

THE FOUR-DAY SCHOOL WEEK: AN EXAMINATION OF LONG-TERM
STUDENT ACHIEVEMENT AT THE MIDDLE AND SECONDARY LEVELS

A Dissertation Presented to the Faculty
of
The Boyer Graduate School of Education

In Partial Fulfillment of the Requirements
for the Degree
Doctor of Education

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February 2003

We, the Undersigned Members
Of the Committee
Have Approved This Dissertation

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Abstract of the Dissertation

THE FOUR-DAY SCHOOL WEEK: AN EXAMINATION OF LONG-TERM STUDENT ACHIEVEMENT AT THE MIDDLE AND SECONDARY LEVELS

THE BOYER GRADUATE SCHOOL OF EDUCATION, 2003

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Statement of the Problem

Currently, there is a gap in the literature concerning the impact of the four-day school week. This dissertation compares academic achievement under the four-day week to the traditional five-day week over a fifteen year period at the middle and secondary levels, as two school districts transition in and out of the program.

Methodology

Test scores from the California Achievement Test (CAT), Iowa Test of Basic Skills (ITBS), Stanford Test of Academic Skills (TASK), Stanford Achievement Test (SAT), Tests of Academic Proficiency (TAP), and the Metropolitan Achievement Test (MAT) were analyzed from a fifteen year period. The data were broken into three pieces: the first five years when the districts were on a five-day school week (termed Pre-5 day), the second five years when the districts were on the four-day school week (termed 4-day), and the last five year period when the districts returned to a five-day school week (termed Post 5-day). Students were divided into sixteen cohorts. In order to be included as a member of a particular cohort, the student must begin and end with his or her cohort

group, be continually enrolled in school, and be present for testing. Adequate Yearly Progress, or AYP, was defined in the following manner: a student “made” AYP if the NPR from one year to the next was the same, greater than, or no lower than three NPRs on the various standardized tests. Chi Square tests were performed to determine if there were significant differences between the Pre-5 day week and 4-day week, the 4-day week and the Post-5 day week, and the Pre-5 and Post-5 day weeks. If significant differences were found, effect sizes were also calculated.

Results

Although there were various hindrances to the complete analysis of the data, enough comparisons were available to make valid judgments for eighth, eleventh, and twelfth grade students across reading, mathematics, and language subject areas.

In thirteen comparisons no relationship was found between scores and school week length (Pre-5 and Post-5 versus 4-day). In three comparisons, there was evidence against the four-day week. In two comparisons, there was evidence for the four-day week. Additionally, an assessment of the relationship between the lengths of the school year (Pre-5 versus Post-5 school weeks) supports the interpretation that the majority of students are making AYP across the fifteen year study interval. Measures of effect size also support these interpretations.

This research is one piece of evidence suggesting that there are no detrimental effects to students’ standardized achievement test scores when the four-day school week is used.

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Acknowledgements

My sincere thanks to Roger J. Duthoy, Ed.D., chairperson of my committee, for his guidance and patience. The expert advice of Louis S. Joseph, Ed.D., and Phillip E. Jones, Ed.D. is also appreciated. My thanks to Judith A. Rein, Ph.D. for her support in designing the statistical methodology.

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CHAPTER ONE

INTRODUCTION

Background

Time is the missing element in our great national debate about learning and the need for higher standards for all students. Our schools and the people involved with them—students, teachers, administrators, parents, and staff—are prisoners of time, captives of the school clock and calendar.

The National Education Commission on Time and Learning was created in 1991 with the passage of Public Law 102-62. The nine-member Commission was appointed by the Secretary of Education, the President of the Senate, and the Speaker of the House of Representatives. This independent advisory group was convened to make a comprehensive review of the relationship between time and learning in the nation's schools. The quote above is from the Commission's final report of April 1994, entitled, "Prisoners of Time."

The Commission reached several conclusions about school operations in America: (1) most schools begin between 7:30 AM and 8:00 AM and close between 2:15 PM and 3:00 PM; (2) the school calendar is usually nine months in length, running from late summer to late spring; (3) most schools offer a six-period day with 5.5 to 6.0 hours of instruction; (4) the national average length of a class period is 51 minutes; (5) the average calendar is 180 days in length; (6) graduation from secondary schools is based on Carnegie units (defined as one credit for completing one course over a school year); (7) the faculty salary schedule is linked to time—years of service with the district (and

completion of graduate credit); and (8) only 41% of the school day is spent in core academic subjects.

When the Commission issued its final report, two recommendations were emphasized: time should be used in new and better ways, and reform should begin at the local level to transform schools. The report stated:

“No community in the United States is so small or impoverished that it cannot benefit from an examination of how it uses time—if not in extending the day or year, at least in re-configuring how it uses the time now available.”

One of the most radical ideas to re-configure the use of time is the four-day school week. Simply stated, the weekly time in session is compressed from five days to four days, with a three-day weekend involving the district’s choice of either Friday or Monday. It is very unusual because almost all restructuring involves a lengthening or expansion of the school calendar in some manner. For example, a move to Year Round Education (YRE) involves a rearrangement of the typical 180-day school calendar and then an expansion of the curriculum to fill the intersessions.

The four-day school week has been utilized by various school districts around the nation since the early 1970’s. It has been employed almost exclusively within districts that are categorized as small and/or rural. Rural districts comprise fifty-seven percent of America’s school districts and enroll approximately twenty percent of the student population (Stephens, 1991). A district may be categorized as rural by one of two definitions. According to the U.S. government, a rural area is one that is merely non-metropolitan (Herzog & Pittman, 1995). The more technical definition used by the Census Bureau is a community with fewer than 1000 inhabitants per square mile or less

than 2,500 inhabitants (Herzog & Pittman, 1995). These communities also share the common characteristics of small enrollments, diversity, unique cultural legacies, and isolation (Nachtigal, 1982; Stephens, 1991; and Theobald, 1989).

The four-day school week has been utilized almost exclusively by small and rural school districts because of the special problems they face. It is certainly true that all public schools in America have many challenges. But some of the problems of small and rural schools are very unique (Childress, 1998). The problems are so specialized that in at least one state (Arizona), there have been periodic attempts to create a small and rural endorsement within the regular Principal or Superintendent administrative certificates. These problems center on five areas: finances, facilities, teacher quality and compensation, curriculum, and student achievement.

In a recent survey of rural school administrators, the financial problems were grouped under the categories of cash flow, late approval of state budgets, expenditures, budget oversight, and programs (Inman-Freitas, 1991). According to the researcher doing the survey, these are problems common to all school districts, but within smaller schools the context affects the ability to find solutions. The problem of revenue, or cash flow, is very serious because of (1) delayed tax receipts and (2) up to 30 percent of aid from the state after the end of the fiscal year. The delayed tax receipts forces the school to borrow money for district operations until the funds are actually received. In many areas it is common for the state budget to be two or three months late in being approved. This results in a lack of knowledge as to what the state revenues will be and forces late adjustments to the budget. Expenditures are a basic problem because they typically increase at a rate that is three to four times faster than the revenues. Many of the rural

administrators reported that budget oversight was difficult because of unexpected rising costs in special education funding, health insurance, or new expenses. The higher costs in special education were impacted by a decrease in federal support. Health insurance rates may rise dramatically within one year. And, new expenses include laws that require the district to cover social security or pension plans solely with local funds. The last common complaint mentioned in the survey, providing quality programs, is at the heart of the financial problems in rural schools. According to the survey, a lack of revenue makes the development of quality programming based on current pedagogy models nearly impossible to attain.

Intimately linked to the overall financial difficulties facing small and rural school districts is the serious problem of antiquated facilities. In an article examining the social and political influences on education in rural areas (Childress, 1998), it was noted that in states classified as mainly rural, funding formulas are usually based on population density. The end result is that general obligation bonding or tax overrides are rarely successful because of the high percentage of adults living on fixed incomes. Typically, there is a general negative opinion of education because many have not witnessed an improvement within their own lives. In some areas, many of the younger generation have left the rural community for better paying jobs in urban areas (DeYoung and Lawrence, 1995). Administrators must face a hostile, or at least ambivalent community, to try to repair or replace aging facilities with general obligation bonding or tax overrides.

A good example of the problem involving aging facilities and inequities in funding can be found in Arizona. The Superintendent of Public Instruction was the recent target of a successful class action lawsuit brought by forty-one of the state's small

and rural school districts. The basis of the lawsuit was the fact that the students in the rural school districts were not receiving equal funding for education. Because of the local tax base, relying on a secondary property tax, it was extremely difficult for a rural district to successfully pass a bond to improve the schools. Using the property wealth of a school district to fund improvements was felt to be a basic violation of constitutional rights. The case reached the Arizona Supreme Court in 1994 and the Court ruled that the current system of school capital finance was unconstitutional because it failed to meet the state constitution's general and uniform clause. The Court ordered the state legislature to find some means of equalizing funding for all students within the state and imposed a 1998 deadline. The end result was the passage of "Students FIRST" (Fair and Immediate Resources for Students Today) and the creation of the School Facilities Board (SFB).

The new revenues are provided by the state transaction privilege (sales) tax. The monies are transferred, without legislative appropriation, directly to the SFB from the State Treasurer. The SFB is currently surveying all the schools within Arizona and providing the necessary capital funds for major improvements. The funds are used for the correction of deficiencies in existing school facilities, building renewal, and new school construction. The districts retain the right to raise additional local funds by passing general obligation bonds and capital overrides.

For the first time, in at least one state, small and rural schools are starting to see their facilities brought up to the same standards as the wealthier school districts found in urban areas. Ironically, this solution to facility improvement may be short-lived. Many people in the legislature feel that the SFB has too much power. In a recent article in The

Arizona Republic, the authors complain that the board was created to oversee the equalization of funding but that this billion-dollar operation has little oversight from the Legislature. Further, the chairman of the board can go to the State Treasurer and ask for a check for almost any sum of money. Because of this freedom, the authors recommended more safeguards on the process. This political attitude, and an unforeseen shortage in revenues from the state's sales tax, has placed the small and rural schools back where they started.

The ability to recruit quality teachers and maintain a competitive salary schedule is the third major problem facing small and rural schools. With rare exceptions, the average annual salaries of teachers in rural areas, as well as the starting salaries, are significantly lower than other areas. They are lower as compared to urban schools as well as national or regional averages of all teachers, as reported by the National Education Association (Barker, 1985).

Administrators must rely on special recruitment techniques to attract teachers. These include the hiring of husband and wife teams, providing more fringe benefits, providing a teacherage (and in some cases, janitorial services for the housing), and even paying for interview or moving expenses. In the southern part of the nation, most of the rural schools are comprised of minority students with non-minority administrators and teachers. Efforts are being made to recruit minority teachers and administrators. One incentive is to provide state loans at very low interest rates which can be retired by teaching in small or rural districts (Rosborough, 1989). Several of the rural school districts in Alaska even offer scholarships to local students if they major in education and will return to teach in their home communities (LaBerge, 1999).

Retention of the teachers is at least as big a problem as finding them. Nationwide, the turnover of teachers in rural areas is more than twice the rate as in urban areas (Allred, 1982; Williams, 1985; and Bull, 1989). The problems include the fact that preservice preparation is more suitable for urban schools than rural schools. Many of the teachers who come to a rural school discover a conflict between their personal lifestyle and the pace of the community. Administrators find that the teacher-candidate must be immune to the psychological problems of geographic isolation, inadequate or non-existent shopping opportunities, distance from extended family, weather, and cultural opportunities.

These factors combine to create severe staffing problems in rural schools. Because of the continual shortage of teachers and administrators in the small districts, these areas also become the stalking ground of problem educators who cannot secure employment in the nicer districts.

An omnipresent challenge in small and rural districts is to provide a balanced curriculum. The district must have a core curriculum which meets the guidelines for the state-mandated standards. For example, in Arizona, the students must meet the standard on an exit examination at grades 3, 5, 8, and 12. The final examination at the secondary level determines the awarding of a diploma, or in the case of failure, merely a certificate of completion. This accountability standard follows the legal mandates of many other states.

In the small districts, there is typically a single teacher for each academic department. This person has the sole responsibility for assuring that the various competencies and standards are met. The teacher must be a highly competent generalist.

For example, the high school science teacher must be capable of delivering quality instruction in earth science, biology, chemistry, and physics on a daily basis. Finding such talented persons is very difficult. Districts are always looking for ways to broaden and enrich curricular offerings. These efforts may include team teaching, collaborations between neighboring school districts, arrangements with state universities or colleges, distance learning programs, or school-based enterprises.

In addition to the core curriculum, the rural districts struggle to provide a balanced selection of worthwhile electives, especially at the secondary level. Because of budgetary constraints, there is always a choice to be made between programs. Instead of a woods program and a metals program in the vocational department, it is one or the other. The decision is based on the current needs of the students. Larger districts offer most, if not all of the vocational programs eligible for Carl Perkins federal funding. If music is part of the curriculum, it is typically either a keyboard program or a band program, but not both. Marching bands at the level of the small and rural school district are practically non-existent. Art classes are offered if the teacher of a core academic subject has the pertinent skills and background. Unless there is some historical precedent, a small and rural school will rarely have the financial means to hire a full time art teacher.

The extra-curricular arena also presents some special challenges. In many states, the students at small and rural schools play 8-man football because of the inability to field a regular size team. Because of their geographical isolation, the travel time between schools is considerable. A classical example is the Fredonia School District in northern Arizona. Located on the Arizona Strip (the strip of land between the north rim of the

Grand Canyon and the Utah border), students must travel one full day ahead of time to go around the Grand Canyon to reach the first school in their athletic conference. When an athletic team travels, the players, statisticians, and cheerleaders may constitute fifty percent or more of the high school student body, leaving very few students in class.

