

**Student Achievement Results for the
ARTS FIRST Windward Research
Project: Addendum to the Report,
“Evaluation of the First Year of the
ARTS FIRST Windward Research Project”**

**Paul R. Brandon
Brian Lawton**

**Program Research & Evaluation Office
Curriculum Research & Development Group
University of Hawai‘i at Mānoa**

November 2004

Contents

Purpose	1
Evaluation Methods	2
Hawai‘i Content and Performance Standards (HCPS) Test	2
Writing	2
Reading	2
Mathematics	2
Stanford Achievement Test 9 th edition (SAT9)	3
Reading	3
Mathematics	3
Analyses	3
Results	4
School Year 2002–03, Grade 3	4
School Year 2002–03, Grade 5	4
School Year 2003–04, Grade 3	4
School Year 2003-04, Grade 5	4
Discussion	4
References	5

Tables

Table 1. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2002–03 . . .	6
Table 2. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2002–03 . . .	6
Table 3. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2003–04	7
Table 4. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2003–04	7
Table 5. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2001–02	8
Table 6. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, School Year 2001–02 . . .	8

Figures

Figure 1. Grade 3 frequency distribution of 2003–04 HCPS writing scores.	9
Figure 2. Grade 5 frequency distribution of 2003–04 HCPS writing scores.	9
Figure 3. Grade 3 frequency distribution of 2003–04 HCPS reading scores.	10
Figure 4. Grade 5 frequency distribution of 2003–04 HCPS reading scores.	10
Figure 5. Grade 3 frequency distribution of 2003–04 HCPS mathematics scores.	11
Figure 6. Grade 5 frequency distribution of 2003–04 HCPS mathematics scores.	11
Figure 7. Grade 3 frequency distribution of 2003–04 SAT9 reading scores.	12
Figure 8. Grade 5 frequency distribution of 2003–04 SAT9 reading scores.	12
Figure 9. Grade 3 frequency distribution of 2003–04 SAT9 mathematics scores.	13
Figure 10. Grade 5 frequency distribution of 2003–04 SAT9 mathematics scores.	13

Student Achievement Results for the ARTS FIRST Windward Research Project: Addendum to the Report, “Evaluation of the First Year of the ARTS FIRST Windward Research Project”

**Paul R. Brandon and Brian Lawton
Curriculum Research & Development Group
University of Hawai‘i at Mānoa**

November 2004

Purpose

This report is an addendum to the report, “Evaluation of the First Year of the ARTS FIRST Windward Research Project” (Brandon, Lawton, and Krohn-Ching, 2004). It has two purposes. The first purpose of the report is to examine the extent to which the project and control schools in the ARTS FIRST Windward Research Project (AFWRP) are evenly matched on achievement. We report and analyze public-school student achievement data from the statewide testing program for School Year (SY) 2002–03, the year on which we collected data when matching six schools into three pairs and randomly assigning schools within pairs to project and control groups. The statewide test is the Hawai‘i State Assessment (HSA), administered by the Hawai‘i Department of Education (HDOE). We also report and analyze data for SY 2003–04, the first year of the project. The second purpose of the report is to provide SY 2001–02 data for archival purposes. The 2001–02 scores will be used in the third year of the project when we conduct trend analyses. Trend data will be limited to the years since the HSA was first implemented in 2001–02 and will go through the final project year (2005–06).

The achievement test data are being presented in an addendum to the full report (Brandon, Lawton, & Krohn-Ching, 2004) because they were unavailable when the full report was produced last summer. The results reported here will ultimately be used to answer part of Evaluation Question 1, “To what extent do students show improvements in *reading and mathematics achievement*, attitudes toward school, interest in artistic activities, and behavior?” and Evaluation Question 2, “To what extent do these changes differ among project and comparison schools?”

Year 1 of the project, examined in the full report, was implemented during only a four-month period (February 2004 to May 2004). Therefore the 2003–04 results reported here, which were collected in April 2004, follow an abbreviated period of implementation, during which time the project could not reasonably have been expected to affect student performance notably. Therefore, we do not discuss project effects on the 2003–04 test scores.

Evaluation Methods

This section provides a description of the methods for obtaining and analyzing student achievement data for SYs 2001–04.

The HSA consists of two subtests, the Hawai‘i Content and Performance Standards (HCPS) Test, which has three segments measuring writing, reading, and mathematics achievement, and the Stanford Achievement Test (9th ed.) (SAT9). The SAT9 consists of three segments measuring reading, mathematics, and language; HDOE uses the reading and mathematics segments to measure student achievement. The HCPS is state-developed criterion-referenced test with items addressing the Hawai‘i content and performance standards. The SAT9 is a norm-referenced test developed by Harcourt Educational Measurement. The full test is administered to Grades 3 and 5 in April of each school year.

Hawai‘i Content and Performance Standards (HCPS) Test

The HCPS test, a standards-based assessment, was first implemented in SY 2001–2002 to measure students’ progress toward meeting the Hawai‘i Content and Performance Standards.

Writing. In the writing segment, students provide one written response to a prompt. The segment directly measures standards addressing conventions and skills and standards addressing rhetoric. Student responses are scored on meaning, voice, clarity, design, and conventions (HDOE, Test Development Section, 2003). The total writing raw score used for group comparison was obtained by summing the scores from each of the writing content standard scores.

Reading. The standards-based reading segment addresses students’ ability to read and understand various types of printed materials, including literary pieces such as stories and poems, informational pieces such as textbook-like selections, and functional pieces such as directions and consumer material. The questions directly measure three of the HCPS reading content standards, including comprehension processes, conventions and skills, and response (HDOE, Test Development Section, 2003). The total reading raw score used for group comparison was obtained by summing the scores from each of the reading content standards scores.

Mathematics. The two standards-based mathematics segments measure how well students understand mathematics, including content knowledge and skills. The questions directly measure all five of the HCPS mathematics content strands, including number and operations; measurement; geometry and spatial sense; patterns, functions, and algebra; and data analysis, statistics, and probability (HDOE, Test Development Section, 2003). The total mathematics raw score used for group comparison was obtained by summing the scores from each of the mathematics standards scores.

