CHAPTER IV

RESULTS

The purpose of this study was to compare the effect of the 7-period alternating day (7 A-B), the 4 x 4 block, and the traditional single-period schedules on the Virginia Standards of Learning (SOL) end-of-course tests. This chapter presents the results. The chapter is organized into two main sections. The first section presents descriptive statistics including the results of the principal survey. The second section presents the results of the Analysis of Variance (ANOVA). The ANOVA was used to test for mean differences between the mean scaled scores. The ANOVA is further organized by SOL end-of-course test: English: Reading, English: Writing, Algebra I, Geometry, United States History, and Earth Science.

*Descriptive Statistics*

Seventy-eight percent of the high school principals responded to the survey. Table 6, Number and Percent of High Schools by Schedule Type and School Location, describes the high schools. Additionally, all high schools were identified as having used the schedule (7 A-B, 4 x 4, traditional) for three or more years. Average daily membership ranged from 56 schools with 0-500 students, 66 schools with 501-999 students, and 99 schools with 1000 or more students.

Table 6

*Number and Percent of High Schools by Schedule Type and School Location*

| | School Location | | | |
|---|---|---|---|---|
| Schedule Type | Urban | Suburban | Rural | Total |
| 7 A-B | 6 (9%) | 45 (63%) | 20 (28%) | 71 (32%) |
| 4 x 4 | 4 (6%) | 15 (20%) | 53 (74%) | 72 (33%) |
| Traditional | 7 (9%) | 12 (15%) | 59 (76%) | 78 (35%) |
| Total | 17 (8%) | 72 (32%) | 132 (60%) | 221 |

The survey requested high school principals that used a block schedule during the 2000-2001 school year to identify the core content area that had embraced the block schedule the best and the core content area that had difficulty embracing the block schedule. Table 7, Content Areas that Embraced the Block Schedule and that had Difficulty with the Block Schedule, reports the results for both the 7 A-B schedule and the 4 x 4 schedule.

Table 7

*Content Areas that Embraced the Block Schedule and that had Difficulty with the Block Schedule*

|  | *n* | % |
|---|---|---|
| Embraced the Block Schedule | | |
| Science | 78 | 55% |
| English | 31 | 22% |
| Math | 15 | 10% |
| No Response | 15 | 10% |
| History | 4 | 3% |
| Difficulty with the Block Schedule | | |
| Math | 66 | 46% |
| History | 49 | 35% |
| No Response | 15 | 10% |
| English | 11 | 8% |
| Science | 2 | 1% |

*Note.* *n* denotes the number of high school principals responding.

Further analysis revealed that science received the most responses for the content area that had embraced the block schedule format the best for both the 7-period alternating day (59%) and the

4 x 4 block (50%). However, for the content area that had difficulty adjusting to the block schedule, the results indicated that mathematics was the content area that had the most difficulty with the 7 A-B schedule (66%) and history and the social science was the content area that had the most difficulty with the 4 x 4 block schedule (51%).

*Analysis of Variance*

The mean scaled scores for the SOL end-of-course tests for the 2000-2001 school year were used to compare the high schools. The scores were analyzed using an Analysis of Variance (ANOVA) where the independent variables were schedule type and school location. The dependent variable on the interval scale of measurement was the mean scaled score for each SOL end-of-course test. The researcher's overall hypothesis was that there is a significant difference among high schools using either the 7-period alternating day schedule, the 4 x 4 block schedule, or the traditional single-period schedule for three or more years with respect to the mean scaled score on the Virginia SOL end-of-course tests. To test the overall researcher's hypothesis, the following three null hypotheses were statistically tested:

$H_{01}$: There is no significant difference among schools using the 7-period alternating day schedule, the 4 x 4 block schedule, or the traditional single-period schedule with respect to the mean scaled score on the Virginia SOL end-of-course tests.

$H_{02}$: There is no significant difference among schools located in an urban, suburban, or rural location with respect to the mean scaled score on the Virginia SOL end-of-course tests.

$H_{03}$: There is no significant interaction between schedule type (7 A-B, 4 x 4, traditional) and school location (urban suburban, rural) with respect to the mean scaled score on the Virginia SOL end-of-course tests.