All of the aforementioned problems combine to affect the critical area of student achievement. The general poverty of the rural areas, the monolithic economy of the community, the financial plight of the district, the poor infrastructure of the facilities, the inability to recruit and retain quality teachers, and the daily struggle to provide a quality curriculum combine to impact student achievement. These problems are so overwhelming that many small and rural districts exist on the knife edge of extinction from school year to school year. There is no surplus in the district's budget and the administration and staff must perform minor miracles of creativity and ingenuity on a regular basis.

In the words of one unidentified school district superintendent in New Mexico, "There was nothing noble or high-minded about the birth of the four-day school week." It was implemented to simply save energy and transportation costs. By closing the school one day in five, various studies have shown that it can save 10 to 23 percent in transportation costs and 10 to 25 percent in fuel and electricity costs (Blankenship, 1984; Hazard, 1986). From the outset, school boards and administrators had no other goal or intention in implementing the four-day week other than addressing the major problem of finances.

Following adoption, however, the school districts which remained on the four-day week for several years, began to observe unusual benefits outside the original purpose for

implementation. These have been reported extensively in the educational literature base over the past thirty years. It was found that the four-day school week solved many of the other problems afflicting small and rural schools. In the area of school facilities, the improvements in the finances led to direct and indirect opportunities. The saved funds could be used directly for repair or replacement of buildings. Putting the district on a solid financial basis also led to increased confidence in the school and administration. This, in turn, led to successful bonding or tax overrides to improve facilities. In the area of teacher recruitment and retention, it was discovered that many quality teachers were willing to commute the extra distance to a rural area in exchange for the opportunity of having every weekend be a three-day weekend. The many drawbacks of living in a rural area were overshadowed by this unique employment opportunity. Rural districts that typically had, at best, one or two applicants for a teaching position, suddenly had the choice of 10 or 20. Retention of the faculty improved because the teachers viewed the three-day weekend as a perquisite more valuable than a high-end salary schedule. With the improvements in quality teachers and budget, there was a direct improvement in the curriculum and quality of instruction. Besides the extra funds for instructional materials, there was an immediate increase in academic learning time. Most of the districts on the four-day week concentrated their extra-curricular activities on the off-day (Friday or Monday). This resulted in a truly unique situation for the classroom teachers: uninterrupted classroom time. The heavy toll from field trips and athletics vanished. No longer did the teachers find 50 percent or more of their classes absent for a conference game at a distant school. No longer were there interruptions over the intercom asking for all the members of one class to report to the auditorium for school photographs. The

teachers who have experienced the pureness of this teaching situation, day in and day out, testify that no other program in their experience has made such an immediate and dramatic impact on instruction.

It was found that the four-day week positively impacted the educational process in terms of finances, facilities, teacher recruitment and retention, and curriculum. It was reported to have a positive effect in many other ancillary areas: There were reports of dramatic improvements in student attendance and punctuality. There were improvements in school atmosphere and teacher morale. There were articles about fewer discipline problems and more school awards bestowed for perfect attendance. There were reports of unanticipated savings in the use of substitute teachers as the regular faculty moved dental and doctor appointments to the Friday or Monday of the three-day weekend. In many respects, the four-day school week seemed to be a tailor-made solution for the challenges facing small and rural schools.

But, despite these many positive benefits, the community hostility towards the four-day week has continued unabated. There has been a reluctant acceptance in some areas from fiscal necessity, but the lingering, unanswered question is simply this: How does the four-day school week address the major problem of student achievement? This is the great question which could put to rest much of the controversy. Research studies examining the impact to student learning, as measured by standardized test scores, especially at the secondary level, are extremely rare. Long-term longitudinal studies are almost non-existent.

Statement of the Problem

This researcher was able to find one long-term longitudinal study comparing

academic achievement between the four-day and five-day school week. This study was conducted at an elementary school. There is an important gap in the literature to elucidate the educational impact at the secondary and middle school levels. This research would fill that gap.

Research Questions

This study was guided by these research questions:

1. What is the effect on secondary and middle school student learning (as measured by standardized test scores) when the students move from a five-day school week to a four-day school week?
2. What is the effect on secondary and middle school student learning (as measured by standardized test scores) when the students move from a four-day school week to a five-day school week?

Methodology for Questions #1 and #2

The test scores on the various subtests of six nationally standardized tests will be individually compared before and after the implementation/withdrawal of the four-day school week. The six tests are the California Achievement Test (CAT), the Iowa Tests of Basic Skills (ITBS), the Tests of Achievement and Proficiency (TAP), the Stanford Achievement Test (SAT-9), the Stanford Test of Academic Skills (TASK), and the Metropolitan Achievement Test (MAT). The first five year period covers the school years from 1979 to 1984 (“Pre-treatment” period on the five-day week). The second five year period covers the school years from 1984 to 1989 (“Treatment” period on the four-day week). The third five year period covers the school years from 1989 to 1994 (“Post-treatment” period of the five-day week). The objective of this methodology has two

parts: the comparison of scores as the four-day week is introduced and then the comparison as the four-day week is withdrawn. The comparisons will be made between the *same* students at the *same* school. Using statistical methodology, it will be determined if there is a significant difference in the scores. If this is true, the null hypotheses will be rejected ($\alpha=0.05$) and the research hypothesis supported.

3. How do the standardized test scores compare longitudinally over a fifteen year period in a secondary and middle school as they transition in and out of the four-day school week.

Methodology for Question #3

The test scores on the subtests will be compared for the five year period on the five-day week preceding the district's move to the new program, the five year period on the four-day week, and then the five year period back on the five-day week. The objective of this methodology is to examine general trends in *aggregated* scores on the various subtests over the fifteen year period. If there is a significant difference ($\alpha=0.05$), the null hypotheses will be rejected and the research hypothesis supported.

4. What are the opinions of parents towards the four-day school week while the secondary and middle schools are on the program?

Methodology for Question #4

Survey data exists in the archives of the school district. This descriptive data will be presented as a side issue. The objective of this methodology is to examine the attitude of parents over the fifteen year period of the study. Although it does not relate directly to the main thrust of the research hypothesis, it does relate indirectly. Parental support (or lack thereof) for the new program could have an impact on test scores.

Purpose of the Study

The purpose of this study is to determine the effect of the four-day school week on student achievement at the middle and secondary levels. This research will examine student achievement, as measured by standardized test scores, in a long-term longitudinal manner. It will compare the test scores of students in a typical small and rural high school before, during, and after the implementation/withdrawal of the four-day school week. It will compare the test scores between the same school and the same students on a five-day school week and a four-day school week.

Null Hypothesis

The null hypothesis in this research problem states that there will be no significant difference in the scores on the various subtests of a nationally standardized test before and after the implementation of a four-day school week, as compared to a five-day school week. It further states that there will be no significant difference in the scores on the various subtests of a nationally standardized test before and after the removal of the four-day school week and a revision to a five-day school week. Although the four-day week has been used solely for fiscal reasons, it is this researcher's hypothesis that the unanticipated benefits which accrue will catalyze a significant improvement in student learning, as measured with standardized test score results. This will be demonstrated as the four-day week is implemented, and then as it is withdrawn, to a return to a traditional five-day school week within the same school.

Importance of the Study

The fundamental importance of this problem lies in the fact that it is unknown whether or not secondary students can physically and psychologically adjust to a four-day

school week. This format means longer days in session because the total minutes mandated by state law must be made up with an extended day. If students can successfully learn in this compressed environment, or at the least, not be adversely harmed, it will provide a powerful tool for the survival of small and rural school districts. As previously explained, the four-day school week has been found to be a unique and marvelous tool for addressing the severe problems of finances, facilities, teacher recruitment and retention, and curriculum. This research study will address the fifth major problem: student achievement. If the null hypotheses are rejected, administrators will no longer have to apologize to a hostile community for the anticipated negative impact to student learning, as the district seeks innovative ways of balancing the budget. It would provide valuable resources for facility improvement. It would give the governing board a powerful recruiting tool: quality administrators and teachers would be drawn to positions where every weekend was a three-day weekend. It would help both the regular curriculum and extra-curricular activities by providing a tool to segregate these activities, thereby improving the quality of both.

In a grander sense, this problem addresses the overall issue of time and learning for all students, regardless of school size or setting. It seems to be a given in the current national debate over school calendars, programming, and days in session that more is automatically better. It is politically correct for the nation's schools to assume a larger and longer role in educating students, with little or no increase in funding. The solution of this research problem, if the null hypotheses are rejected, would help shift the focus of attention from one of quantity to one of quality, where this researcher believes it rightly belongs.

In a philosophical sense, the importance of the research goes to the heart of education as a profession. Educators are surrounded by the drive for educational excellence. Within this rhetoric are words like “reform,” “standards,” and “accountability.” But hidden behind all the political talk are the artificial boundaries imposed on the school system by the community. These boundaries are rarely an issue when other professionals, such as a medical doctor or attorney, have to make an important decision concerning their clients. With education, it is a case of the parents, community and nation asking for higher achievement, but only if the reform fits within their preconceived notions and is convenient for their lifestyle. The rallying cry is, “Give us educational excellence while you baby-sit for the specified number of hours per day!” When a school district moves to the four-day school week, there is a major disruption to the lifestyle of the parents. The most commonly used phrase in the literature, when the format is rejected, is that the four-day week caused a “burden to the parents.” But, if the hypotheses are supported, it forces the parents to face the reality of educational excellence versus baby-sitting. Rarely does the American public have to make this clear-cut choice. In so doing, education moves closer to becoming a true profession.

Definition of Terms

The terms listed below are used in this research study. The definitions are given to create a common understanding.

Academic Learning Time. The time when students are actively engaged in learning; as opposed to classroom time in which the teacher is taking attendance, returning papers, responding to the intercom, etc.

Adequate Yearly Progress (AYP). A definition used to indicate that a student has made at least one year's progress in learning in a particular subject area.

Extended Calendar. The name given to any program that is designed to increase the amount of instruction received by students (Richmond, 1978). It may also refer to a "Year Round Calendar" when the district provides services during the intersessions of a Year Round Education program so that students have the opportunity for continuous education throughout the year.

Four-Day School Week. A compressed version of the typical five-day school week in which the total number of minutes in session is reformatted to fit four consecutive days each week. The most common are four days in session with each Friday or Monday off, creating a three-day weekend.

Intersessions. The time between the regular school days in a district on Year Round Education. The intersessions add-up to the approximate length of the traditional summer break.

Small and/or Rural School. A school district located in a community which has a total population of fewer than 2500 persons or less than 1000 persons per square mile.

Year Round Education. A system where the typical school calendar of 180 days is broken into approximately even pieces of smaller days, thus eliminating the traditional summer break. It is abbreviated "YRE."

Scope and Delimitations/Limitations of the Study

This study is classified as ex post facto. The financial impact of the four-day school week has been well-researched. There is abundant survey data available on teacher, administration, and community attitudes towards the four-day school week. Its

positive impact on facilities, curriculum, and staffing has also been documented. This study is focusing on the long-term effects, negatively or positively, at the middle and secondary levels on student achievement. Some assumptions, the delimitations, and the limitations are listed:

Assumptions

1. Standardized test scores are a valid measure of student achievement.
2. The standardized tests were administered and scored in the proper manner.
3. The sample number was of sufficient size to permit a valid statistical analysis.
4. The high school and middle school selected for the study are typical of other small and rural secondary and elementary schools.

Delimitations

1. The study is delimited to the secondary and middle students at two small and rural schools.
2. The study is delimited to a relatively small sample size of students.
3. The study is delimited to the subtests of the standardized test.
4. Although there is an abundance of scientific and anecdotal information on the relationship of the four-day week and finances, facilities, staffing, curriculum, attendance, school climate, and extra-curricular activities, this study is delimited to academic achievement.

Limitations

1. All of the students come from the same secondary and middle schools. One of the characteristics of small and rural schools is that they each have unique cultural legacies. This uniqueness compounds the problem of generalizability.

2. Neither the school nor the students were randomly selected or assigned in this ex post facto study.
3. There is no way to address the issue of teacher preparation of the students for the yearly standardized test. As the faculty population was relatively stable over the length of the study, the between-groups methodology used in this ex post facto study will minimize this competing hypothesis.
4. This study spans a fifteen year period. It is not possible to eliminate all alternative causes in a comparison of variation in test score data. The student enrollment remained stable within one percent. The faculty turnover rate for this time period was less than five percent. The facility was on the same campus. There were no major shifts in curriculum. But, despite these constants, other variables, unnoticed or unmeasured in this ex post facto study, could have been the cause of changes in test score data. These rival hypotheses are acknowledged.

Summary

This chapter has presented an overview of the many severe problems facing small and rural school districts. These problems center on finances, facilities, teacher recruitment and retention, curriculum, and student achievement. Because of their isolation and poverty, many of the solutions available to larger or urban districts do not exist. When it comes to providing an education for the students in the district, they are the “only card game in town.” It was shown how these problems, especially those financial in origin, have led to the natural evolution of the four-day school week as an overall solution. Its introduction has provided unanticipated improvements in the other

areas of facilities, staffing, and curriculum. However, the important question of impact to student achievement has not been fully answered, especially at the secondary level. This chapter provided an overview of how the four-day school week helps in each of these areas. It demonstrated how this research problem is directly and significantly linked to the improvement of small and rural schools. The purpose of the study, research questions, objectives and methodology, null hypotheses, importance of the study, definition of terms, and delimitations/limitations were presented.