Stanford Achievement Test 9th edition (SAT9)

The SAT9 is a national standardized, norm-referenced achievement test published by Harcourt Educational Measurement. It consists of two segments measuring reading comprehension and mathematics problem solving. These SAT9 segments include multiple-choice questions only.

Reading. The reading segment assesses comprehension of three types of reading material: textural (non-fiction, general information); recreational (fiction); and functional (material encountered in everyday life, such as advertisements). Test questions tap various comprehension skills from the basic literal level to the inferential and critical levels of reading comprehension (Arizona Department of Education (ADOE), Accountability Division, Assessment Section, 2004).

Mathematics. The mathematics segment assesses the ability to compute, as well as apply, mathematics concepts to problem-solving situations. Skills in interpreting a graph or a chart and in the application of principles of geometry, measurement, and probability also are assessed (ADOE, Accountability Division, Assessment Section, 2004).

Analyses

To compare project and control group schools in 2002–3 and in 2003–04, we used multivariate analyses of variance (MANOVA). MANOVA is an inferential statistical test for comparing groups on the scores collected in multiple subtests. It is appropriate to analyze the scores for all tests administered to a grade together in a single statistical test because the results for the various tests are often correlated. MANOVAs were conducted on the scores for SY 2002–03, the year in which the schools were randomly assigned to groups, to compare project and control groups in Grades 3 and 5. MANOVAs were also conducted for SY 2003–04, the first year in which the AFWRP was implemented. Descriptive statistics for Grades 3 and 5 are shown in Tables 1–4, and frequency distributions comparing project and control group mean scores on each segment of the HCPS and SAT9 subtests in 2003–04 are presented in Figures 1–10.

We also report effect sizes, which indicate the practical significance of the differences between groups. The effect size is the standardized mean difference between two groups. Cohen's (1988) suggested guidelines for effect size: $d=0.2$ ($\eta^2=0.01$) for a small effect size, $d=0.5$ ($\eta^2=0.06$) for a medium effect size, and $d=0.8$ ($\eta^2=0.14$) for a large effect size.

To present results that we will use in later years for tracking trends in student achievement, we present results that were obtained from the HSA for SYs 2001–02 for both Grades 3 and 5. In the final project year, we will use these scores, as well as the 2002–03 scores, as baseline years for trend analyses. The trends will be examined and compared to the results for Years 1–3 of the project to determine the extent to which the AFWRP affects student achievement. The descriptive statistics for 2001–02, presented in Tables 5 and 6, are given for archival purposes only and are not discussed further in this report.

Results

School Year 2002–03, Grade 3

As seen in Table 1, the Grade 3 control group mean scores were higher on all segments of the HCPS and SAT9 subtests than the project group means in 2002–03. The MANOVA results indicate a significant difference between the groups ($\Lambda=0.90$, $F(5,354)=7.46$, $p<0.05$). A medium effect size was found for the HCPS ($\eta^2=0.08$) and a small effect size was found for the SAT9 ($\eta^2=0.03$).

School Year 2002–03, Grade 5

As seen in Table 2, the Grade 5 project group mean scores were higher on all segments of the HCPS and SAT9 subtests than the control group means in 2002–03. The findings of the MANOVA show a significant difference between the groups ($\Lambda=0.97$, $F(5,392)=2.27$, $p<0.05$). A small effect size was found for the HCPS ($\eta^2=0.01$) and SAT9 ($\eta^2=0.02$).

School Year 2003–04, Grade 3

As seen in Table 3, the Grade 3 control group outperformed the project group on all segments of the HCPS and SAT9 subtests except one in 2003–04. The results of the MANOVA show a significant difference between project and control groups on the HSA ($\Lambda=0.91$, $F(5,357)=7.13$, $p<0.05$), with the control group outperforming the project group. A medium effect size was found for the HCPS ($\eta^2=0.06$) and a small effect size was found for the SAT9 ($\eta^2=0.01$).

School Year 2003–04, Grade 5

The 2003–04 Grade 5 control group outperformed the project group on all segments of the HCPS and SAT9 subtests except two. The MANOVA results show a significant difference between the groups ($\Lambda=0.95$, $F(5,374)=3.82$, $p<0.05$). A small effect size was found for the HCPS ($\eta^2=0.02$) and the SAT9 ($\eta^2=0.02$).

Discussion

The comparison between project and control group schools' scores for 2002–03, which is the year from which scores (and school demographics) were used to match schools before randomly assigning them to groups, shows that the control group outperformed the comparison group in Grade 3 and that the project group outperformed the control group in Grade 5. The effect sizes show a larger difference for Grade 3 than for Grade 5; however, none of the effect sizes indicate a substantially large difference between groups. These results show that the pairs of schools were not as closely matched on achievement as desirable. Nevertheless, given that we had a pool of only six schools with which to work and that the effect sizes were not large, we do not believe that the differences between groups invalidates the matching of schools. Furthermore, we will take the differences between group means into account by using the 2002–03 scores as covariates in our analyses at the conclusion of the project.

The comparison between project and control group schools' scores in 2003–04, the first project year, shows a pattern of differences similar to the comparison for 2002–03: The effect sizes show a larger difference for Grade 3 than for Grade 5, but with no substantially large differences between groups. As noted earlier, no useful conclusions about the effects of the program can be drawn because of the short duration of the program year. Therefore, we cannot use the results of the 2003–04 analyses to arrive at conclusions about program effects at this point. Instead, we note again that the control group is somewhat higher scoring than the comparison group and that we will use the 2002–03 scores as covariates in our analyses of the differences between groups at the conclusion of the project.