For each SOL end-of-course test, descriptive statistics (means and standard deviations) are presented followed by the ANOVA results. When a statistical significance was found, the Tukey post hoc test was conducted. Tukey was chosen because it is a relatively conservative procedure providing greater control over a Type I error (Huck, 2000).

*English*: *Reading SOL End-of-Course Test*

All 221 high schools included in this study administered the English: Reading SOL end-of-course test. Table 8, Means and Standard Deviations for English: Reading SOL End-of-Course Test, reports the means and standard deviations for each schedule type by school location. Table 9, ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for English: Reading SOL End-of-Course Test, reports the statistical analysis.

Table 8

*Means and Standard Deviations for English: Reading SOL End-of-Course Test*

| | School Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Schedule Type | Urban | | | Suburban | | | Rural | | |
| | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* |
| 7 A-B | 442.0 | 7.2 | 6 | 457.9 | 15.1 | 45 | 448.8 | 12.9 | 20 |
| 4 x 4 | 433.9 | 13.9 | 4 | 447.0 | 14.9 | 15 | 442.6 | 17.5 | 53 |
| Traditional | 462.1 | 22.6 | 7 | 455.5 | 15.7 | 12 | 445.3 | 18.6 | 59 |

The results indicated that there was a statistically significant difference (p<.05) in the mean scaled scores for the main effects of both schedule type and school location. The results also indicated that there was no statistically significant interaction (p<.05) between schedule type and school location.

Table 9

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for*

*English: Reading SOL End-of-Course Test*

| Source | df | SS | MS | F | p |
|--------|----|----|----|----|----|
| Schedule Type (ST) | 2 | 2687.91 | 1343.95 | 4.81* | .009 |
| School Location (SL) | 2 | 3003.60 | 1501.80 | 5.38* | .005 |
| ST x SL | 4 | 2492.13 | 623.03 | 2.23 | .067 |
| Error Within | 212 | 59173.57 | 279.12 | | |
| Total | 220 | 68895.74 | | | |

*\*p<.05*

The Tukey post hoc test was conducted to determine the source of the main effects for schedule type and school location. The mean scaled scores for high schools using the 7-period alternating day schedule were significantly higher (M=452.9) than the mean scaled scores for high schools using the 4 x 4 block schedule (M=443.1). When comparing the mean scaled scores for school location, high schools in a suburban location scored significantly higher (M=455.3) than the high schools in a rural location (M=444.2). There was no significant difference for the mean scaled scores of high schools in an urban location when compared with high schools in a suburban or rural location.

*English: Writing SOL End-of-Course Test*

All 221 high schools included in this study administered the English: Writing SOL end-of-course test. Table 10, Means and Standard Deviations for English: Writing SOL End-of-Course Test, reports the means and standard deviations for each schedule type by school

location. Table 11, ANOVA for Main Effects and Interaction Effects of Schedule Type and

School Location on English: Writing SOL End-of-Course Test, reports the statistical analysis.

Table 10

*Means and Standard Deviations for English: Writing SOL End-of-Course Test*

| Schedule Type | School Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | Suburban | | | Rural | | |
| | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* |
| 7 A-B | 438.6 | 5.5 | 6 | 457.7 | 13.8 | 45 | 448.3 | 12.2 | 20 |
| 4 x 4 | 437.8 | 14.2 | 4 | 447.6 | 13.7 | 15 | 440.0 | 17.3 | 53 |
| Traditional | 459.3 | 20.3 | 7 | 453.7 | 18.1 | 12 | 445.4 | 20.2 | 59 |

Table 11

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for*

*English: Writing SOL End-of-Course Test*

| Source | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Schedule Type (ST) | 2 | 1881.66 | 940.83 | 3.30* | .039 |
| School Location (SL) | 2 | 2536.97 | 1268.48 | 4.45* | .013 |
| ST x SL | 4 | 1776.30 | 444.07 | 1.56 | .186 |
| Error Within | 212 | 60325.65 | 284.55 | | |
| Total | 220 | 70477.66 | | | |

*\*p<.05*

The results indicated that there was a statistically significant difference (p<.05) in the

mean scaled scores for the main effects for both schedule type and school location. The results

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also indicated that there was no statistically significant interaction (p<. 05) between schedule type and school location.