In Chapter Two of this study, an overview of the literature will be provided. The historical trends and philosophies of educational pioneers which have influenced the present-day models of time management will be presented. Secondly, the literature relating to current attempts to restructure time will be summarized for three models: lengthening the time in session, modifications of the schedule, and year-round education. Finally, the literature concerning one model, the four-day school week, will be examined in detail.

CHAPTER TWO

REVIEW OF THE LITERATURE

At a recent symposium in Arizona, school administrators met with leaders of business and industry. The purpose of the conference was to convey to educators the expectations of future employers of high school graduates. As with many in the audience, it was expected to hear the need expressed for graduates with solid skills in writing, reading, thinking ability, computer literacy, communication ability, and basic vocational training. Instead, the keynote speaker stated that the real need was for employees who simply came to work on time. He said that if employees of a business needed any particular job skill, they would receive the necessary training in-house. But, the fundamental need was for punctuality.

The importance of time in the school setting is generally overlooked. It is the hidden variable that serves as the foundation for many decisions. Invisible, it permeates the culture of the school and places boundaries on every endeavor. It is for this reason the National Education Commission on Time and Learning recommended that the issue of time be placed at the very top of the nation's education reform agenda.

Today's public schools are Frankensteins—organizations assembled from bits and pieces of countless historical artifacts. Nowhere is this assemblage more evident than in the use of time. This chapter reviews some of the historical trends and contributions of educational pioneers which impact the management of time today. It will show why our present system has been characterized by the Commission as obsolete, because the continual misuse or disregard of time will undermine the best efforts for improvement. It will summarize three modern strategies to restructure time. It concludes with a

comprehensive review of the literature that pertains directly to the four-day school week, one of the few attempts to think outside the box and radically change the use of time in a public school.

Historical Antecedents

The ideas of Plato, the student of Socrates, form the earliest thread which can still be found in today's school systems. In the *Republic*, Plato wrote about his ideal society. The people would be divided into three categories or classes, depending on their intelligence. The highest class was the philosopher-kings. These were the most intelligent persons who had the ability to lead the people correctly. The second category consisted of the warriors. They were characterized by a strong will power and athletic prowess, rather than a strong intellect. They were valiant fighters who could defend the society. At the bottom were the workers who formed the foundation of economic support. Plato believed that women, like men, could be sorted into these three categories to create a harmonious society.

The education of these groups began at an early age when children were separated from their parents and placed in state nurseries. Beginning at age six and lasting until age eighteen, the youth studied gymnastics, music, writing, reading, choral singing, and dancing. After age eighteen and lasting until the early twenties, the students would study military rules and tactics. By the age of twenty, Plato believed that the philosopher-kings could be identified and were segregated for specialized studies in astronomy, mathematics, music, and science. This category, by age thirty, was split into two groups: those with the highest intelligence becoming the political rulers, and those with lesser intelligence becoming the civil servants (Chambliss, 1987).

The direct influence of Plato and other Greek philosophers can be seen today in the Great Books curriculum and the ideals of a liberal education. The three categories of his ideal society can be found in every modern high school: the philosopher-kings on the college preparatory track, the warriors striving for athletic scholarships, and the vocational students receiving the basic training to get a job immediately after high school graduation.

His legacy touches the present issue of time management in many areas. Plato's system is the first known example of a formalized curriculum with standards and benchmarks that must be reached by a certain age. Students must complete the sequence of standards within a fixed time frame and be judged by their efforts. Successful students are allowed to move forward and fulfill more prestigious positions in society.

Today, 49 of the 50 states have mandated essential skills, or a state-approved list of minimum standards (Marzano & Kendall, 1998). Each of these standards, in turn, has associated benchmarks that are to be reached in an appropriate sequence by the specified grade. As the entrance to first grade is formally linked to a child's age, these standards are in lock-step with a pupil's age.

In addition to the individual state standards, there are also standards issued by the federal government and through national organizations. For example, the National Committee on Science Standards and Assessment (NCSSA) published in 1996 its list of standards for all K-12 science teachers in the nation. The 200 page document divided the curriculum into three components: K-4 with 28 standards, 5-8 with 28 standards, and 9-12 with 34 standards. The American Association for the Advancement of Science (AAAS) has also published its list of science standards (in 1993). It includes 60

standards over four levels (K-2, 3-5, 6-8, and 9-12). In addition to these two documents, the National Science Teachers' Association has also published its list of standards. Entitled, "Scope, Sequence, and Coordination of National Science Education Content Standards," it was released in 1993. These three lists are in addition to the individual state standards. Fred Temples, the Associate Superintendent of the California Department of Education has expressed the opinion that most states would like to be free to establish their own standards (Olson, 1995).

Unfortunately, there is little coordination between the organizations issuing the standards. The lists vary significantly in content, structure, and level of generality (Marzano & Kendall, 1998). To include all the recommended standards, a recent survey had to analyze 116 documents (federal and state). A K-12 curriculum which included all recommended components would have 200 separate standards and 3,093 associated benchmarks. With this much material to learn, the management of time becomes critical.

The National Education Commission on Time and Learning reported that the nation's schools, with rare exceptions, all followed the same model: schools started at 8:00 AM and ended at 3:00 PM; the school year lasted nine months; and each week consisted of five days with an average of six periods per day. Students were expected to finish the secondary curriculum in the standard four years. It lamented that there was no relationship between the complexity of the subject matter and the amount of time assigned to master the objectives. A shop or gym class received the same 51 minutes per period as an advanced placement science class. Further, the secondary school graduation requirements have become based on a standard Carnegie unit—one credit for seat time in a one-year course that meets daily.

The establishment of an ideal curriculum with age benchmarks gives predictable results. In the words of the Commission on Time and Learning, “the school clock governs how families organize their lives, how administrators oversee their schools, and how teachers work their way through the curriculum.” With the establishment of an arbitrary age to begin or end instruction, time becomes the master that dictates the manner in which material is presented and also sets the boundaries for how much of an opportunity students will have to comprehend and learn it.

With 200 standards and 3,093 benchmarks, is it possible for a typical school, as defined by the Commission, to cover the material? Mathematically, the typical school would have 13,104 hours of instruction. The Commission reported 41% of the school day was used for instructional time. Other researchers have reported as low as 21% (Park, 1976), to 31% (Conant, 1973), to a high of 69% (Marzano & Riley, 1984). Teachers must constantly see to other matters such as attending to the welfare of individual students, disciplining, restoring attention to the lesson, responding to the intercom, doing bookkeeping procedures such as attendance, and providing transition from activity to activity. The balance, referred to as Academic Learning Time, is when the student is actually experiencing learning. Using the best-reported scenario of 69%, the standards would have to be taught in 9,042 hours. Research has found that it takes approximately five hours for a well-organized teacher to appropriately teach the curriculum associated with a single benchmark (Marzano & Kendall, 1998). It was noted that the 15,465 necessary hours for teaching all benchmarks falls considerably short of the 9,042 presently available under a best-case scenario. Marzano and Kendall estimate that to realistically teach all the recommended standards would take twenty-two years,

nine more than is currently established. Obviously, there are only two solutions: the number of standards/benchmarks has to be decreased; or, the amount of instructional time has to be increased.

Although Plato's work is the first historical example of the importance of standards and time, his ideas have cast a long shadow through the work of many other educational pioneers and into our present-day dilemma. Our current standards documents, if weighed together, would total over 14 pounds, be approximately six inches in height, and comprise about 2,000 pages. And, in recent years, many more pages, pounds, and inches could be added to these totals (Kendall & Marzano, 1997).

The work of Aristotle, the pupil of Plato, forms another continuous thread. Like Plato, he believed in a formalized curriculum that would be taught at the appropriate age. He emphasized the conceptual nature of knowledge. A school would be a place where expert teachers would transmit their knowledge to motivated students. This philosophy forms the foundation of Medieval Scholastic Education and extends to the present with perennialism and the work of such educators as Mortimer J. Adler (Adler, 1982).

In our present schools there is a continuous conflict between the importance of a liberal education and the necessity of earning a living. For example, within the present arena of vocational education, Carl Perkins federal monies are used to establish hierarchical programs which prepare a student for the job market. At Level One, typically introduced in grades seven and eight, the student is introduced to the arena of technical work. The middle school student receives a broad sampling of vocational fields. As a freshman and sophomore, the student enters the Level Two program and receives the basic training in a general category such as auto mechanics or computer

repair. Level Three programs cover the in-depth training required to immediately enter the job market. When this third level is completed during the junior and senior years in high school, the student graduates with an authorized certificate in refrigeration or carpentry, for example. In a few of the more technical areas, the student must do Level Four at a local community college before employment. For many persons within the vocational arena, the liberal arts or college preparatory curriculum is generally looked upon with disdain. College is a place for the wealthier students to go play for another four years and avoid the necessity of earning a living. It is seen as an opportunity to postpone becoming a productive member of society.

These programs and opinions are in opposition to the ideas of persons from Aristotle to Mortimer Adler. They feel that there exists a fundamental curriculum that all students must master in order to be considered educated. This curriculum includes speaking, writing, listening, reading, calculating, observing, measuring, estimating, and problem solving. These ideals are best taught through the media of foreign language, fine arts, mathematics, science, history, geography, literature, and social studies. Adler does not believe in the two track system of our present high schools and feels that education is democratic in that everyone needs to receive the same education. This philosophy teaches that there is a need for inner self-respect that only comes from a classical education. Regardless of your future employment, the truly educated person needs this foundation to be a productive citizen and member of society.

These two philosophies come head-to-head with the management of time. Our standard model serves as the foundation for both systems. The Commission on Time and Learning states that “by relying on time as the metric for school organization and

curriculum, we have built a learning enterprise on a foundation of sand.” This foundation of sand consists of five premises that are known to be false: (1) the idea that students arrive “ready to learn in the same way, on the same schedule, all in rhythm with each other;” (2) the idea that “academic time can be used for nonacademic purposes with no effect on learning;” (3) the idea that yesterday’s calendar is good for today despite many changes in our society; (4) the idea that “schools can be transformed without giving teachers the time they need to retool themselves and reorganize their work;” and (5) the idea that we can “expect world-class academic performance from our students within the time-bound system that is already failing them” (Report of the National Education Commission on Time and Learning, 1994, p. 3).

At the elementary school level, there is typically one track to follow. At the secondary level, the track splits and the students must choose their future and move forward appropriately. Under the current model, there is simply not enough time for a student to participate in both tracks. Unless the student has extensive prior knowledge or experience from outside employment, a choice must be made between the two. Upon making this choice, time is again the taskmaster and the student must align with one of two philosophies that have been in opposition for over two thousand years.

Jan Komensky (1592-1670), also known as Comenius, was one of the first post-medieval educators to formally link the importance of time and learning. According to him, “instruction should be arranged according to four six-year periods: (1) infancy, when education is informal and centered primarily in the home; (2) childhood, when learning takes place in the formal school; (3) adolescence, when the student is exposed to the learning of Latin; and (4) youth, when the student attends the higher studies of the

university” (Ornstein & Levine, 1989, p. 121). The linking of the timeliness of education to the general patterns of human growth and development is felt to be one of his greatest contributions. He was also an advocate for universal education, a philosophy which would have vast implications for the present-day management of time.

John Locke (1632-1704) wrote *Some Thoughts Concerning Education* in 1697. He recommended that education should begin at a very early age. He also believed that formal instruction should be integrated within the framework of the child’s physical environment. The other necessary components that support learning include activities, diet, fresh air, adequate sleep, frequent baths, regular exercise, play, the eating of plain food, and recreation. All of these factors are foundational today in the use of time to regulate the pace of learning. The use of recess breaks, passing time, and vacations find their roots in Locke’s idea of learning as a gradual process. According to him, the educational process should be slow, gradual, and cumulative (Locke, 1959). Within the secondary school structure of today, the use of longer periods for hands-on activities such as laboratory science can be traced to Locke. His emphasis on empiricism and learning by doing, impact the daily schedule of most modern schools.

Jean Jacques Rousseau (1712-1778), like Comenius, was an early developmental psychologist. He linked the appropriateness of education to the proper time in a child’s growth and development. For him, there were five main stages of growth. In the first stage, infancy, the baby learns to exercise his body. He initiates the first contacts with the surroundings of his environment (Ornstein & Levine, 1989).

During his second stage, childhood, the child’s first instructors are his eyes, ears, and hands. This stage (from five to twelve) is one in which the environment is explored.

Formal instruction is not introduced until the third stage, boyhood, is reached. Manual instruction is taught at this stage so the relationship between mental and physical work could be understood.

From ages fifteen to eighteen is the stage of adolescence. A student's instruction would include human sexuality, government, business, and economics.

During the last stage from eighteen to twenty, the pupil would be encouraged to learn about society. Aesthetic tastes would be cultivated by visits to the library, the theatre, or museums.

Besides the direct link to the use of time, Rousseau's ideas have many indirect links in today's schools. Exploratory learning, individual schedules, the elimination of tracking, and group projects all have their foundation in the child-centered progressivism of Rousseau.

Johann Heinrich Pestalozzi (1746-1827) founded an educational philosophy that is intimately linked to the use of time. He started a type of pedagogy with specific strategies. He felt that teaching should "(1) begin with the concrete object before introducing abstract concepts; (2) begin with the learners immediate environment before dealing with what is distant and remote; (3) begin with easy exercises before introducing complex ones; and (4) always proceed gradually, cumulatively, and slowly" (Ornstein & Levine, 1989, p. 128). As with Locke, the use of time in regulating the pace of learning is critical. In the United States, his ideas were applied to the education of disadvantaged children at the beginning of the last century. He emphasized that children need emotional security before they can be taught. The element of time is critical to establish the

relationship of trust between teacher and pupil. This idea also serves as the foundation of the modern concept of school-home relationships.