References

- Arizona Department of Education, Accountability Division, Assessment Section. (2004). *Stanford 9 fact sheet*. Retrieved October 28, 2004, from <http://www.ade.state.az.us/standards/stanford9/stanford9factsheet.asp>.
- Brandon, P. R., Lawton, B., & Krohn-Ching, W. (2004). *Evaluation of the first year of the ARTS FIRST Windward Research Project*. Honolulu: University of Hawai'i at Mānoa, Curriculum Research & Development Group, Program Research & Evaluation Office.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Hawai'i Department of Education, Test Development Section. (2003). *Overview of the Hawai'i content and performance standards, second edition, (HCPS II) state assessment program*. Retrieved October 28, 2004, from http://www.hawaiiassessmentmatters.org/HCPSII_parent.pdf.

Table 1. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2002–03

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	185	11.94	3.26	33.54	10.29	40.15	12.62	18.93	5.42	19.90	5.51
Keolu	28	10.89	2.06	29.29	10.43	37.68	10.78	17.29	5.71	18.32	4.79
Parker	79	11.51	3.50	32.89	9.85	37.00	13.88	18.22	5.27	18.71	6.16
La‘ie	78	12.76	3.20	35.73	10.24	44.22	10.74	20.23	5.24	21.68	4.53
Control	175	14.01	4.29	37.57	10.82	42.86	12.28	20.49	5.16	21.59	4.96
Ka‘a‘awa	18	12.50	3.15	36.33	11.57	45.61	12.49	20.17	6.13	22.72	4.61
He‘eia	76	14.33	4.66	37.86	11.19	43.57	12.95	20.61	5.34	21.82	5.53
Kāhuku	81	14.05	4.11	37.57	10.40	41.58	11.56	20.44	4.82	21.12	4.45

Table 2. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2002–03

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	192	12.88	4.01	35.60	10.63	37.84	12.22	17.96	5.39	19.95	5.53
Keolu	36	10.25	2.63	35.53	8.29	38.75	12.41	17.14	5.11	20.53	6.02
Parker	72	12.69	3.57	32.29	10.51	35.46	12.02	17.21	5.27	18.58	5.25
La‘ie	84	14.16	4.29	38.47	10.91	39.50	12.12	18.96	5.52	20.87	5.38
Control	206	12.18	3.73	34.36	11.47	37.37	14.24	16.64	5.63	19.57	6.09
Ka‘a‘awa	16	9.00	3.63	27.50	11.93	33.63	12.83	14.38	5.49	18.06	6.59
He‘eia	98	12.69	3.73	37.23	12.11	41.88	15.42	16.88	5.94	21.16	6.20
Kāhuku	92	12.18	3.50	32.49	9.78	33.22	11.60	16.78	5.28	18.15	5.52

Table 3. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2003–04

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	153	15.07	3.28	32.54	11.54	45.01	13.86	18.62	6.10	20.12	6.09
Keolu	32	14.96	3.16	33.50	10.16	39.69	13.13	18.17	5.48	16.75	5.68
Parker	46	15.19	3.22	32.89	11.26	44.57	11.90	17.85	5.62	19.70	5.50
La‘ie	75	15.05	3.40	31.92	12.34	47.55	14.74	19.28	6.62	21.81	6.04
Control	210	15.02	3.51	36.51	13.35	45.89	14.33	19.80	6.24	21.46	5.70
Ka‘a‘awa	28	13.29	2.99	35.82	13.16	46.50	15.43	19.29	6.41	21.43	5.85
He‘eia	92	15.95	4.04	35.53	14.99	44.88	16.36	19.49	6.71	21.28	6.31
Kāhuku	90	14.62	2.75	37.73	11.56	46.73	11.60	20.29	5.70	21.66	5.01

Table 4. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2003–04

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	181	14.65	3.55	31.33	11.44	39.48	13.13	17.43	6.81	20.04	6.28
Keolu	33	13.54	3.38	32.27	11.20	39.27	12.41	17.88	5.82	19.70	6.09
Parker	56	14.30	3.22	28.91	9.97	35.73	13.28	15.11	6.01	18.43	6.05
La‘ie	92	15.25	3.72	32.47	12.22	41.83	12.89	18.68	7.28	21.14	6.33
Control	199	14.53	3.67	33.39	11.27	42.51	12.80	17.38	5.95	21.04	5.65
Ka‘a‘awa	27	13.41	3.85	30.44	13.75	42.56	15.03	15.56	7.31	21.19	6.03
He‘eia	91	14.13	4.10	33.99	12.16	42.60	14.22	17.55	5.85	20.87	6.40
Kāhuku	81	15.35	2.89	33.70	9.13	42.40	10.22	17.79	5.52	21.19	4.59

Table 5. Grade 3 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2001–02

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	197	10.55	3.53	34.74	11.75	36.62	13.98	18.66	5.81	19.11	5.90
Keolu	35	12.57	3.41	36.69	8.95	41.03	13.23	19.40	4.90	20.11	5.37
Parker	60	9.79	3.14	30.58	12.05	31.32	13.42	16.25	5.75	17.10	6.02
La‘ie	102	10.30	3.56	36.53	11.88	38.22	13.75	19.83	5.74	19.94	5.77
Control	197	12.07	3.66	37.53	11.54	40.51	13.73	19.96	5.69	21.18	5.75
Ka‘a‘awa	24	10.74	4.06	33.25	12.32	35.54	15.16	17.92	6.54	18.29	7.18
He‘eia	98	12.35	4.07	37.76	12.71	42.43	15.21	19.97	6.13	21.67	6.03
Kāhuku	75	12.15	2.82	38.60	9.31	39.60	10.54	20.61	4.65	21.45	4.55

Table 6. Grade 5 Descriptive Statistics for HCPS and SAT9 Scores, Project and Control Schools, School Year 2001–02

