and non-minority groups showed a dramatic decrease in the percentage of students scoring below 50% and a dramatic increase in the percentage of students scoring above 70%.

Figures 10 and 11
Percentage of Minority and Not Minority Students
Scoring at Various Levels on Pretest and Posttest
HOLT BIOLOGY



Special Services Group Analysis

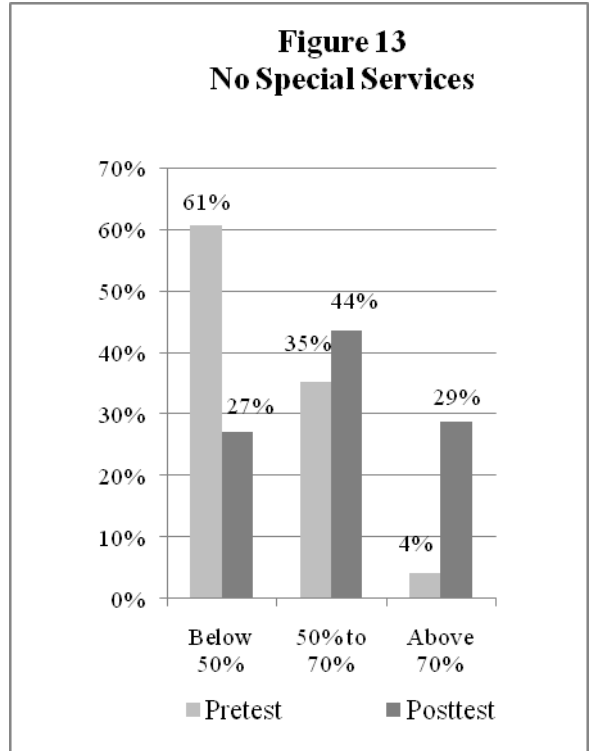
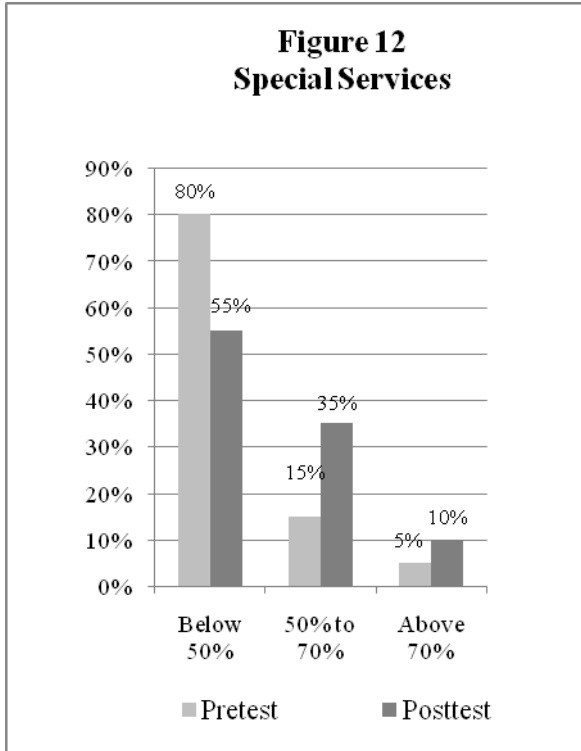
A fourth analysis was conducted to compare the performance of students who were identified as receiving special services compared to those not receiving such services. Teachers were asked to identify students who received special education services and those who did not receive such services. The results for this analysis are shown in Table 7. The increase was statistically significant ($<.0001$) for the non-special services students indicating a difference that would occur by chance fewer than one time out of 10,000 repetitions. For the special services students the increase was statistically significant ($<.001$) indicating a difference that would occur by chance fewer than one time out of 1,000 repetitions. Cohen's d statistic indicated a large effect size for the non-special services students and a medium effect size for the special services students. The medium effect size for the special services students (as opposed to a large effect size) might have been due to the relatively small size of the group.