Johann Herbart (1776-1841) created a system of learning that was very popular in the United States. Called the “Herbartian Method,” it relied on five steps: “preparation,” when the teacher links the readiness of the learner for the new lesson by referring to materials that were learned earlier; (2) “presentation,” when the new lesson is given; (3) “association,” in which the new lesson is deliberately related to ideas or materials that were studied earlier; (4) “systematization,” or the use of examples to generalize the lesson; and (5) “application,” which involves the testing of the new ideas to determine if the student has understood and mastered them (Ornstein & Levine, 1989, p. 130). This pedagogy is the foundation of the Madeline Hunter “Direct Instruction Model,” used by many modern school districts as the basis for their teacher evaluation instrument. This model emphasizes the highly structured use of time in following specific steps from the beginning of the tardy bell until the conclusion of the class with the passing bell. Although Herbart’s model was condemned by John Dewey and other progressive educators, it serves as the foundation of the modern lesson plan, which is built around the standard one-period unit of time.

Friedrich Froebel (1782-1852) is the father of early childhood education. Today’s kindergarten and pre-kindergarten owe their existence to his emphasis on the cultivation of songs, crafts, stories, games, and basic instruction. William Harris, U.S. commissioner of education (1894), promoted the idea that kindergarten was a necessary first step in the American school system. He felt it was essential for getting a child accustomed to the daily routine of an elementary schedule (Tanner and Tanner, 1980). At the same time he

was advocating early childhood education, Harris issued a national report in which he promoted the idea of keeping urban schools open and operating throughout the year. He complained that the number of days in session was reduced from 193.5 to 191. He wrote (and is quoted in the Commission's report):

“The constant tendency has been toward a reduction of time. First, the Saturday morning session was discontinued; then the summer vacations were lengthened; the morning sessions were shortened; the afternoon sessions were curtailed; new holidays were introduced; provisions were made for a single session on stormy days, and for closing the schools to allow teachers...to attend teachers' institutes. The boy of today must attend school 11.1 years in order to receive as much instruction, quantitatively, as the boy of fifty years ago received in 8 years...It is scarcely necessary to look further than this for the explanation for the greater amount of work accomplished in the German and French than in the American schools” (Report of the National Education Commission on Time and Learning, 1994, p. 5).

Ironically, some of this present-day order and routine of the elementary school, promoted by Froebel and Harris, has been specifically condemned by the National Education Commission on Time and Learning. It is one of the constraints that lock the nation's public schools into a rigid framework with few options for the creative use of time.

Today, the public schools also find themselves in the competitive marketplace with the many private and charter schools. The correct management of time and resources in sustaining all day kindergarten schools and well-structured pre-kindergarten schools, as well as early childhood classes, is essential for survival.

Herbert Spencer (1820-1903) is classified as a Social Darwinist. He sought to implement the evolutionary ideas of Charles Darwin into the classroom. His ideas evolved from the growth of industrial society in which the “required vocational and professional education was based on utilitarian (scientific and practical) objectives rather than on the very general educational goals associated with humanistic and classical education” (Gutek, 1987, p. 253). He felt that education should deal with the progression and survival of the human race. “According to Spencer’s curriculum rationale, (1) educational priorities should be based on those human activities that sustain life; (2) education that is valuable should prepare men and women to perform these activities efficiently; and (3) science should have curricular priority because it aids in the effective performance of life activities” (Ornstein & Levine, 1989, p. 137).

His theories have many implications for the use of time. He believed that instruction should be unhurried, cumulative, and gradual. He felt that education, like life, should be competitive. In the modern school, the use of rank-in-class, grade point averages, membership in the National Honor Society, and the awarding of valedictorian honors, all have their origin with Spencer. He emphasized the study of science over the classical works of literature. With the launching of the Soviet satellite, Sputnik, in 1957, Spencer’s ideas were at the forefront of American public education. Science and math became the more important subjects. More time and resources were devoted to these areas as the United States struggled to fight the cold war.

Today, his philosophy impacts the use of time because we live in a global economy. The Commission reported that in our agrarian and industrial past, when most Americans worked on farms or in factories, society could live with the consequences of

time-bound education. Able students usually could do well and accomplish a lot. Dropouts learned little but could still look forward to productive unskilled and even semi-skilled work. Society can no longer live with these results. Because Spencer felt that school like life should be competitive, he would agree that the realities of a global economy provide few decent jobs for the poorly educated. He would agree that a 21st century standard is required. In the words of the Commission, “All of our citizens, not just a few, must be able to think for a living. Indeed, our students should do more than meet the standard; they should set it” (Report of the National Education Commission on Time and Learning, 1994, p. 3). With the national movement towards measurable standards of student performance, time must become a resource that is adjustable.

John Dewey (1859-1952) is an educational pioneer who emphasized pragmatism. He felt that the classroom should be a model of society. He wrote of five steps for the correct assimilation of knowledge:

“(1) the learner has a genuine situation of experience—involvement in an activity in which he or she is interested; (2) within this experience, the learner has a genuine problem that stimulates thinking; (3) the learner possesses the information or does research to acquire the information needed to solve the problem; (4) the learner develops possible and tentative solutions that may solve the problem; and (5) the learner tests the solutions by applying them to the problem” (Dewey, 1916, p. 84).

His ideas strike a resonant chord in the recommendations of the National Education Commission on Time and Learning. Dewey felt that schools should be free to experiment. Administrators, teachers and students should be free to implement new

ideas. Time should be available for reflection and introspection. The classroom would be a miniature social laboratory. This is precisely what is not happening in our modern schools. The Commission's final report was entitled, "Prisoners of Time." In their words, "Learning in America is a prisoner of time. For the past 150 years, American public schools have held time constant and let learning vary. The rule, only rarely voiced, is simple: learn what you can in the time we make available" (Report of the National Commission on Time and Learning, 1994, p. 7). The demands of time have become so binding in our modern society that schools are also severely constrained. Schools exist within the boundaries of a very high fence. Educators are given the freedom to create, experiment, and strive for educational excellence, just as long as they stay within the fenced area. Dewey felt that education should be a social experiment. When it comes to the use of time, he would be one of the first to advocate the removal of all constraints in the search for pragmatic solutions. He would agree with most Americans today that we need higher academic standards. He would also agree that higher standards might further disadvantage certain segments of society. Within a time-bound system, this disadvantage becomes more pronounced. In the words of the Commission, higher standards applied inflexibly would cause great mischief. Further, when any standards are implemented, slower students will need more time just as gifted students will require less time. Meeting a standard then becomes a significant achievement because the correct management of time has become an academic equalizer.

Maria Montessori (1870-1952) pioneered a method of early childhood education. Children learn motor and intellectual skills through a highly structured program. Although originally developed for children with special needs, her ideas have been

applied to regular education students as well. Many parents send their children to a Montessori school to get a head start on their public school education. In relation to the use of time, Montessori felt that children should learn at their own pace. Knowledge would be assimilated when the child was ready, without being forced by the teacher. This concept is in opposition to the direct instruction model of Madeline Hunter in which it is believed that correct pedagogy will allow any concept to be taught. Her ideas of self-pacing and independent study are criticized by many educators as insufficient for the development of necessary social skills (Ornstein & Levine, 1989).

George Counts (1889-1974) had an educational philosophy which can be summed up in his famous book title: “Dare the school build a new social order” (Counts, 1932)? He believed that schools should serve as a catalyst for the remodeling of society. He is one of the few educational pioneers who would be most likely today to try a radical experiment involving the restructuring of time. He felt that teachers should be the leaders of society, rather than the followers. School administrators should be making and defining the policies of our culture, rather than being constrained by what has been given to them. Schools would be the agents to change the status quo. He would agree with the Commission’s report that American schools have to be reinvented. It requires a transformation in our society that learning matters. This must take place not simply for the sake of employment or the national economy, but because it promotes social health and enlivens the human spirit. His ideas are best exemplified in those school administrators who attempt unorthodox solutions to complex problems. With the management of time, the two best examples are Year Round Education and the four-day school week.

Jean Piaget (1896-1980) made significant contributions in the area of developmental psychology. Learning takes place when the child interacts with the environment. A necessary precondition is for the child to have the necessary age or developmental stage. His stages of readiness are: (1) Sensorimotor (eighteen months to two years old); (2) Preoperational (two years to seven years old); (3) Concrete Operations (seven years to eleven years old); and (4) Formal Operations (eleven years to fifteen years old). (Penrose, 1979) Because learning cannot take place unless the child is mentally ready to learn, the management of time is essential. The concept of mental readiness is foundational to the development of a curriculum, especially at the lower grade levels.

Robert Maynard Hutchins (1899-1977) is considered an educational “perennialist.” Like Plato and Adler, he believed that the purpose of education was to learn the great ideas and philosophies of mankind from a classical perspective. The search for truth should be the overall objective. Students should be introspective and analytical. It was more important to cultivate the mind than to undergo training for the sake of earning money. In today’s schools, two tracks are generally found: the academic track for those students going on to higher education at a college or university, and the vocational track for those entering the work force. The academic curriculum includes the higher math classes, foreign language requirement, and other extra credits that are generally given the label of liberal arts. The vocational track is a fundamental curriculum which focuses on the essential skills to receive, in addition to the graduation diploma, a certification in some trade. A student can move directly into the work force as a certified brake mechanic or air conditioning technician.

The existence of this dichotomy comes from the influence of Hutchins. He was instrumental in shifting American education away from the philosophy of leaning as a tool to secure a job. Because of this fundamental split between curricula, the role of time becomes more critical. At the secondary level of education, the student typically faces an either-or decision. Time constraints necessitate moving forward in one arena or the other. In the educational systems of other countries, there is true tracking in this regard as students are tested and then relegated to a career as either a future blue or white collar worker. Within the United States, the choice always exists for changing career goals. This is a valuable freedom, but it does place additional constraints on the management of time.

Ten national education reports were issued from 1983 to 1991. Although all of them impact time indirectly, seven of the reports have direct implications for the management of time.

The “Action for Excellence” report by the Education Commission of the States recommended a longer school day. The “Educating Americans for the 21st Century” report by the National Science Foundation also recommended a longer school day. It went further and expressed the need for a longer week and school year. It tried to establish a “set” twelve year plan for teaching math and science. The “High School” report by the Carnegie Foundation for Achievement in Teaching recommended flexible schedules for students and flexible time allotments. This would be a departure from the standard 50 minute period criticized by the Commission a decade later. It also felt that the two-track secondary system should be eliminated in favor of one track. “A Nation at Risk” report by the National Commission on Excellence in Education felt that the school

day should be lengthened to seven hours. Fifteen years later, the Commission of Time found that the national average was still only 5.6 hours. It also recommended that students be grouped by performance rather than age. A longer school day was also recommended by “First Lessons: A Report on Elementary Education in America” by the Secretary of Education. “The Early Years,” another report by the Carnegie Foundation for the Advancement of Teaching also recommended a longer school day and year. It felt that the school schedule should also reflect changing family and work patterns. Lastly, the report, “Time for Results: The Governors’ 1991 Report on Education,” by the National Governors’ Association, recommended the move to year-round education. It also stated that kindergarten should be mandatory for all children and early childhood programs for all at risk children.

The Restructuring of Time

Since the issue of the report, *A Nation at Risk*, the management of time has come to the forefront of the national education agenda. The report, unlike many other similar reports from the same time period, was startling in its wording: “The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a nation and a people... We have, in effect, been committing an act of unthinking, unilateral educational disarmament.” It argued that our country was at risk because its once unchallenged preeminence in commerce, industry, service, and technological innovation is being overtaken by competitors throughout the world. The nation’s economy was in a general decline, there were high unemployment rates, and the annual inflation rate was steadily rising. Adding to these problems was the general decline in standardized test scores for U.S. students. This was particularly apparent in the

scores on math and science as compared to other countries such as France, Germany, and Japan.

It was at this point of crisis that the Japanese school system, with its extended calendar, became the model for educational reform in the U.S. Japanese students were consistently scoring higher in all subject areas of tests. At the same time, the Japanese economy was booming and companies were buying vast real estate tracks in the U.S. It seemed that Japan was fulfilling its pre-World War II dream of establishing a Pacific basin empire. The U.S. appeared to be losing its status as a superpower. Their successes were attributed to the proper use of time, and our failures to the improper use of time.

An examination of the Japanese education system revealed that their students had longer school days. When the regular school day ended, parents enrolled their children in special evening tutoring classes (*juku*). Students attended school for six days a week. The school calendar was 240 days long. Japanese students did not enjoy an extended summer vacation. The idea quickly spread through the American educational system that the key to our future success, and survival as a nation, was to emulate the Japanese system. Since that initial fever, research has revealed that many other factors contribute to the success of the Japanese system, characterized by a monolithic culture, intense parental involvement, superior classroom discipline, and closer cooperation between teachers and parents (Deasy, 1986). The Japanese model was the initial catalyst for making time the “hot topic” in school reform. For the past two decades, attempts at restructuring time have fallen into the following categories: (1) lengthening the school day, week, or calendar; (2) rearrangements of the class schedule; (3) year-round

education (YRE); and, within the realm of small and rural schools, (4) the four-day school week.

Extended Calendars

In 1991, it was reported that the bulk of a person's IQ score is determined by the amount of time spent in school, irrespective of the quality of the educational experience. (Raymond, 1991) A Professor, Stephen J. Ceci, reached this conclusion after a review of dozens of studies. He found that a high correlation existed between IQ and the number of years of school completed, even after taking into account the tendency for the smartest children to start school earlier than their peers. The study also stated that children who enter school at a later-than-normal age lose about five points on their IQ score for each year they delay. This effect was thought to be irreversible. The increase in IQ was attributed directly to instruction and indirectly to the nurturing of cognitive skills such as visual relations, attention span, and the ability to verbalize responses.

