

CHAPTER III

METHODOLOGY

The purpose of this study was to compare the effects of the 7-period alternating day schedule, the 4 x 4 block schedule, and the traditional single-period schedule on high school student academic achievement. Student academic achievement was measured by using the mean scaled scores for the Virginia Standards of Learning (SOL) end-of-course tests for the 2000-2001 school year as reported by content area for each high school. The Virginia Standards of Learning end-of-course tests are part of the overall Virginia reform program that connects rigorous academic standards to graduation requirements for students and accreditation status for the high schools. The study also attempted to determine if length of time on the schedule was a factor by comparing only high schools that had used the schedule (7-period alternating day, 4 x 4, traditional) for three or more years. Other variables included school location and school size. All data were obtained by the use of a survey or from the Virginia Department of Education.

Population

The study included 261 high schools in Virginia utilizing either a 7-period alternating day schedule, a 4 x 4 block schedule, or a traditional, single-period schedule as identified in the *Directory of High School Scheduling Models in Virginia* (Rettig, 2000). Table 4 indicates the number and percent of high schools utilizing each scheduling model during the 2000-2001 school year.

Instrumentation

Surveys (see Appendix B) were distributed to the principals of each of the high schools to gain information about schedule type, school location, and school size. The principals also were asked to identify the core content area (English, history and the social science, mathematics, or

sciences) that had embraced the block schedule the most and the core content area that had difficulty embracing the block schedule.

Table 4

High School Scheduling Models in Virginia during the 2000 – 2001 School Year

Scheduling Model	Number of Schools	Percent
7-period alternating day	89	29.5%
4 x 4	94	31.1%
Traditional single-period	78	26.5%
Total	261	87.1%

Note. Table 4 is from the *Directory of High School Scheduling Models in Virginia, 2000-2001*, by Rettig, 2000.

The 2001 Virginia Standards of Learning (SOL) high school end-of-course tests were used to compare the mean scaled scores of the students in schools utilizing the 7-period alternating day schedule, the 4 x 4 block schedule, and the traditional, single-period schedule. The SOL end-of-course tests, a component of the Virginia Assessment Program, were designed to ensure that an effective educational program was established and maintained in the Virginia public schools (Commonwealth of Virginia, 1998). The SOL assessment was designed to assess the extent to which the students have learned the content and skills specified in the Virginia Standards of Learning. The tests are administered in grades 3, 5, 8, and at the end of certain high school courses in the core subjects of English, mathematics, history and the social science, and science. With the exception of the English: Writing test, the SOL test questions are multiple choice. On the Virginia Standards of Learning assessment, each student receives a scaled score ranging from 0 – 600. A scaled score of 400 or greater is required to pass the test. A scaled score

of 500 or greater is required for a designation of advanced proficiency. A mean scaled score of 400 or higher signifies that the average score of the students in this group was passing or above. A mean scaled score of 500 or above means that the average score of the students in this group was at the advanced level. A mean scaled score of 399 or lower means that the average scores of the students in this group were below the score required to pass.

There are 12 SOL end-of-course tests administered to high school students in Virginia. These 12 tests are distributed among four content areas: English, history and the social science, mathematics, and science. There are two tests in English: Reading, literature and research; and writing. There are four tests in history and the social science: geography, World History I, World History II, and U.S. History. There are three tests in mathematics: Algebra I, geometry, and Algebra II. There are three tests in science: Earth Science, biology and chemistry. The two tests in English are given during the 11th grade. All other end-of-course tests are given when the student completes the course.

Although there are 12 SOL end-of-course tests for high schools, six were used for this study. The six tests were identified by the Virginia Department of Assessment as the end-of-course tests assessing the largest number of students for the 2000-2001 school year (D. Keeling, personal communication, January 16, 2002). In most cases, students use these tests as the required verified unit of study for graduation. Appendix C explains the difference between the standard unit of study and the verified unit of study along with listing the graduation requirements for a standard diploma in the Commonwealth of Virginia. The tests selected were English: Reading, literature, and research; English: Writing; Algebra I; geometry; Earth Science; and United States History.

Validity and Reliability

A survey based on one developed by Arnold (1998) and Alderman (2000) was developed (see Appendix B). Arnold established validity and reliability based on the review of literature and a field test with his dissertation committee and mentor groups. The same procedure was used for this survey.