The Tukey post hoc test was conducted to determine the source of the main effects for schedule type and school location. The mean scaled scores for high schools using the 7-period alternating day schedule (M=453.5) and for high schools using the traditional single-period schedule (M=448.0) were significantly higher than the mean scaled scores for high schools using the 4 x 4 block schedule (M=441.5). When comparing the mean scaled scores for school location, high schools in a suburban location scored significantly higher (M=455.0) than high schools in a rural location (M=443.7). There was no significant difference for the mean scaled scores of high schools in an urban location when compared with high schools in a suburban or rural location.

Furthermore, the results for the English: Writing SOL end-of-course test were similar to the results of the English: Reading SOL end-of-course test presented earlier. On both the English: Reading and the English: Writing SOL end-of-course tests, the 7 A-B was significantly higher than the 4 x 4. In addition, the mean scaled scores for suburban schools were significantly higher than rural schools. There was no significant difference for high schools in an urban location when compared with high schools in a suburban or rural location for both SOL end-of-course tests.

*Algebra I SOL End-of-Course Test*

Of the 221 high schools included in this study, 218 administered the Algebra I SOL end-of-course test. During the 2000 – 2001 school year, three high schools in one school division taught Algebra I at the middle school level only. Table 12, Means and Standard Deviations for Algebra I SOL End-of-Course Test, reports the means and standard deviations for each schedule

type by school location. Table 13, ANOVA for Main Effects and Interaction Effects of Schedule

Type and School Location on Algebra I SOL End-of-Course Test, reports the statistical analysis.

Table 12

*Means and Standard Deviations for Algebra I SOL End-of-Course Test*

| Schedule Type | School Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | Suburban | | | Rural | | |
| | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* |
| 7 A-B | 411.7 | 17.1 | 6 | 418.6 | 16.6 | 42 | 419.9 | 18.6 | 20 |
| 4 x 4 | 418.6 | 25.8 | 4 | 421.1 | 9.4 | 15 | 421.0 | 22.4 | 53 |
| Traditional | 426.9 | 32.4 | 7 | 424.8 | 17.3 | 12 | 409.3 | 18.5 | 59 |

Table 13

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for*

*Algebra I SOL End-of-Course Test*

| Source | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Schedule Type (ST) | 2 | 299.09 | 149.54 | .39 | .671 |
| School Location (SL) | 2 | 784.97 | 392.48 | 1.04 | .353 |
| ST x SL | 4 | 3254.55 | 813.63 | 2.17 | .073 |
| Error Within | 209 | 78322.37 | 374.74 | | |
| Total | 217 | 84748.86 | | | |

The results indicated that there was no statistically significant difference (p<.05) in the mean scaled scores for the main effects of both schedule type and school location as well as for the interaction effects between schedule type and school location.

*Geometry SOL End-of-Course Test*

All 221 high schools included in this study administered the Geometry SOL end-of-course test. Table 14, Means and Standard Deviations for Geometry SOL End-of-Course Test, reports the means and standard deviations for each schedule type by school location. Table 15, ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location on Geometry SOL End-of-Course Test, reports the statistical analysis.

Table 14

*Means and Standard Deviations for Geometry SOL End-of-Course Test*

| Schedule Type | School Location | | | | | | | | |
| | Urban | | | Suburban | | | Rural | | |
| | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* |
| 7 A-B | 419.0 | 13.9 | 6 | 441.3 | 17.2 | 45 | 431.2 | 17.4 | 20 |
| 4 x 4 | 401.6 | 7.6 | 4 | 440.1 | 13.6 | 15 | 424.3 | 27.0 | 53 |
| Traditional | 441.7 | 38.1 | 7 | 443.8 | 16.3 | 12 | 431.4 | 20.8 | 59 |

The results indicated that there was a statistically significant difference (p<.05) in the mean scaled scores for the main effects of both schedule type and school location. The results also indicated that there was no statistically significant interaction (p<.05) between schedule type and school location.