This idea serves as the philosophical foundation for lengthening the time-in-session. It seems an extension of a logical premise that it takes time to learn. If you spend more time, you therefore will learn more. For example, if students were in school for 195 days, an increase of only fifteen days from the standard model, the result would be equal to an entire extra school year. This is the common theme of Gardner's 1983 report, *A Nation at Risk*, in 1983, and Holsinger's 1982 report entitled, "Time, Content and Expectations as Predictors of School Achievement in the USA and Other Developed Countries." Gardner reported that in England and other industrialized countries, it is not unusual for academic high school students to spend 8 hours a day at school 220 days a year. In the United States, by contrast, the typical school day lasts 6 hours and the school

year is 180 days.

Many school districts are trying to find ways to make this happen. In Bridgeport, Connecticut, the Six to Six Interdistrict Magnet School has a twelve hour schedule each day. The school is also open on the traditional vacations and holidays other schools are closed. The only time it is closed is a two week period before the start of September. Currently in Arizona and Pennsylvania, the length of the school year is increasing by one day per year for the next five years. These increases are linked to salary increases for teachers.

It is believed that an extended school calendar will increase academic success because of the time available to more effectively use the following teaching styles: (1) cooperative learning (Slavin, 1990); (2) integrating the curriculum (Jacobs, 1989); and (3) focusing on different learning styles.

Despite the logic of the argument for an extended calendar, the issue is more complex than one would expect. In the words of Mazzarella, “No one would argue with the findings that more study produces more achievement. Yet, the relationship between time spent on instruction in school and achievement may be more complex than it appears.” For example, within Gardner’s report, it was noted that many European countries had longer calendars than the U.S. and their students scored better on standardized tests. But, within these same countries, there was considerable variation between calendars, yet the school systems...are all more or less equally effective-this in spite of the differences in length of school day. In a study in 1985 by Karweit about the relationship between learning and time, he concluded that time spent is positively and moderately related to achievement...for understanding the potential of school time as an

agent for school reform, these global indications of the effect of time tell us very little. Most researchers on this topic agree that the terms “time in school,” and “academic learning time,” have to be strictly separated (Ellis, 1984; Adelman, 1996; Aronson, 1995). These observations go to the heart of the discussion about extended calendars, the overlooked difference between quantity and quality.

Block Scheduling

The most dramatic restructuring of the class schedule has been the introduction of the “block schedule.” It has been defined as a reorganization of the daily schedule into larger blocks of time, usually more than 60 minutes in length (Cawelti, 1994). It was created to give teachers the flexibility to use instructional techniques that require an extended period of time. (Canady & Rettig, 1995) From its inception, it was hoped that the block schedule would help many teachers move away from the “lecture-note taking mode” of delivering instruction to more hands-on activities. (Burden & Byrd, 1999) With the extra time, teachers would have the chance to enlist strategies such as “modes of learning,” or Howard Gardner’s ideas of multiple intelligence (MI). For the first time, it was believed that teachers would have the opportunity to individualize instruction. It was realized from the outset that the success of the block schedule would depend on the degree to which the faculty implemented strategies that took advantage of the longer blocks of time (Byrant, 1995). Some of the other advantages include: decreased class size, more course offerings, more teacher-pupil contact, better use of school time, easier pace, and the opportunity to use more process-oriented strategies (Sturgis, 1995).

A variety of block schedules are in operation. One of the most popular is an “A/B schedule,” often named with alternating school colors, in which two sets of class

schedules are switched on a regular basis. The rotation may take place on a daily, weekly, grading period, quarter, trimester, or semester basis. When the rotation takes place on a semester basis, it is sometimes referred to as a “4 by 4” block schedule. Under this schedule, year-long courses are completed in one semester.

The biggest challenges to block scheduling have come at the transition point. Teachers need advanced training and preparation to move out of the comfortable groove of the traditional model. Schools do not usually report success in meeting the primary goals of a block schedule until they have been on it for at least three years. Administrators must provide in-service training for staff development for at least two years prior to moving to a block schedule (Jenkins, Queen, & Algozzine, 2001). The staff must have a common vision with support of all stakeholders (Carroll, 1994).

Even with timely preparation, many articles report that pedagogy under a block schedule remains the same as under a standard schedule. Teachers refuse to use more interactive instructional strategies. Many teachers cannot move away from lecturing and then experience increased discipline problems as they try to lecture for the entire block (Carroll, 1994). Successful reports of block scheduling show teachers using the extra time for better feedback on classroom and homework assignments, the incorporation of more outside projects, and the creation of novel assignments to stimulate student interest. It is also important for the district to have a specific need for such a schedule in order for it to be successful (Irmsher, 1996).

Another strategy to modify the standard schedule is to shift the school hours. This is similar to the use of daylight savings time by the government. There has been a gradual movement over the past fifty years for the starting time of school to become

earlier and earlier. In rural areas with exceptionally long bus routes, it's not uncommon for students to get up at 5:30 AM to make it to school on time for the 8:00 AM bell. This movement is contrary to an accumulating research base which states that students, particularly teenagers, need to sleep longer in the morning. In the words of Mark Muhowald at the Minnesota Regional Sleep Disorders Center, "asking high school students to absorb and understand classroom material at 7 AM is like asking adults to function in a work environment at 3 AM." He further states on NEA Today Online, "Kids are in a learning-impaired mode right now. I fail to find a single educationally or societally valid reason to send kids to school exhausted. If the purpose of school is to educate, then we should send children to school in a condition that promotes learning—not one that interferes with it."

At the onset of puberty, ages 12-14, researchers report that the body's natural sleep-wake cycle is delayed, and, biologically speaking, teens can't fall asleep before 10:30 or 11:00 PM (Covino, 2001). The best time for the student to arise is approximately 8:00 AM, after nine hours of sleep. Without this adjustment, students lose the "Rapid Eye Movement" episodes of deep dream-sleep. The end result is a decrease in memory retention, higher-order thinking skills, and wider swings in mood.

Administrators are well aware of the end result: bleary-eyed students wandering the hallways like zombies. Students try to compensate for this problem by the use of caffeine. The liter-size cola product or extra-large 7-11 coffee are a part of the students' preparation for classes.

As with many other strategies to restructure time, shifting the start of school forward is difficult. Many teachers and administrators have the opinion that getting up

early is part of becoming an adult. If we have to get up early, so do you! A change of this magnitude also affects the structure of the family and community. It necessitates a change in lifestyles. Some districts have considered it and agreed with the research, but have had to back down under community pressure. The change would result in problems with bus routes, meal times, after school jobs, athletics, and family dynamics. Some districts which have made the change report an increase in absenteeism, attributed to the lack of supervision of middle-school age children because their parents have already left for work.

For some of the districts which have made the change, many of the comments are positive. A school district in Minneapolis made the forward shift in 1996. They felt it made sense from the research about sleep deprivation and the fact that the change would not cost the district too much. The starting time for high schools was moved from 7:25 AM to 8:30 AM. Some of the positive comments include: a more conducive learning environment; more time before the morning bell to hold staff meetings and prepare for the day; students feeling more refreshed in their first-period classes and earning better grades; and tardiness, absenteeism, and visits to the nurse's office for fatigue-related symptoms are down.

This type of restructuring has now reached the political arena. In Connecticut, a bill has been proposed to mandate high schools to begin no earlier than 8:30 AM. At the federal level, U.S Representative Zoe Lofgren (California) is trying to pass her "Zzzz's to A's" legislation. It would provide up to \$25,000 in federal funds to districts that switch their secondary school start times to 9:00 AM, or later.

It will remain to be seen if this type of restructuring gains in popularity and acceptance. At the moment, it is only in the experimental stage and there is little solid research as to its effects.

Year Round Education

Next to block scheduling, year round education (YRE) has been the most widely implemented program to restructure time. It has its origin in a rejection of the idea that America is still an agrarian society. The traditional school calendar was created to allow students the opportunity to help with the harvest during the summer months. In the words of a summarizing article in *Better Homes and Garden* magazine, “A hundred and fifty years ago, when a large segment of our nation was agricultural, a majority of America’s families needed their children at home to work on the family farm. Public school calendars were designed to accommodate” (Palar, 1996, p 13). As the U.S. today is more of an urban/suburban society, it is felt to be illogical to base our school calendar on an antiquated idea.

In reality, there is considerable controversy over the real origins of our present model with an extended summer vacation. Historians at the living history museum in Old Sturbridge Village, New England, state that farm children went to school from December to March and from mid-May to August. (Stark, 2000) In many of the urban areas of the same time period (1800s), children were in school over the summer months. This is attributed to the fact that children of immigrant families needed a safe and affordable place...to stay while parents worked.

It is said that necessity is the mother of invention. YRE was not born out of a desire to change an “agrarian-based, tradition-bound box of time from the 19-century.”

The philosophical arguments came after school districts implemented YRE to simply ease overcrowding. By operating the school on a twelve-month basis, larger populations of students could be rotated through the system. This relieved the pressure until the construction of new schools could catch up. It is reported that a district can increase its capacity by 33 percent by using YRE (Kneese, 2000).

Advocates of YRE now state that its origins can be traced to 1645 in Dorchester, Massachusetts when it was first implemented in a school (Zykowski, 1991). More modest historians place its creation in the 1800s when European immigrants thought it would help assimilate their children to North American culture (Herman & Grove, 1971). The first modern school to use YRE was a multi-track model in St. Charles, Missouri in 1969. Multi-track models continue to be used to manage high rates of population growth. In the meantime, the popularity of YRE was established and many organizations were created to lobby for YRE throughout the nation. Single track models were created, not to ease overcrowding, but to improve academic achievement (Hazelton, Blakey, and Denton, 1992).

As originally defined, YRE does not add any extra days to the school calendar. This was not an option in most states as the addition of a single day costs approximately \$25 million (Stevick, 2000). The traditional 180 days in session are divided into smaller blocks of time. Some of the more common are the 45/15 model, the 60/20 model, or the 95/30 model. For example, students would attend school for 45 days and then have a 15 day vacation, or “intersession.” Over 50 models of YRE have been identified (Merino, 1983). Some models work better than others, depending on whether the district is using YRE for a single track or for multiple tracks. There are currently over 2,057,000 students

enrolled in some type of year-round education in about 2,950 schools in 41 states (Ballinger, 1999).

The philosophical basis for YRE can best be summarized by the words of Ballinger in 1987: “If year-round education were the traditional school calendar and had been so for a hundred years or more, and if someone came along to suggest a new calendar wherein school students were to be educated for only nine months each year, with another three months free from organized instruction, would the public allow, or even consider, such a calendar” (Ballinger, 1999, p. 1)?

Once established as a viable modification of time, YRE was predicted to improve education in many areas. It was felt that shorter vacations would result in less learning loss for students over time (Silberman & Bradbury, 1997). It was going to correct, as stated by the Commission on Time and Learning, the unacknowledged design flaw in American education. It would provide more opportunities for remediation. It would be closer aligned to the parents’ work schedule. It would reduce absenteeism. It would result in less stress for the teachers and pupils because of the pace (SSTA Research Centre Report, 1999). It was going to reduce the juvenile crime rate in urban areas (Brekke, 1983; Merino, 1983). It was going to improve learning opportunities for the educationally disadvantaged (Willis, 1993). It was even going to reduce the rate of school killings, which are more likely to occur at the beginning of semesters (McClam, 2001). It would provide an economical advantage because making better use of existing schools, would mean fewer additional schools need be constructed (Shields & LaRocque, 1997).

Many school districts used the introduction of YRE as an opportunity to establish true scientific studies of its effectiveness. The Scottsdale Unified School District in Arizona matched two elementary schools in 1990 as to population, demographics, and test scores. One was placed on YRE and the other on a traditional calendar. All other factors were held constant and the schools were monitored for almost a decade. As yet unpublished data shows no difference in test scores for the duration of the experiment. The math scores were slightly higher in the traditional school and the English scores were slightly higher in the YRE school, but neither of these differences was statistically significant. The results of many other studies are equally ambiguous. Some studies have reported a positive impact in terms of student achievement (Baker, 1990; Bradford, 1993; Peletier, 1991). Other scientific studies have reported, like the Scottsdale study, neither a positive nor negative impact (Goren, 1986; Hazelton, 1992; Zykowski, 1991). The greatest gains in student scores have occurred in districts where the intersessions are used for educational enrichment. Under this model, which is the most expensive, YRE becomes not a simple rearrangement of the standard 180 day calendar, but true year-round education. As expected, because the students might be in school for 240+ days, there is more academic growth. This growth is not always correlated solely to YRE, but to the personality of the student who would give up his or her vacation time for math or science enrichment.

There have been negative consequences from YRE. In many locations, children from the same family are on different tracks. Or, one child is in a YRE school and the siblings under a traditional calendar in another school. YRE has been found to not work well in schools of low enrollment. It spreads the school population too thin.

Approximately 600+ students are needed (SSTA Research Centre Report, 1999). It also is a serious conflict for professional development opportunities. Teachers use the summer vacation to complete graduate programs and enrichment activities. For many teachers, this is the only opportunity to advance on the salary schedule. YRE can be expensive. In the words of a California educator, year-round education threw students into unbearable hot classrooms during the height of summer and created child care problems during the extended winter break. It cost the L.A. Unified School District an additional \$4.2 million per year mainly for extra staff costs for break preparations and to keep their sports program going (Kirman, 1996). Lastly, it causes problems with family scheduling, even when all the children are on the same track.