		Hawai‘i Content and Performance Standards (HCPS)						Stanford Achievement Test 9 th Edition (SAT9)			
		Writing		Reading		Mathematics		Reading		Mathematics	
School	<i>N</i>	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Project	194	11.60	3.36	31.34	10.51	36.65	12.67	17.04	5.93	19.09	5.58
Keolu	37	11.93	3.23	33.51	10.78	40.05	12.27	18.73	5.82	19.89	5.38
Parker	71	11.55	3.20	30.95	10.35	37.14	12.74	16.54	5.85	19.28	5.62
La‘ie	86	11.51	3.57	30.74	10.52	34.78	12.59	16.73	5.97	18.58	5.65
Control	223	12.34	3.42	33.57	9.97	38.87	13.39	18.92	5.48	20.61	5.57
Ka‘a‘awa	23	12.13	3.21	35.22	10.29	40.70	14.89	19.74	5.63	20.43	6.10
He‘eia	112	12.88	3.44	33.46	10.15	40.90	14.18	18.91	5.76	21.20	5.98
Kāhuku	88	11.69	3.37	33.28	9.73	35.81	11.36	18.72	5.12	19.91	4.82

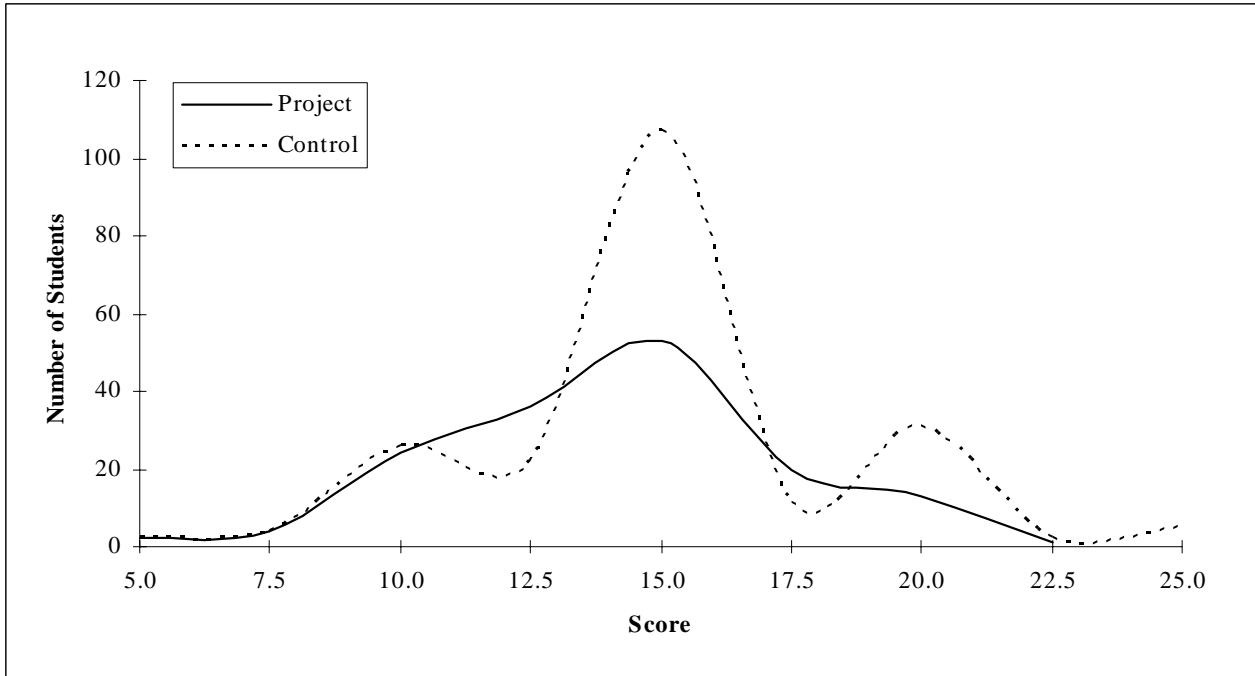


Figure 1. Frequency distribution of 2003–04 Grade 3 project and control schools’ HCPS writing scores.

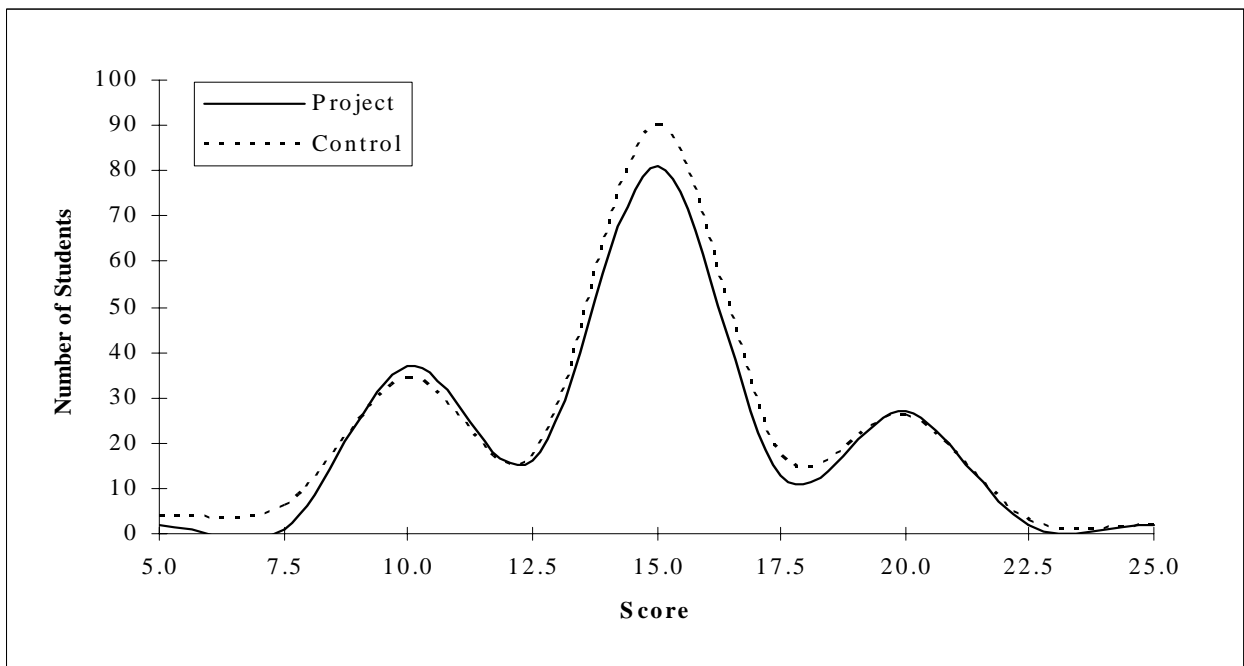


Figure 2. Frequency distribution of 2003–04 Grade 5 project and control schools’ HCPS writing scores.