Table 15

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for*

*Geometry SOL End-of-Course Test*

| Source | df | SS | MS | F | p |
|---|---|---|---|---|---|
| Schedule Type (ST) | 2 | 4528.01 | 2264.00 | 4.92* | .008 |
| School Location (SL) | 2 | 7939.31 | 3969.65 | 8.63* | .000 |
| ST x SL | 4 | 3132.15 | 783.03 | 1.70 | .151 |
| Error Within | 212 | 97514.44 | 459.97 | | |
| Total | 220 | 112544.32 | | | |

*\*p<.05*

The Tukey post hoc test was conducted to determine the source of the main effects for schedule type and school location. The mean scaled scores for high schools using the 7-period alternating day schedule were significantly higher (M=436.6) than the mean scaled scores for high schools using the 4 x 4 block schedule (M=426.4). When comparing the mean scaled scores for school location, high schools in a suburban location scored significantly higher (M=441.5) than high schools in both an urban location (M=424.3) and a rural location (M=428.5).

## United States History SOL End-of-Course Test

All 221 high schools included in this study administered the United States History SOL end-of-course test. Table 16, Means and Standard Deviations for the United States History SOL End-of-Course Test, reports the means and standard deviations for each schedule type by school location. Table 17, ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location on United States History SOL End-of-Course Test, reports the statistical analysis.

Table 16

*Means and Standard Deviations for United States History SOL End-of-Course Test*

| Schedule Type | School Location | | | | | | | | |
| | Urban | | | Suburban | | | Rural | | |
| | M | SD | n | M | SD | n | M | SD | n |
|---|---|---|---|---|---|---|---|---|---|
| 7 A-B | 378.6 | 17.3 | 6 | 404.5 | 20.4 | 45 | 389.4 | 16.3 | 20 |
| 4 x 4 | 383.7 | 10.7 | 4 | 401.9 | 22.0 | 15 | 393.7 | 25.2 | 53 |
| Traditional | 406.4 | 35.5 | 7 | 404.9 | 22.8 | 12 | 390.6 | 23.6 | 59 |

Table 17

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for*

*United States History SOL End-of-Course Test*

| Source | df | SS | MS | F | p |
|---|---|---|---|---|---|
| Schedule Type (ST) | 2 | 1935.84 | 967.92 | 1.84 | .160 |
| School Location (SL) | 2 | 5976.89 | 2988.45 | 5.70* | .004 |
| ST x SL | 4 | 3016.51 | 754.12 | 1.44 | .222 |
| Error Within | 212 | 111038.60 | 523.76 | | |
| Total | 220 | 121795.88 | | | |

*$p<.05$

The results indicated that there was a statistically significant difference ($p<.05$) in the mean scaled scores for the main effect of school location. The results also indicated that there was no statistically significant difference ($p<.05$) for the main effect of schedule type as well as the interaction effects of schedule type and school location.

The Tukey post hoc test was conducted to determine the source of the main effect for school location. The mean scaled scores for high schools in a suburban location were significantly higher (M=404.0) than for high schools in both an urban location (M=391.3) and a rural location (M=391.7).

*Earth Science SOL End-of-Course Test*

Of the 221 high schools included in this study, 218 administered the Earth Science SOL end-of-course SOL test. Three high schools in one school division did not administer the Earth Science SOL end-of-course test as Earth Science is taught at the middle school level to allow students the opportunity to take more science courses at the high school level. Table 18, Means and Standard Deviations for the Earth Science SOL End-of-Course Test, reports the means and standard deviations for each schedule type by school location. Table 19, ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location on Earth Science SOL End-of-Course Test, reports the statistical analysis.

Table 18

*Means and Standard Deviations for Earth Science SOL End-of-Course Test*

| Schedule Type | School Location | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | | | Suburban | | | Rural | | |
| | *M* | *SD* | *n* | *M* | *SD* | *n* | *M* | *SD* | *n* |
| 7 A-B | 413.7 | 10.8 | 6 | 431.6 | 16.6 | 44 | 431.6 | 16.5 | 19 |
| 4 x 4 | 408.4 | 3.3 | 4 | 432.8 | 13.4 | 15 | 426.7 | 16.7 | 52 |
| Traditional | 425.8 | 24.7 | 7 | 437.0 | 15.9 | 12 | 427.6 | 14.2 | 59 |

The results indicated that there was a statistically significant difference (p<.05) in the mean scaled scores for the main effect of school location. The results further indicated that there

was no statistically significant difference (p<.05) for the main effect of schedule type as well as for the interaction effects of schedule type and school location.