Although the evidence for YRE is inconclusive in terms of student achievement, it is successful in that it is one of the few attempts to restructure time in a major way. Perhaps its greatest achievement is serving as a model that change is possible. Most of the larger school districts in the nation now offer parents the choice of an elementary school on YRE or one on a traditional calendar a few blocks down the street. Similar choice is available for middle schools or junior high schools. YRE high schools are the rarest of all, mainly because of the conflicts with athletic schedules. YRE high schools are in athletic leagues with non-YRE high schools. YRE students would have to forego an intersession break to attend practice and games. The future will hold the key to the overall success or failure of YRE in terms of academics. At present, it is a success in terms of offering more choice.

The Four-Day School Week

As with YRE, the four-day school week has economic origins. Like YRE, it was discovered after-the-fact that the restructuring might have implications for improving the school in other areas.

The original motivation for this model was to reduce energy and transportation costs in school districts with severe budgetary constraints. By closing the school one day in five, the savings were estimated at 20 percent (Thompson, 1985; Bauman, 1983).

The O.P.E.C. oil embargo of the early 1970s led to the first use of the four-day week in the U.S. Schools in Cimarron, New Mexico made the change in 1972 to save energy. They reported a 20 percent savings in heating costs by allowing the facilities to cool down over the three-day weekend. This report encouraged the neighboring state of Colorado to pass legislation permitting the four-day school week. Within a few years, their research reported similar savings. Their buses were using 23 percent less gas and requiring 18 percent less maintenance. Electricity usage dropped by 23 percent and heating fuel costs by 7 to 25 percent (Braun, 1983). There were further savings associated with fewer substitute teacher days. Catholic schools in Georgia examined the four-day week at the same time and felt it would benefit their system. It would save the driving parent one day of gas to get his child to and from school (Mulvenna, 1973).

Since that time, many other state agencies and K-12 districts have made similar reports. A study performed by the New York State Department of Education in 1978 examined nine different schemes for saving energy use and cost. The report examined calendars using: (1) traditional; (2) ten month school year; (3) mid-August start with two semesters; (4) four-day week; (5) four day, 7.5 hours; (6) five-day week; (7) twelve

month, multiple variations; (8) five eight-week learning periods; and (9) 45-15 rotation [YRE]. The study concluded that only the four-day, 7.5 hours model was producing more than a 10 percent change in all four climates (New York State Department of Education, 1978). An elementary school in New Hampshire was faced with a budgetary crisis in 1981. The administration was able to balance its budget only through the adoption of a temporary four-day schedule. The alternative was to cut art, physical education, or music (Featherstone, 1991). In Oregon, the implementation of the four-day schedule resulted in a 15 percent to 23 percent reduction in transportation costs plus additional savings in energy costs and nonteacher salaries (Reinke, 1987). In 1997, the Arkansas Department of Education received permission for districts to operate under the four-day week. It was initially noted that the only possible benefit of such a proposal would be the obvious cost factor...When you shorten the bus run and cut lunches by one day, you will save some money (Johnson, 1997). In Saratoga, Arkansas a move to the four-day week resulted in annual savings of slightly more than one starting teacher's salary, a significant number in a \$1.2 million budget (Parker, 1998). The Burden School District in Kansas reported going to the four-day week as a result of the district's budget being cut by \$300,000, approximately 10 percent of the overall budget for a small school. The energy savings from the four-day week made up this difference (Choi, 2001). Schools in Wynot, Nebraska use the four-day week to save energy costs, but only during the most severe months of the winter (Dockendorf, 1999). Several school districts in Eastern Oregon have recently moved to the four-day model. This was a direct result of Ballot Measure 5, which set limits on property taxes. The savings, on a percentage basis for a small and rural school are considerable. The Morrow County School District

reports that a move back to a five-day schedule would cost an additional \$350,000 per year. The Grant School District in Oregon reports an annual savings of about \$150,000 due to lower expenditures on fixed building costs, transportation, and classified staff (Federman, 2000). The Marion School District in Mississippi recently made the move to the four-day school week. Superintendent Craig Robbins gave his board the options: restrict purchasing in all categories for the remainder of the year; reduce length of bus routes; use assistant teachers as substitutes for the rest of the year; abolish positions that become vacant; or, adopt a four-day school week. He has since found that the model saves the district about \$8,000 per day (Hotchkiss, 2001). Other reports have made similar findings (Blankenship, 1984; Richberg & Sjogren, 1983; Koki, 1992; Grau & Shaughnessy, 1987; Culbertson, 1982; Sagness & Salzman, 1993; Featherstone, 1991).

In addition to savings associated with natural gas, electricity, and heating oils, researchers have identified savings with light bulbs, water, hand soap, and towels. It was also found that general maintenance costs were reduced (Feldhausen, 1981). This is primarily attributed to the elimination of overtime hours for maintenance personnel. If a major repair is required in a classroom, the maintenance worker may have to complete the job on a Saturday under a traditional calendar. With the four-day week, the repairs may be completed on the Friday or Monday for which students are absent but the worker has a regular shift. In some districts, maintenance staff do not even work on the fifth day, resulting in additional savings. This has added to the controversy about this model because the savings are created on the backs of the classified staff (Wilson, 2001). Finally, because this model is used primarily in rural areas with long bus routes, the transportation savings can be considerable (Saskatchewan School Trustees Association

Research Centre Report, 1999).

Colleges began to explore the use of the four-day week as a money-saving option at the same time as K-12 schools. It is most popular during the summer months when employees work four-day weeks to save energy costs (Mangan, 1993). The Lake City Community College in Florida was the first from 1970 to 1974. They reported that an analysis of energy consumption indicated that energy was saved, but the amount contributed to the total energy-saving program by the four-day week could not be determined with reliability (Hardman, 1974). The Indian Hills Community College used the four-day week from 1976 to 1979. Because of poorly insulated buildings, it was implemented during the winter quarter to conserve energy. It was also discovered that it saved commuting students a total of \$2500 per day in fuel costs (Hellyer, 1980).

DuPage Community College, part of the Illinois community college system, went to the four-day week in 1980. It is reported that cost savings due to a reduction in miles driven was estimated at more than \$30,000, and savings from reduced building maintenance was in excess of \$23,000 (per summer)(Wallace, 1981). Recently, the Porterville College of California went to the four-day model for the summer. The school's air conditioning is turned off over the three day weekend because of the dramatic increases in the cost of electricity (Porterville College News, 2001).

As K-12 schools began experimenting with the four-day week to save money, many of the districts started to report unanticipated improvements, and problems, in other areas. The original schools to start using the model in Cimarron, New Mexico, reported a reduction in student and teacher absenteeism (Braun, 1983). The Deerfield School District in New Hampshire reported a similar dramatic drop in teacher absenteeism

(Featherstone, 1991). This has been reported in many other studies (Blankenship, 1984; Litke, 1994; Koki, 1992; Grau & Shaughnessy, 1987; Sagness & Salzman, 1993; Featherstone, 1991).

The families in Cimarron reported that they liked the extra time together. In neighboring Colorado, the parents also reported: It gives us more family life together. Before, there was always something at school on Saturday, church on Sunday, and the weekend was over (Braun, 1983). Ironically, in the Animas School District of New Mexico, it was the issue of having more time with your children that was the main obstacle to implementation. Superintendent Bill Coker said, “The hidden deal-breaker was the babysitting. Parents admitted privately they liked their four-day work week (at the local copper smelter), but they weren’t necessarily ready to share that day off with their children (Reeves, 1999, p. 2).

There are many reports of improvements in classroom dynamics. The teachers in New Mexico noticed that the students were intense throughout the week without the usual Friday letdown on Thursday (Braun, 1983). Schools in Canada reported that one of the advantages of the four-day model was more frequent opportunities for remedial intervention (SSTA Research Centre Report, 1999). Concentrating extra-curricular activities on Friday resulted in fewer interruptions. Because the four-day model requires a longer day, teachers reported an increase in efficiency of instruction (Blankenship, 1984; Koki, 1992; Grau & Shaughnessy, 1987; Culbertson, 1982).

The longer school day is both a source of praise and condemnation of the four-day model. Some of the negative comments included, “Students who miss a day of four-day school are really missing 1 1/4 days.” Also, because it requires better organization, a poor

teacher becomes poorer. It was also noted that the day was too long for mentally handicapped children and kindergarten youngsters (Braun, 1983). Administrators in New Mexico reported, “We do see some tiredness among the younger children” (Reeves, 1999, p. 2). Other reports state the same: some teachers feel that at-risk and special-needs students may have retention difficulties with an extra day off each week (Blankenship, 1984; Culbertson, 1982).

A survey of the schools in Oregon on the model listed several benefits. These included more learning time, more time for staff development, higher morale in both staff and students, and a decrease in teacher and student absenteeism. The negative comments included an increase in teacher stress, the younger children being more tired at the end of the day, the impact of holidays on the schedule, and concerns about the national movement toward a longer school day (Reinke, 1987). Another report made the same negative comment: some educators are concerned that the four-day week may appear to be inconsistent with the new emphasis for more time in school (Blankenship, 1984).

One of the greatest reported benefits is the ability to shift and concentrate extra-curricular activities to the off-day. In this respect, it is a misnomer to call the model a four-day week, because a majority of the student population and faculty are involved in school activities on the fifth day. In the words of the administration of the Animas Public Schools in New Mexico, every Friday afternoon became a case of chronic spring flu. Those students and teachers who were left on the high school campus would be stuck in idle. The cost in lost productivity—and increased student and teacher frustration was high (Reeves, 1999). Roy Brubacher, assistant commissioner of education in Colorado says, “We get full use out of four days, academically, and push activities to the off-day.

That's the strong point of the four-day school week" (Braun, 1983, p. 17). Similarly, many of the school districts on the plan require their teachers to be at work on the off-day. This provides a weekly inservice opportunity that is extremely rare under the standard model for a school district of any size or location. In the Oregon schools, it was noted that the first misconception about the four-day week is that teachers get a three-day weekend. That's not the case. Fridays are workdays for teachers and can be used for professional training or curriculum development (Federman, 2000). One principal in Oregon reports that under the program there have been significant improvements in the curriculum. The Superintendent of the Grant School District in Oregon states that there is time under a four-day week to have significant communication with the staff (Federman, 2000). In Arkansas, the off-day is used to bring kids in, to tutor more kids—an extra day to do more things with more kids (Education World, 2000). The opportunity for intense staff development has been noted in other reports (Blankenship, 1984; Litke, 1994).

This benefit has eliminated the energy savings in some districts. If the off-day is Friday, the academic advantages are realized. But, if the off-day is Monday, energy savings are maximized because there are few athletic events on that night and the gym does not have to be lit and heated (Blankenship, 1984).

The greatest complaint about the four-day week concerns child care. When the issue was being debated in the New Mexico legislature, larger districts were ruled out for using the four-day model. The logic was that in larger districts, you typically had more families with both parents working. The options for child care on the fifth day were fewer. In your rural districts, it was more likely that the child would be working at home

with their parents on a farm or ranch (Reeves, 1999). Because of this, the model was limited to districts with enrollment less than 500, but was later raised to 1000. A similar concern was voiced in Arkansas when the four-day model reached the Senate Education Committee. The main complaint was the possible loss of family stability and burden to parents which would seem to make the proposal unrealistic (Johnson, 1997). When the Hattiesburg School District in Mississippi heard arguments about the four-day model, it was said, “we believe education officials should implement the four-day school week only as a last resort. Why? Because a four-day schedule will create undue hardships for parents—especially single parents. . .many of whom will be required to make arrangements for day care or baby-sitting” (Campbell, 2001, p. 1).

Interestingly, the majority of positive comments about the four-day school week are found in reports from districts which have implemented the plan. The majority of negative comments are from districts which have not tried the model and are anticipating problems.

Overall, the four-day school week was found to make improvements in economics, facilities management, teacher quality and compensation, curriculum, morale, pedagogy, drop-out rates (Litke, 1994; Grau & Shaughnessy, 1987), and student discipline (Koki, 1992). Its main drawback from an educational stand point was the increase length of time-in-session. But, in the words of John Pierce, superintendent of the Fairplay School District in Colorado, “Oh, sure, some of the kids get tired on the longer-day schedule, but the tired people here are the same ones who were tired on the five-day schedule—usually adults” (Braun, 1983, p. 42).

The specific area of student achievement under a four-day week is the critical

concern for which there is a shortage of data. It has remained unresolved since the first district implemented the plan in 1972. It is the primary focus of this doctoral dissertation.

It is common in most of the reports for parents, and school administrators, to anticipate a negative impact to student achievement. The administration presents the plan as a necessary evil to balance the budget. At the community meeting to talk about the program in a New Mexico school district, the “forty who rose harshly criticized the idea and complained the four-day week was not academically sound” (Reeves, 1999). When the schools in Mississippi were looking at implementation, Superintendent Craig Robbins of the Marion County School District said, “I’m not telling you a four-day week is in the best interest of the kids. If it were, we’d have been doing it for years.” In this same editorial in the local paper, it was asked, “How much learning is actually going to take place—especially with younger children—if the school day is lengthened 90 minutes” (Campbell, 2001, p. 3)? It is a given in the literature base that the four-day model is assumed to cause damage to academics. Most of these arguments are closely linked to child-care arguments.

Almost all of the reports about student achievement, from districts already on the plan, are very short term or anecdotal in nature. One of the first school systems in Colorado made this report after one year on the four-day model: “No significant growth or decline in any of the areas tested, but we don’t yet know what the long-run results will be” (Braun, 1983, p. 41). In Arkansas, it is reported by the Saratoga School District concerning future test results that we’re hoping it will show up really well in September (Education World, 2000). Another school district in Arkansas reported, “After one year, students’ average scores on the Stanford-9 exams rose one percentile” (Diggs, 1999, p.