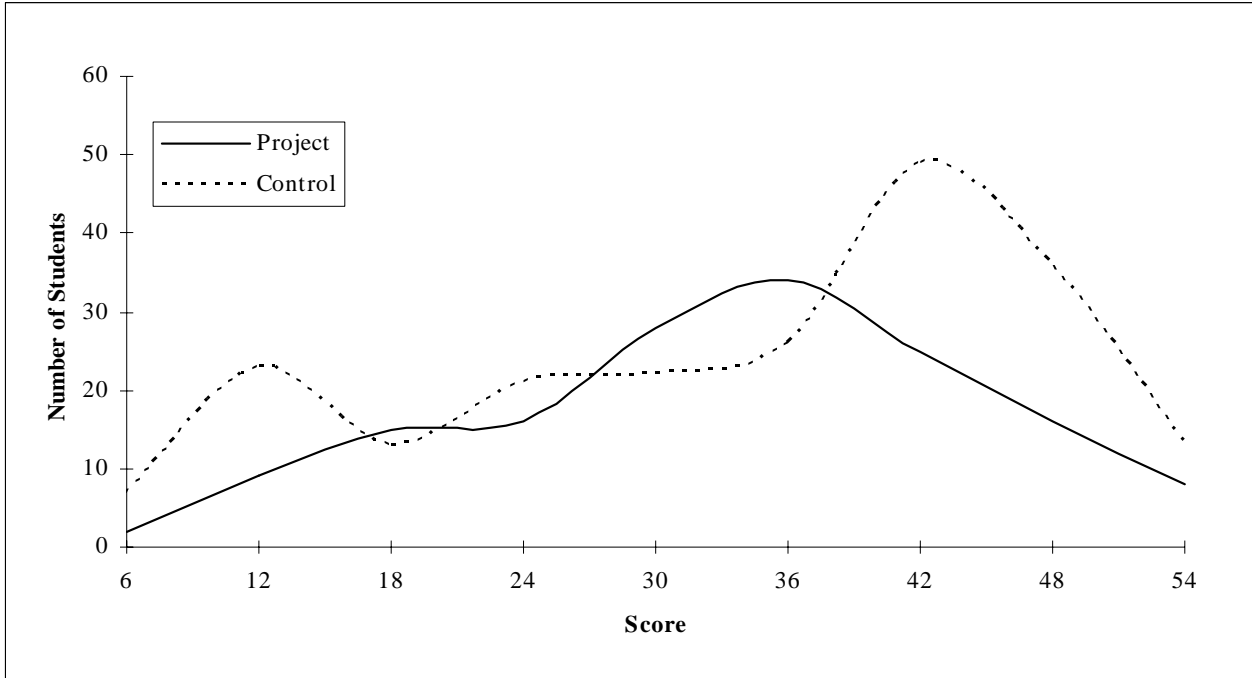


Figure 3. Frequency distribution of 2003–04 Grade 3 project and control schools’ HCPS reading scores.

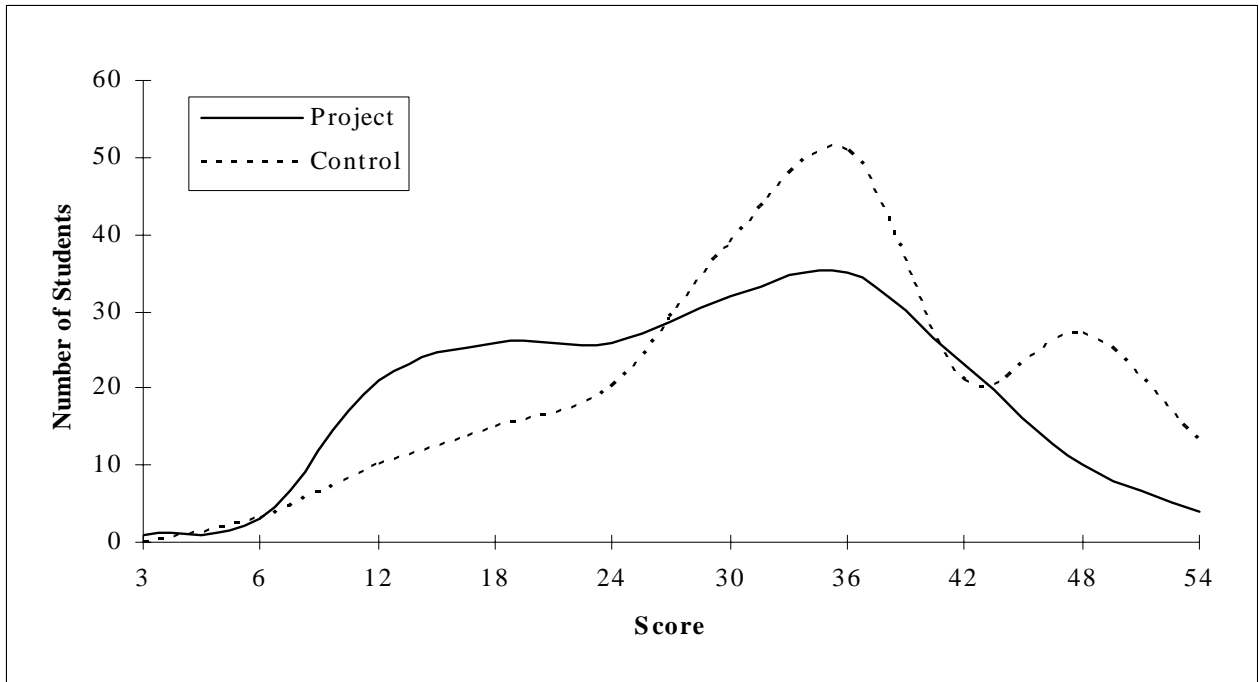


Figure 4. Frequency distribution of 2003–04 Grade 5 project and control schools’ HCPS reading scores.