Table 19

*ANOVA for Main Effects and Interaction Effects of Schedule Type and School Location for Earth Science SOL End-of-Course Test*

| Source | df | SS | MS | F | p |
|---|---|---|---|---|---|
| Schedule Type (ST) | 2 | 920.96 | 460.48 | 1.82 | .163 |
| School Location (SL) | 2 | 3947.50 | 1973.75 | 7.83* | .001 |
| ST x SL | 4 | 1261.36 | 315.34 | 1.25 | .290 |
| Error Within | 209 | 52629.64 | 251.81 | | |
| Total | 217 | 57559.17 | | | |

*p<.05

The Tukey post hoc test was conducted to determine the source of the main effect of school location. The mean scaled scores for high schools in a suburban location (M=432.8) and a rural location (M=427.9) were significantly higher than for high schools in an urban location (M=417.5).

*Summary of Results*

The overriding research question was to determine if there was a significant difference among high schools using a 7-period alternating day schedule, a 4 x 4 block schedule, or a traditional single-period schedule for three or more years with respect to the Virginia SOL end-of-course tests. Analysis of data indicate that there was a significant difference (p<.05) in the mean scaled scores based upon the schedule type for 3 of the 6 SOL end-of-course tests reported in this study. Table 20, Summary of Main Effects of Schedule Type on SOL End-of-Course

Tests, reports the mean scaled score for each schedule type by SOL end-of-course test and indicates the source of the significance when appropriate.

Table 20

*Summary of Main Effects of Schedule Type on SOL End-of-Course Tests*

| SOL Test | 7 A-B | 4 x 4 | Traditional | Source |
|---|---|---|---|---|
| English: Reading | 452.9 | 443.1 | 448.3 | 7 A-B significantly higher than 4 x 4. |
| English: Writing | 453.5 | 441.5 | 448.0 | 7 A-B and traditional significantly higher than 4 x 4. |
| Algebra I | 418.4 | 420.9 | 413.3 | No significance. |
| Geometry | 436.6 | 426.4 | 434.2 | 7 A-B significantly higher than 4 x 4. |
| U. S. History | 398.0 | 394.8 | 394.2 | No significance. |
| Earth Science | 430.0 | 427.0 | 428.9 | No significance. |

A second research question was to determine if there was a significant difference among high schools in an urban, suburban, or rural location with respect to the mean scaled scores on the Virginia SOL end-of-course tests. Analysis of data indicate that there was a significant difference ($p<.05$) in the mean scaled scores based on school location for 5 of the 6 SOL end-of-course tests reported in this study. In all 5 SOL end-of-course tests, significance was found for the suburban high schools. A possible explanation for this finding is discussed in Chapter V. Table 21, Summary of Main Effects of School Location on SOL End-of-Course Tests, reports the mean scaled score for school location by SOL end-of-course test and indicates the source of significance when appropriate.

Table 21

*Summary of Main Effects of School Location on SOL End-of-Course Tests*

| SOL Test | Urban | Suburban | Rural | Source |
|----------|-------|----------|-------|--------|
| English: Reading | 448.4 | 455.3 | 444.2 | Suburban significantly higher than rural. |
| English: Writing | 446.9 | 455.0 | 443.7 | Suburban significantly higher than rural. |
| Algebra I | 419.6 | 420.3 | 415.7 | No significance. |
| Geometry | 424.3 | 441.5 | 428.5 | Suburban significantly higher than urban and rural. |
| U. S. History | 391.3 | 404.0 | 391.7 | Suburban significantly higher than urban and rural. |
| Earth Science | 417.5 | 432.8 | 427.9 | Suburban and rural significantly higher than urban. |

A third research question was to determine if there was a significant interaction between schedule type and school location with respect to the mean scaled scores on the Virginia SOL end-of-course tests. Analysis of data indicate that there was no significant interaction ($p<.05$) in the mean scaled scores between schedule type and school location for the six SOL end-of-course tests reported in this study. A discussion of these findings along with conclusions and recommendations for further study follow in Chapter V.