2). An article from New Mexico summarizes the benefits of the four-day week and then states concerning academics, “There have been no major studies analyzing the success of the four-day school week” (Sun-News, 1983, p. 8). A summarizing article about four-day schools in Oregon remarked, “While overall achievement gains have been difficult to assess because cumulative test data for small schools is sometimes lacking, all districts maintained or showed slight increases in achievement. At any rate, the results have not shown that the four-day week has an adverse effect on student learning” (Reinke, 1987, p. 1). A report on student achievement in schools on the model in Hawaii concluded, “More years of testing will provide a more definable answer on whether students can actually learn as much in four days of instruction as in five days” (Grau & Shaughnessy, 1987, p. 2). An article from 1987 summarizes the use of the model in New Mexico schools and briefly states that standardized achievement test scores are comparable to state norms (Grau & Shaughnessy, 1987). A school district in Idaho took the preliminary steps to create a valid scientific study of the academic impact of the four-day week in 1993. It was to be a long-term study. However, the project was dropped after one year when the district returned to a five-day model (Sagness & Salzman, 1993). A summarizing article about the 36 school districts in Colorado concludes that the original concerns about student performance are still unresolved because reliable data on this feature are yet to be determined (ERIC Document No. ED 429344, 1999).

The only longitudinal study of the four-day week was conducted by two professors at Colorado State University. They selected five Colorado school districts and identified a pool of students who were in the system before and after the introduction of the new model. Their test scores were compared over a four year period. The study was

performed over grades three through seven. The study concluded that analysis of the ITBS scales revealed that the change to a four-day school week had no effect on student academic achievement, although there was a suggestion that there might be some leveling of performance during the first year the schools were on the four-day schedule. Further, analysis of the same grade level across the four-year period also provided no clear evidence that the change had any effect on student achievement. The significant differences might be explained by the observation that one year or class of students performs quite differently from another (Daly & Richburg, 1984). There are no examples in the literature base of longitudinal studies at the secondary level.

Summary

The use of time has been traced from its historical antecedents to present-day models. Contributions of pioneers in the field of education have been followed with specific regard to the use of time. Four modern-day models have been examined: the extended calendar, block scheduling, year-round education, and the four-day week. The latter was examined in detail with a comprehensive review of the literature from its inception in 1972 to the present day. It was demonstrated that most of the studies about student achievement are short-term and unscientific. Most of them fall into the category of anecdotal comments. There is only one major longitudinal study, a study at the elementary level. There is a gap in the research base concerning long-term academic effects at the secondary and middle school levels. The use of the four-day week has greatly expanded since its creation. It now involves twenty-eight states and over 120 school districts.

Chapter Three of this dissertation will present the research design of the project.

The research objectives are restated. The validity and reliability of the testing instruments are presented. The methodology for data collection and preparation is examined. Finally, the sample and student population will be described.

CHAPTER THREE

METHODOLOGY

Overview

The Patagonia Unified School District No. 20 and Patagonia Elementary School District No. 6 of southern Arizona represent typical small and rural school systems. The secondary facility is comprised of a single, 9-12 public high school. The elementary district is a single, pre-kindergarten-5 campus and 6-8 middle school. Their demographics and cultural legacies fit the classical definitions of a small and rural school. Within the archives of the districts are test score data spanning several decades. The districts are unique in that they were on the four-day school week for five years and then reverted to a traditional five-day school week. This is unusual because most of the schools who have tried a four-day week are elementary. Research projects involving secondary schools are fewest in number, followed by middle schools. Most schools, whether elementary, middle, or high school followed one of two patterns once the four-day week was introduced. The school either remained continuously on the plan, or it was dropped relatively quickly when the school board was recalled or replaced. Consequently the Patagonia School Districts provide a model of the long-term effects of the four-day week in small and rural schools. They present the opportunity to scientifically examine the effects on test score data when a radical change is made in the structure of time and this change is of significant duration.

The longevity of the four-day week in a district is also mirrored in the pattern followed in most of the survey data expressing opinions about the program. Once the plan has successfully negotiated the political barriers to implementation, there seems to

be a general acceptance by the community, a lessening of complaints, and it soon becomes a community tradition. In the other cases, the hostility heightens and the plan is quickly dropped. Most survey data against the four-day week are from districts attempting to implement the plan. Most of the survey data in support of the four-day week are from districts already on the plan. The survey data include opinions from students, faculty, staff, administration, school board members, parents of students, and general community members who are not parents of students.

Therefore, the Patagonia Districts offer the unique opportunity to present the effects of the four-day school week in a long-term longitudinal manner, which focuses on academic achievement, not survey data based on opinions. The five years on the program serve as a classical treatment phase in an ex post facto study. It is assumed for this study that standardized test scores are a valid reflection of academic achievement. This chapter outlines the time period of the study, the definition for membership in a cohort study group, the validity and reliability of the standardized tests administered, the manner in which the data was collected and prepared, a description of the population, and the exact statistical methodology used to analyze the subtests. It also explains the survey instrument used by the districts while on the four-day week. The survey was mandated by the Arizona Department of Education for all schools using the four-day week. The results of the survey are presented in the next chapter, even though they are incidental to the focus of this study.

A fifteen year period was selected to create equal units of time: five years on a five-day week, five years on a four-day week, and then five years on a five-day week again. It was discovered that the archives included significant data over the same fifteen

year period for the Patagonia Union High School, S.D. No. 20, and Patagonia Middle School, S.D. No. 6. The Patagonia Middle School is one of three feeder schools for the Patagonia Union High School. It implemented the four-day school week at the same time as the high school. It was dropped at the same time. These actions took place through board approval of a separate governing board for the high school board. The Patagonia Middle School was also included in the research project using the same research design as the high school. The other two feeder schools could not be used because they did not use the four-day week.

Population

The Patagonia Middle School, part of the Patagonia Elementary School District, was established in 1914. The original “Old Main” schoolhouse with its tall bell tower is the oldest, continuously operating elementary school in Arizona. The high school was established in 1927. Both districts are located in Santa Cruz County, the smallest county in Arizona. The boundaries of the school district start with the international border with Mexico and go north approximately thirty miles. The schools are located in the scenic town of Patagonia, about twenty miles north of the border.

The community came into existence as part of the army campaign to fight the Apaches. At this same time, rich mineral deposits in the Patagonia Mountains led to the establishment of many prosperous mines. The largest of these funneled silver to the Confederacy in the Civil War. The deep grass of the San Rafael Valley, adjacent to the mountains, created many ranching empires. Today, the mines are all closed, but nine of the ten largest ranches in Arizona are within the boundaries of the school district. It is also the home of the Patagonia-Sonoita Nature Conservancy, a famous bird-watching

area noted for its rare species not found in other parts of the United States. Almost everyone is familiar with the Patagonia area, even if they do not know it. It is used frequently as a movie set (Oklahoma, Tom Horn, McClintock, and approximately 75 others).

The student population for the K-8 grades has been around 100 students for many decades. The student population for the 9-12 high school also fluctuates closely around the 100-student mark. Both of the districts, because of their size and location, qualify under Arizona law as small and rural school districts. This gives them special funding formulas with the Arizona Department of Education. For historical reasons, these have remained separate school districts with separate five-member governing boards.

The K-12 student population is approximately 50% Anglo and 50% Hispanic. In socioeconomic studies, Santa Cruz County is the poorest county in Arizona. It has the highest rates of unemployment. This is reflected in the school districts where 76% of the student population qualifies for free or reduced lunches under the federal guidelines. This statistic is more powerful when one realizes that of this total, 52% qualify for free and only 24% for reduced.

Graduating classes typically range from twenty-five to thirty students. Approximately one-half of this class will go on to some type of post-secondary education. Most attend the University of Arizona or Pima Community College, both located in Tucson about sixty miles north of Patagonia. Approximately one-half of each class will be absorbed into the local culture finding employment with ranches, the Arizona Highway Department, or the school system.

The school system, like other small and rural districts, struggles to remain

competitive with teachers' salaries and maintain quality programs. The high school program includes college preparatory and vocational curricula. It offers extra-curricular clubs in Vocational Industrial Clubs of America, Future Business Leaders of America, Academic Decathlon, Science, Hiking, Students Against Drunk Driving, Spanish, Yearbook, and Student Council. Athletics are a mainstay of the community. The school offers eight-man football, volleyball, soccer, basketball, baseball, softball, and track and field. It is associated with the Arizona Interscholastic Association and classified as an I-A school, the smallest category. During any particular season, approximately 75% of the student body is involved in athletics or other extra-curricular activities.

The school typically scores above the other schools in the county and the state on standardized tests. Graduates are frequently accepted into major universities outside of Arizona, including Stanford, M.I.T., Harvard, and the Service Academies. Three of the teachers on the staff have won "Arizona Teacher of the Year" honors, and one was the national "Small and Rural Teacher of the Year."

Research Design

A fifteen year period, 1979 to 1994, was selected for this longitudinal study. This includes the five years before the implementation of the four-day school week. This is termed, "Pre 5-day," and is from the fall 1979 through spring 1984. It represents the pre-treatment phase of the study when students went to school on a traditional five-day school week. The next five year period, from fall 1984 to spring 1989, is when the districts implemented the four-day school week. This is termed the "4-day week," and represents the treatment phase of the study. The final five year period is from the fall 1989 to spring 1994, and represents the withdrawal of treatment phase of the study. The

school returned to a traditional five-day school week. It is termed, “Post 5-day.” This study examines the effects of a four-day school week versus a five-day school week on students’ standardized achievement test scores across the fifteen year time interval.

Table 1

Sample Size broken down by Cohort, Males and Females

Cohort	Number of Male Students	Number of Female Students	Total Number of Students	Percent of Total Students
1	13	15	30	11.7
2	14	17	35	13.6
3	16	9	25	9.7
4	10	6	16	6.2
5	11	4	15	5.8
6	8	4	12	4.7
7	6	3	9	3.5
8	5	6	11	4.3
9	7	4	11	4.3
10	7	6	13	5.1
11	5	8	13	5.1
12	8	4	12	4.7
13	9	5	14	5.4
14	9	4	13	5.1
15	8	3	11	4.3
16	4	6	17	6.6
Total	140	104	257	100.0

Cohorts of students were used for this longitudinal study. To be included as a member of a particular cohort, three conditions had to be met: (1) the student must begin and end with his/her cohort group; (2) the student must be continually enrolled in Patagonia Union High School or Patagonia Middle School; and (3) the student must be present for testing. For example, the students found in Cohort 2 were all 11th graders in the 1979-80 school year and were 12th graders in the 1980-81 school year. This cohort had the exact same set of students that were enrolled in school and all were present for

testing both years. Consider a student in Cohort 8 who was present for testing in the 7th grade, absent for testing in the 8th grade, moved out of the district(s) for the 9th grade, and returned to the district for the 11th and 12th grades. This student would not be a member of any cohort group. Likewise, a student present for testing in grades 7 and 8, moved out of the district(s) during 9th grade, and returned for grades 10, 11, and 12 would not be in the study. These limitations were imposed to eliminate competing hypotheses.

There were no missing data. The total sample size was 257 students with 140 males, 104 females, and 13 students unidentified as to sex. Cohort sample sizes ranged from 9 to 35 students as referred to in Table 1.

Across the fifteen year interval of time, a variety of tests were used, including the California Achievement Test (CAT), the Iowa Test of Basic Skills (ITBS), the Stanford Test of Academic Skills (TASK), the Stanford Achievement Test (SAT), the Tests of Academic Proficiency (TAP), and the Metropolitan Achievement Test (MAT). In one academic year, 1982-83, there were no test scores available.

Significant comparisons were not made across different tests because the meaning of scores differs across tests as do other factors, such as the norming group and the test content. For example, a student's grade equivalent score on the CAT is not comparable to that same student's grade equivalent score the next year on the TASK. The use of multiple tests narrowed the choices of statistical methodologies to attain the research objectives. Tables 3, 4, and 5 give an overview of the standardized tests used across the study years with the cohorts identified at the top.

An example of this limitation is found on Table 4 with Cohort 10, "C10." Reading down the column for Cohort 10 and across the 1984-85 and the 1985-86 rows,

the 8th grade students tested in the spring with the ITBS and as 9th graders with the SAT. No meaningful comparison was possible with more generally used test analysis methodologies. Once again, using Tables 3 and 4, and reading down the column for Cohort 9 and across the 1983-84 and the 1984-85 years, 8th grade students tested in the fall with the CAT and again in the 9th grade in the fall with the CAT. A valid comparison could be made, but the results are for the 8th grade students only. This comparison is affected by the fact that the change from the five-day to the four-day week occurred between the 8th and 9th grades that year. Results for 8th graders on the five-day week are available, but results for those same students as 9th graders are not available. In the 9th grade, the students were tested in the fall with the CAT and in the spring of the 10th grade with the TASK. Meaningful comparisons between the four-day and five-day week were also difficult when some students were tested only in the fall, some only in the spring, and others in both fall and spring.

Nevertheless, the data were rich enough to permit many meaningful comparisons between the five-day and four-day school week. The research questions could be satisfactorily answered. These comparisons are outlined in Table 6, "Meaningful Comparisons across Cohorts and Grades."