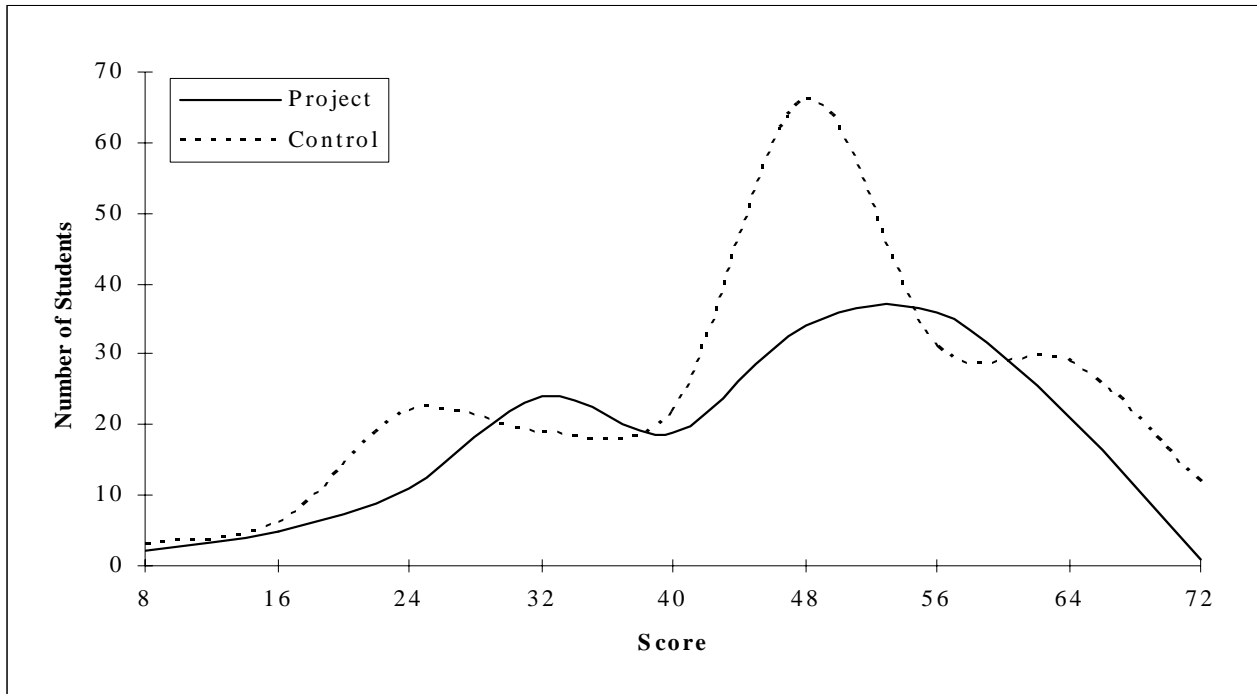


Figure 5. Frequency distribution of 2003–04 Grade 3 project and control schools' HCPS mathematics scores.

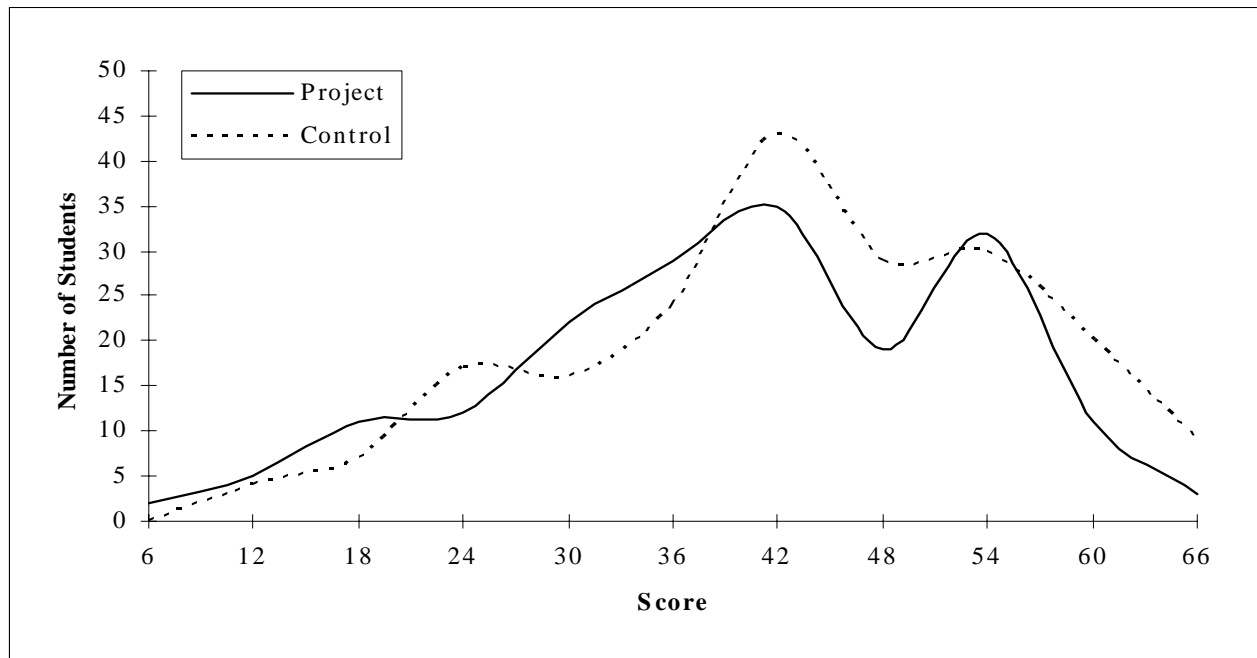


Figure 6. Frequency distribution of 2003–04 Grade 5 project and control schools' HCPS mathematics scores.