Table 7
Paired Comparison *t*-test of Pretest and Posttest Scores
for Students Identified as Receiving Special Services
Compared to Those Identified as Not Receiving Special Services
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Special Services	20	37.7	14.6	3.862	<.001	.60
Posttest	Special Services	20	48.6	20.9			
Pretest	No Special Services	307	45.8	13.8	19.090	<.0001	.94
Posttest	No Special Services	307	60.0	15.6			

Figures 12 and 13 provide a comparison from pretest to posttest of the percentage of students receiving special education services and those not receiving such services scoring below 50%, 50% to 70%, and above 70%. Both groups, showed a dramatic decrease in the percentage of students scoring below 50% and an increase in the percentage of students scoring above 70%.

Figures 12 and 13
Percentage of Special Services and Not Special Service Students
Scoring at Various Levels on Pretest and Posttest
HOLT BIOLOGY



English Proficiency Group Analysis

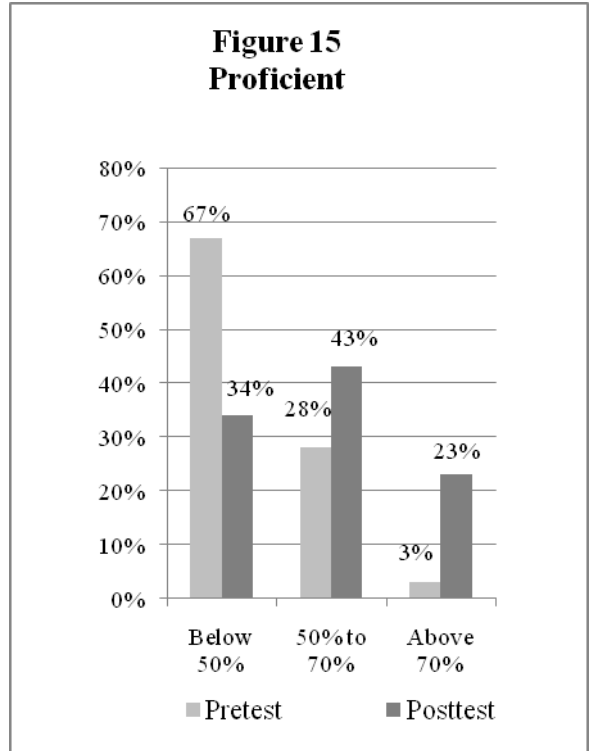
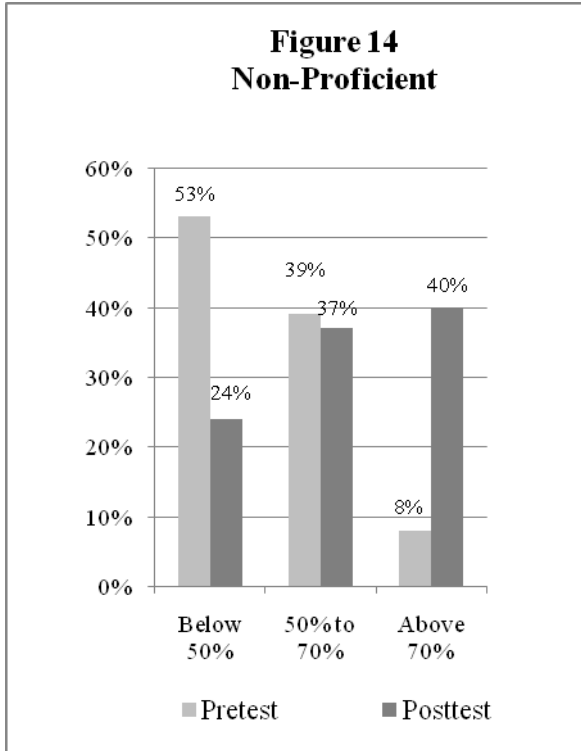
A fifth analysis was conducted to compare the performance of students who were identified as not proficient in English to those who were categorized as English proficient. Teachers were asked to identify whether or not students were proficient in English. The results for this analysis are shown in Table 8. The increase was statistically significant (<.0001) for both groups, indicating a difference that would occur by chance fewer than one time out of 10,000 repetitions. Cohen’s *d* statistics indicated large effect sizes for both groups.