The Virginia Department of Education in conjunction with outside experts from three universities established validity and reliability on each of the SOL tests. A Content Review Committee established content validity. After the Content Review Committees deemed questions valid, they were field-tested. The Kuder-Richardson Formula #20 (KR-20) was used to determine reliability of test items on the Virginia SOL end-of-course tests. Phillips asserted that “the general rule of thumb for high-stakes decisions about individuals is a minimum of .85” (Virginia Department of Education, 1998, p. 11). Each of the tests used in this study met or exceeded this benchmark.

Data Collection

The mean scaled scores for the Virginia Standards of Learning (SOL) end-of-course tests were obtained from the Department of Assessment for the Virginia Department of Education. The scores were received electronically in an Excel format. The survey (Appendix B) was sent to the principals of the public high schools in Virginia that used either a 7-period alternating day or 4 x 4 block schedule during the 2000-2001 school year. Principals of the high schools in Virginia using one of the two types of block schedules were asked to answer questions regarding their schools’ schedule type, location, size, and length of time on the block schedule. Furthermore, the principals were asked to identify the core content area (English, history and the social science, mathematics, or science) that embraced the block schedule the most and the core content area

that had difficulty adjusting to the block schedule. Principals were asked this question to determine if one schedule type was better suited for one particular content area as opposed to using just one schedule type for all content areas in a high school. Data for the traditional single-period scheduled schools (location, size, and years on the schedule) were provided by the Virginia Department of Education. In addition, all high schools were disaggregated by size according to the Virginia High School League (VHSL) classification: A(0-500 students), AA(501-999 students), and AAA(more than 999 students).

Data Analysis

The quantitative study used a causal-comparative design to compare the results of schools on the Virginia SOL end-of-course tests based on the scheduling type and school location. Causal-comparative studies seek to discover the causes and effects of a behavior by comparing individuals to whom the behavior had occurred with individuals to whom the behavior has not occurred (Gall, Borg, & Gall, 1996). Furthermore, to compare the test scores between the schools with the different schedules, descriptive and inferential statistics were utilized. Descriptive statistics included the means and standard deviations for schedule type and school location. Inferential statistics included an Analysis of Variance (ANOVA). An ANOVA was used as the primary tool to test for mean differences between the mean scaled scores. The ANOVA procedure determined if the groups formed by the levels of the independent variables were different enough not to have occurred by chance (Gall, Borg, & Gall, 1996). If the means did not differ significantly, then it was inferred that the independent variables did not have an effect on the dependent variable. In this study, the dependent variable was student achievement as measured by the mean scaled scores of the SOL end-of-course tests in each of the 6 tests administered at the high schools; the variable and the data associated with it were on the interval

scale of measurement. The independent variables associated with the student academic achievement were the type of schedule (7-period alternating day, 4 x 4, or traditional) and school location (urban, suburban, and rural). In addition, the study controlled for the number of years on the schedule by using only those high schools that had been utilizing the schedule for three or more years.

If a statistical significance was found, the Tukey post hoc test was used to compare the differences in the means. This *t* test “adjusts for the probability that the researcher will find a significant difference between mean scores simply because many comparisons are made on the same data” (Gall, Borg, & Gall, 1996, p. 393). The post hoc test also identified which two groups had the significant *F* value. Tukey was chosen because of its use in most of the studies reviewed in the literature on block scheduling (e.g., Veal & Schreiber, 1999; Veal & Flinders, 2001). It is also considered a relatively conservative procedure providing greater control over a Type I error. (Huck, 2000).

On all statistical analyses, significance was reported at an alpha level of 0.05 (Huck, 2000). This level of significance was determined by its use in most of the studies reviewed on block scheduling (e.g., Lawrence & McPherson, 2000; Veal & Flinders, 2001). Table 5 indicates how data was collected and analyzed for each of the research questions. The Statistical Package for the Social Sciences (SPSS, 2000) was used to perform the statistical procedures.

Table 5

Data Analysis for a Comparison of the High School Schedules

Research Question	Data Collection	Data Analysis
1. Is there 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 mean scaled scores on the Virginia SOL end-of-course tests?	SOL Test Scores (mean scaled scores)	ANOVA
2. Is there 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?	SOL Test Scores, Principal Survey	ANOVA
3. Is there a significant interaction between schedule type (7-period alternating day, 4 x 4, traditional) and school location (urban, suburban, rural) with respect to the mean scaled scores on the Virginia SOL end-of-course tests?	SOL Test Scores	ANOVA
4. Are there any content areas (English, history, mathematics, or science) that appear to be positively or negatively affected by one block schedule as compared to the other?	Principal Survey	Descriptive Statistics