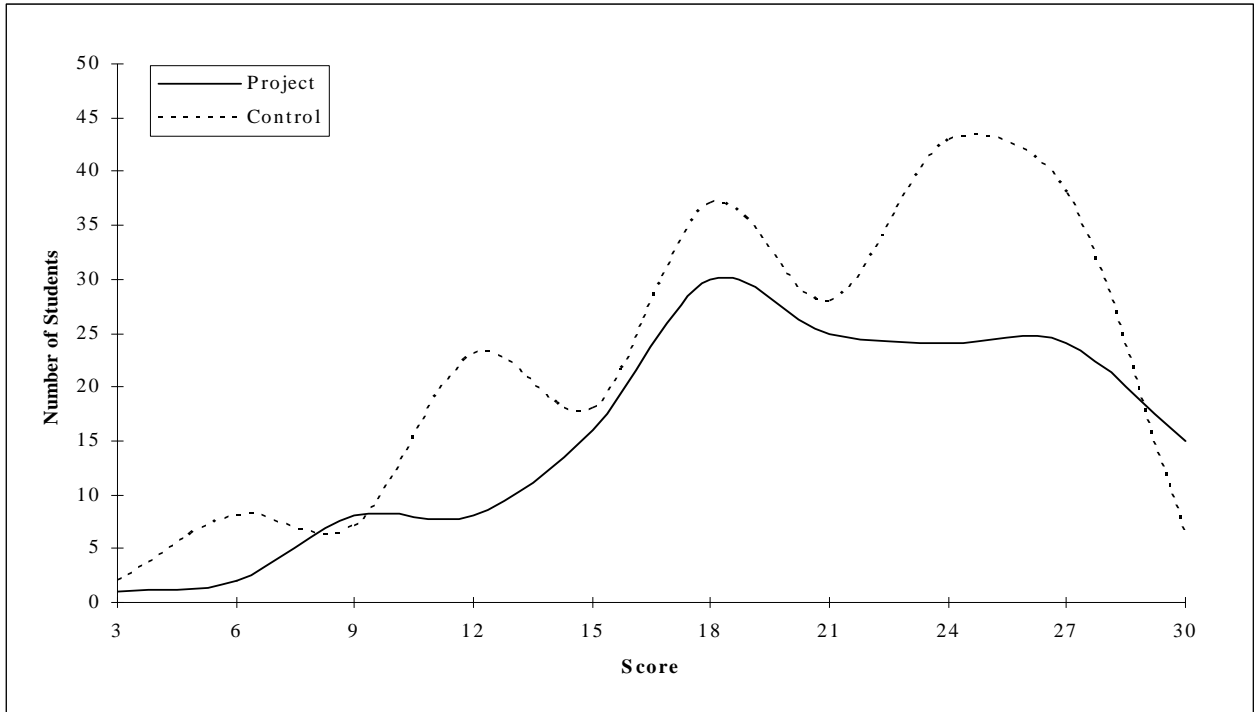


Figure 7. Frequency distribution of 2003-04 Grade 3 project and control schools' SAT9 reading scores.

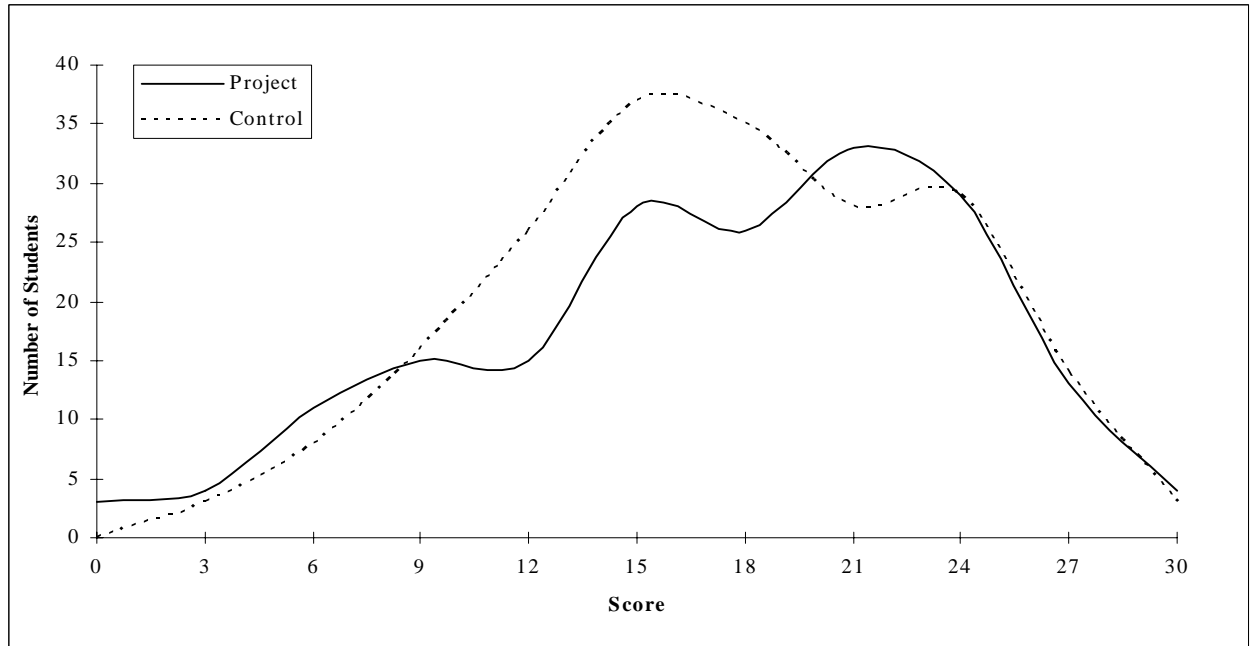


Figure 8. Frequency distribution of 2003-04 Grade 5 project and control schools' SAT9 reading scores.