Table 8
Paired Comparison *t*-test of Pretest and Posttest Scores
for Students Identified as Not Proficient in English
Compared to Those Identified as English Proficient
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Non-Proficient	38	48.0%	13.8%	8.2	<.0001	.98
Posttest	Non-Proficient	38	63.2%	17.1%			
Pretest	Proficient	331	43.3%	14.1%	19.1	<.0001	.87
Posttest	Proficient	331	56.7%	16.3%			

Figures 14 and 15 provide a comparison from pretest to posttest of the percentage of students who were and were not English proficient who scored below 50%, 50% to 70%, and above 70%. Both groups of students showed a dramatic decrease in the percentage of students scoring below 50% and a dramatic increase in the percentage of students scoring above 70%.

Figures 14 and 15
Percentage of Non-Proficient and English Proficient Students
Scoring at Various Levels on Pretest and Posttest
HOLT BIOLOGY



Pretest Levels Group Analysis

A sixth analysis was conducted to compare the performances of students who scored low, middle, or high on the pretest. The entire group was arranged in rank order based on pretest scores. The total group was then divided into three approximately equal groups with 146 students in low and middle pretest groups and 145 students in the high pretest group. Pretest and posttest scores were then compared for each group. The results for this analysis are shown in Table 9. Results indicate that the scores for all three groups increased statistically significantly ($<.0001$) indicating a difference that would occur by chance less than one time out of 10,000 repetitions. For the low and middle groups the effect sizes were large, and for the high group the effect size was medium.

Table 9
Paired Comparison *t*-test of Pretest and Posttest Scores
for Students Grouped by Pretest Performance
HOLT BIOLOGY

<i>Results</i>	<i>Group</i>	<i>Number of Students</i>	<i>Mean Score</i>	<i>SD</i>	<i>t-test</i>	<i>Significance</i>	<i>Effect Size</i>
Pretest	Low Pretest	146	28.3%	5.7%	14.9	<.0001	1.06
Posttest	Low Pretest	146	44.3%	13.8%			
Pretest	Middle Pretest	146	42.6%	3.8%	17.2	<.0001	.97
Posttest	Middle Pretest	146	57.2%	11.9%			
Pretest	High Pretest	145	59.2%	7.4%	13.3	<.0001	.67
Posttest	High Pretest	145	69.2%	12.0%			

Figures 16, 17, and 18 provide a comparison from pretest to posttest of the percentage of students scoring below 50%, 50% to 70%, and above 70%. All three pretest groups showed changes in the desired directions, with a decrease in the percentage of students scoring below 50% and an increase in the percentage of students scoring above 70%. For the low and middle pretest groups, the decrease in the percentage of students scoring below 50% was dramatic. For the high pretest group, the increase in the percentage of students scoring above 70% was dramatic.

Figures 16, 17, and 18
Percentage of Low, Middle, and High Pretest Achieving Students
Scoring at Various Levels on Pretest and Posttest
HOLT BIOLOGY

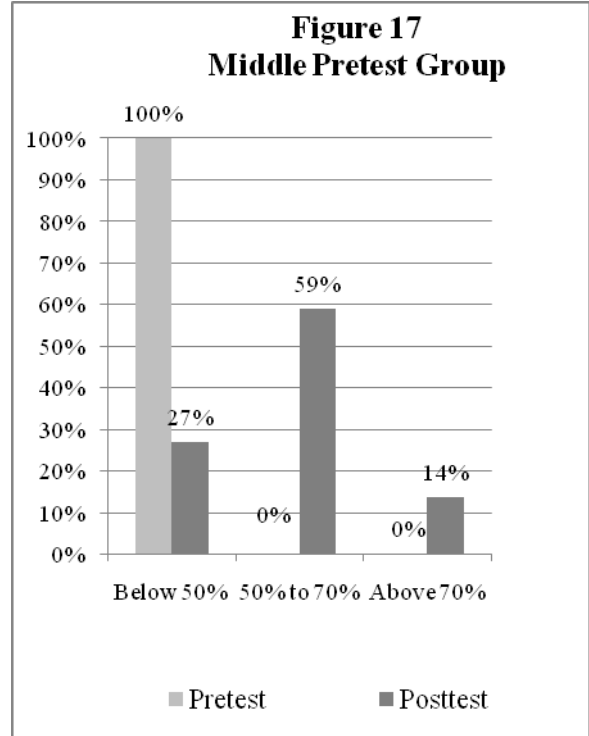
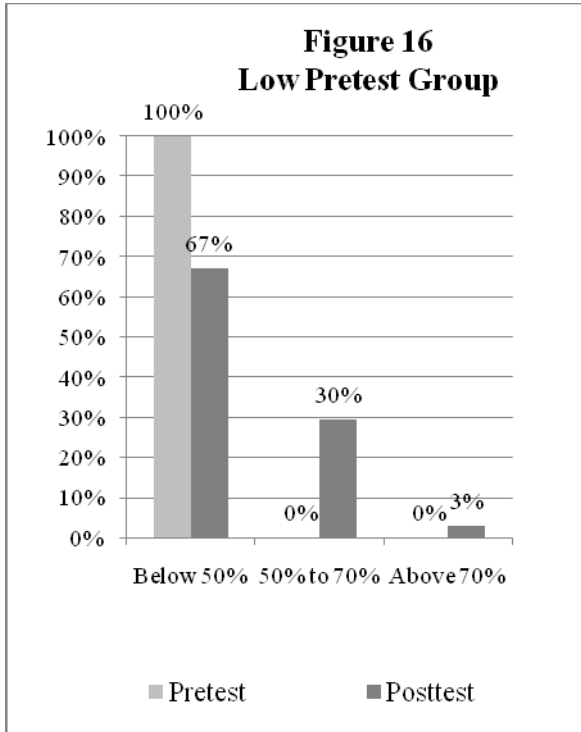
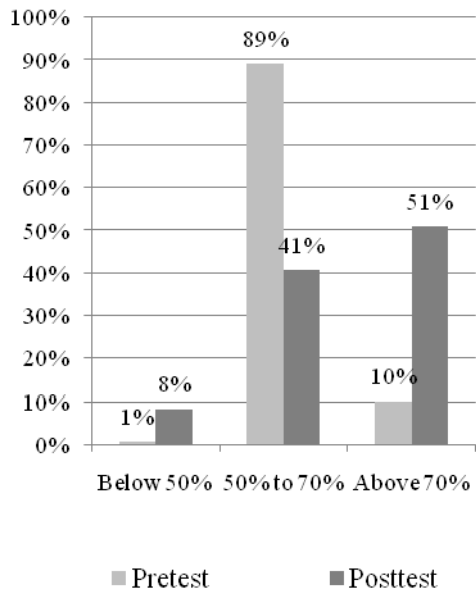


Figure 18
High Pretest Group



Conclusions

The results of the various analyses conducted on the pretest and posttest score comparisons for over 400 students in twenty-three classes enrolled in ten different high schools across seven different states lead to the conclusion that **HOLT BIOLOGY ©2008** is very successful in increasing students' knowledge and understanding of biology.

The total group of students increased their scores statistically significantly from pretest to posttest. The analysis indicated that the increase was statistically significant the effect size was large

In addition to the analysis for the total group, the study looked at the performance of five subgroups based on: socio-economic status (SES); minority classification; receipt of special education services; English proficiency; and pretest performance level (high, middle, and low). For all subgroups, the increases from pretest to posttest were statistically significant. The analyses indicated the increases for all of the groups were not only statistically significant; the effect sizes were all large, with the two exceptions of the group of students who received special education services (medium effect size) and the group of students who received the highest scores on the pretest (medium effect size). **HOLT BIOLOGY** appears not to be biased toward one group or another. Gains were significant for all groups under study.

The total group analysis showed that the percentage of students scoring below 50% correct declined dramatically from pretest to posttest, while the percentage of students scoring above 70% correct increased dramatically from pretest to posttest. For the subgroups the changes from pretest to posttest were all largely in the desired directions as well.

This study sought to determine if HOLT BIOLOGY ©2008 is instructionally effective. Based on the results reported in this study the conclusion can be made that the program is very effective in increasing students' knowledge and understanding of biology.