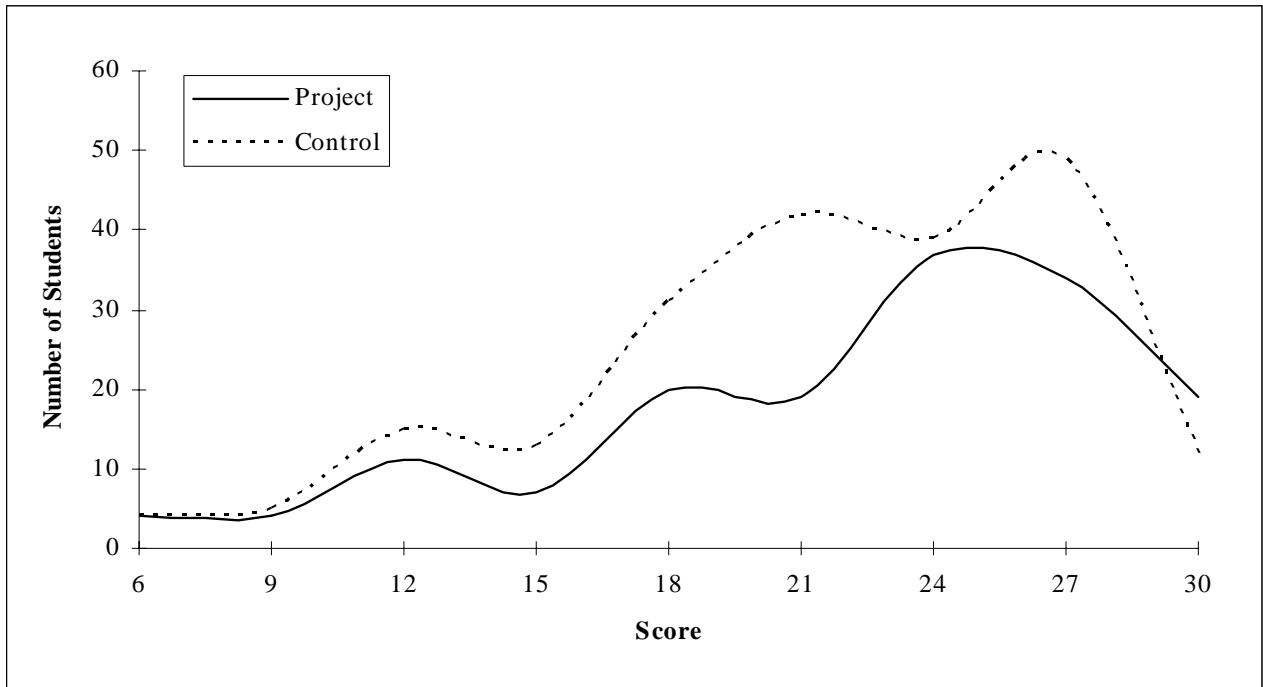


Figure 9. Frequency distribution of 2003–04 Grade 3 project and control schools' SAT9 mathematics scores.

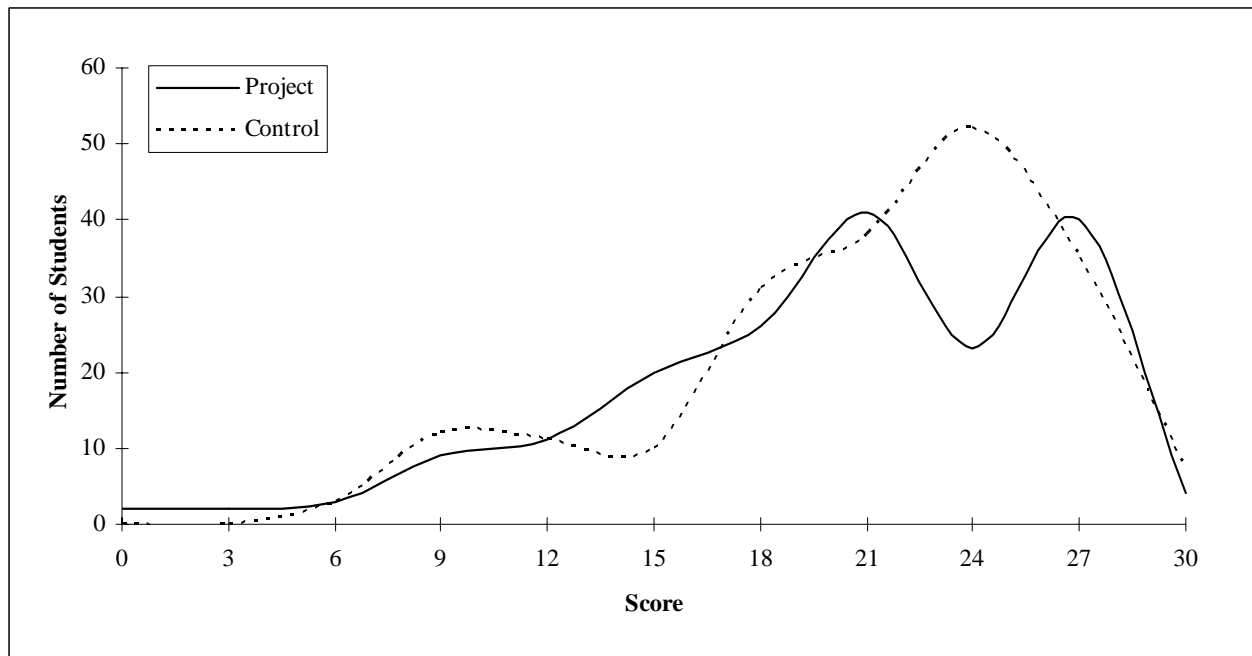


Figure 10. Frequency distribution of 2003–04 Grade 5 project and control schools' SAT9 mathematics scores.