Table 2 indicates the abbreviations used in Tables 3, 4, and 5:

Table 2

Abbreviations and Definitions for Understanding Tables 3, 4, and 5

Study Years 1 – 5	Pre 5-day week	Fall 1979 – Spring 1984
Study Years 6 –10	4-day week	Fall 1984 – Spring 1989
Study Years 11 – 15	Post 5-day week	Fall 1989 – Spring 1994

CAT	California Achievement Test
ITBS	Iowa Test of Basic Skills
TASK	Stanford Test of Academic Skills
SAT	Stanford Achievement Test
TAP	Test of Academic Proficiency
MAT	Metropolitan Achievement Test
----	No Test
F	Fall Testing Date
S	Spring Testing Date

Examples: 8 F-CAT: California Achievement Test administered to 8th graders in the Fall

 10 S-TASK: Stanford Test of Academic Achievement administered to 10th graders in the Spring

Table 3

Overview of Standardized Tests Used across the Study Years and Cohorts: Pre 5-Day

School Year	Days	Began in Study Year	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
79-80	5	1	12 F- C A T	1 1 F- C A T	10 F- C A T	9 F- C A T	8 F- C A T	7 F- C A T										
80-81	5	2		1 2 F- C A T	11 F- C A T	10 F- C A T	9 F- C A T	8 F- C A T	7 F- C A T									
81-82	5	3			12 F- C A T 12 S- C A T	11 F- C A T 11 S- C A T	10 F- C A T 10 S- C A T	9 F- C A T 9 S- C A T	8 F- C A T 8 S- C A T	7 F- C A T 7 S- C A T								
82-83	5	4				12- --	11- --	10- --	9--- --	8--- --	7--- --							
83-84	5	5					12 F- C A T 12 S- C A T	11 F- C A T 11 S- C A T	10 F- C A T 10 S- C A T	9 F- C A T 9 S- C A T	8 F- C A T 8 S- C A T	7 F- C A T 7 S- C A T						

Table 4

Overview of Standardized Tests Used across the Study Years and Cohorts: 4-Day Week

School Year	Days	Began in Study Year	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	
84-85	4	6						1 2 F- C A T	1 1 F- C A T	1 0 F- C A T	9 F- C A T	8 F- CAT 8 S- ITB S	7-F CAT 8 S- ITB S						
85-86	4	7							1 2 S- T A S K	1 1 S- T A S K	1 0 S- T A S K	9 S- SAT	8 S- ITB S	7 S- ITB S					
86-87	4	8								1 2 S- T A S K	1 1 S- T A S K	10 S- TAS K	9 S- SAT	8 S- ITB S	7 S- ITBS				
87-88	4	9									1 2 S- T A S K	11 S- TAS K	10 S- TAS K	9 S- SAT	8 S- ITBS	7 S- ITBS			
88-89	4	10										12 S- TAP	11 S- TAP	10 S- TAP	9 S- TAP	8 S-ITBS	7 S-ITBS		

Table 5

Overview of Standardized Tests Used across the Study Years and Cohorts: Post 5-Day

School Year	Days	Began in Study Year	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
8 9- 9 0	5	11											12 S- TA P	11 S- TA P	10 S- TA P	9 S- TA P	8 S- ITB S	7 S- ITB S
9 0- 9 1	5	12											12 S- TA P	11 S- TA P	10 S- TA P	9 S- TA P	8 S- ITB S	
9 1- 9 2	5	13													12 S- MA T	11 F- TA P 11 S- MA T	10 S- MA T	9 S- MA T
9 2- 9 3	5	14														12-- -	11-- -	10-- -
9 3- 9 4	5	15															12-- -	11-- -

Table 6

Interpretative Legend for Table 7

-	Not in study
*	No usable test
	Pre 5-day week
	4-day week
	Post 5-day week
F-F	Fall to Fall testing
F-S	Fall to Spring testing

For the data presented in Table 7, within a cohort, across the grades with the same set of standards, read across the row. Likewise, within a grade, across the cohorts with different sets of students, read down the column.

Table 7

Meaningful Comparisons across Cohorts and Grades

Cohort	7 th	8 th	9 th	10 th	11 th	12 th
1	-	-	-	-	-	*
2	-	-	-	-	CAT F-F	*
3	-	-	-	CAT F-F	CAT F-F	CAT F-S
4	-	-	CAT F-F	CAT F-F	CAT F-S	*
5	-	CAT F-F	CAT F-F	CAT F-S	*	CAT F-S
6	CAT F-F	CAT F-F	CAT F-S	*	CAT F-S CAT F-F	*
7	CAT F-F	CAT F-S	*	CAT F-S CAT F-F	*	*
8	CAT F-S	*	CAT F-S CAT F-F	*	*	TASK
9	*	CAT F-S CAT F-F	*	*	TASK	TASK
10	CAT F-S CAT F-F	*	*	*	TASK	*
11	*	ITBS	*	*	*	TAP
12	*	ITBS	*	*	TAP	TAP
13	*	ITBS	*	TAP	TAP	*
14	*	ITBS	*	TAP	*	*
15	*	ITBS	*	*	*	*
16	*	ITBS	*	*	*	-

The largest numbers of comparisons occurred when students were on the Pre 5-day week because only the CAT was used. Fewer comparisons are available during the 4-day week due to the changes in standardized tests. Finally, some comparisons were made for the Post 5-day week. Enough comparisons, however, could be made

to clearly ascertain the effects of the 4-day versus 5-day week for 8th, 11th, and 12th grade students.

For all the standardized achievement tests used, a variety of scores, such as national percentile rank, grade equivalent, raw score, stanine score, normal curve equivalent, percent correct score, and scale score, were available. All scores have limitations. The score used for comparisons in this study was the national percentile rank, NPR, a score that is both useful and readily understandable.

With NPR's, student achievement is described in meaningful small and precise units. A percentile rank describes a student's relative standing within a group. A percentile rank of 75 means that the student's score is equal to or higher than the scores made by 75% of the students in the group. Limitations of NPR's are that they do not represent equal units along the score scale. The score scale runs from NPR = 1 to NPR = 99. The difference in ability from the 5th to 10th percentile is not the same as the difference in ability from the 50th to 55th percentile. For a student to move from the 50th to the 55th percentile, an increase in seven raw score points may be needed, but the move from the 5th to 10th percentile may only require an increase of four raw score points.

Grade equivalent scores, G.E., were also not used. In addition to problems with misinterpretation, the G.E. score is too specific for describing individual student achievement. Furthermore, on the Stanford Tests of Academic Skills, grade equivalents higher than 12.9 were reported as post high school, "PHS." This does not allow for quantification of growth from one year to the next. In summary, neither

G.E. nor NPR scores are measured on an equal interval scale. Thus, the “average G.E.” or “average NPR” are quite meaningless, and as such, could not be used as a dependent variable, for example, in an analysis of variance (ANOVA).

Normal Curve Equivalents, NCE's, are typically used in comparisons of test scores. They are the standard workhorse measures for studies comparing test results. They are equal interval scores which represent a normal curve on a 99 point scale. This assures the equality of the magnitudes of the differences between NCE's. For example, the difference between NCE's of 35 – 40 is equivalent to the difference between NCE's of 85 – 90. This equality allows NCE's to be used for evaluating test results, but they must be based on empirically established norms for a particular grade and time of the year. This leads to their limitation in this study: while it is true that reporting procedures for various test batteries have been standardized, it does not mean that scores from different test batteries are interchangeable. Because of the variety of tests, all using unique norming groups, NCE's could not be used to make direct comparisons of test scores.

The variety of tests used over the fifteen year period and the lack of equating studies when the tests were changed by the Arizona Department of Education, mandated the use of a relatively newer measurement tool: Adequate Yearly Progress (AYP). This definition is used more and more frequently in educational testing and reporting. It is more easily understood by the layperson than the traditional statistical definitions. National Percentile Ranks can legitimately be used to document if a student made a year's worth of progress from one school year to the next. For

example, a student at the 50th percentile in the 9th grade should be at the 50th percentile, or above, in the 10th grade in order to maintain “adequate yearly progress.” The change in NPR would be zero, as expected. If the student was at the 58th NPR in the 10th grade, then that student would have not only maintained but also exceeded the expected adequate yearly progress by eight national percentile ranks. If, however, the student were at the 40th NPR in the 10th grade, that student would not have made adequate yearly progress because of the loss of 10 NPR’s.

It is true that Normal Curve Equivalent, Grade Equivalent, Stanines, or any other standardized score could have been used as the basic number upon which to define Adequate Yearly Progress. Their use, however, would not have made any difference in terms of increased validity of the final results. For example, the NPR’s can easily be converted to NCE’s using the accompanying tables provided with each standardized test. But, as they are not being used mathematically between tests in statistical formulae, as a dependent variable in the analysis of variance, nothing is gained by their use. And, the definition of National Percentile Ranks especially lends itself to a measure and understanding of yearly progress.

For the purpose of this research, AYP was defined as “being made” if the NPR from one year to the next was the same, greater than, or no fewer than three NPR’s. This definition is also used by many state reporting institutions. For example, Jane Doe in the 7th grade was at NPR = 54. In the 8th grade, her NPR dropped slightly to 51. Jane is considered to have made AYP. If her 8th grade NPR were 50, she would not have made AYP.

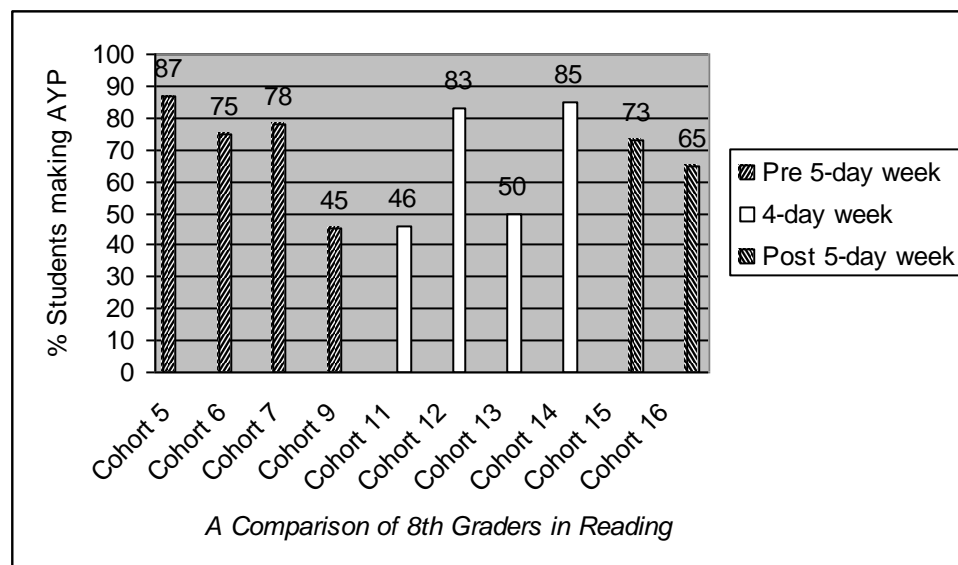
AYP scores were formed for every student in the sample and across three subtests: reading, mathematics, and language. Battery AYP scores were not calculated because more information that is correct is gained from subtest scores. For example, consider a student that made AYP in math and in language but lost 45 NPRs in reading. The battery NPR, using an average, compared across a year might show the student did not make AYP, even though the student did in two of the three subtests.

AYP became the dependent variable in the statistical tests used. SPSS Version 10 and Excel 2000 were used for data analysis. By using AYP, both the effect of outliers and student ability level could be controlled. If one student dropped 60 NPR's in a single year, the mean NPR would be drastically reduced, while the number of students making AYP would be reduced only by a single student. Some student cohorts may have been more academically able than others, but regardless of academic level, all students had equal opportunity to make AYP.

For example, Figure 1 is a reproduction of data presented in the results section of Chapter 4. Notice that 87% of 8th graders in Cohort 5, and on the Pre 5-day week made AYP in reading. Cohort 5 – 8th graders were measured using the CAT in the fall of the 8th grade and fall of the 9th grade. The Cohort consisted of the same students, none of which had left or re-entered the district. For Cohort 11 on the 4-day week, the ITBS in the spring of the 7th grade and spring of the 8th grade was used. Only 46% of the students made AYP in reading. For Cohort 15 on the Post 5-day week, the spring ITBS for the 7th and 8th grades was used, and 73% made AYP.

Because of small sample sizes, differences in percentages should not be over-interpreted. A close examination of Figure 1 shows that some Cohorts performed better with one system than the other. A second statistical test was necessary to isolate the effects of the number of days in the week. For example, referring again to Figure 1, to determine if all 8th graders on the 4-day week (Cohorts 11, 12, 13, and 14) made AYP compared to all 8th graders on the Pre 5-day week (Cohorts 5, 6, and 9), and compared to all 8th graders on the Post 5-day week (Cohorts 15 and 16), a Chi-Square (χ^2) Test of Independence was used.

Figure 1



For all comparisons, all necessary statistical assumptions for using the Chi-Square Test of Independence were met: (1) uses frequency information, (2) variables measured on the same individual, and (3) observations on each variable are between-subjects. The Chi-Square test ascertains if there is a relationship between the length

of the school week and the number of students making AYP. For this statistical analysis, only Cohorts were used that employed fall to fall testing. For example, in Figure 1, Cohort 7 was fall to spring testing and was omitted from the Chi-Square test. To compare the Pre 5-day week, Cohorts 5, 6, and 9 were collapsed into one category and then compared to the 4-day week (Cohorts 11, 12, 13, and 14, also collapsed into one category). Second, a contingency table was constructed, shown as an example of the data from Figure 1 in Table 7:

Table 8

Sample Contingency Table

8 th Grade Reading	Pre 5-day Week	4-day Week
AYP -Yes	The 27 students from Cohorts 5, 6, and 9 that made AYP are used (27)	The 34 students from Cohorts 11, 12, 13, and 14 that made AYP are used. (34)
AYP -No	The 11 students from Cohorts 5, 6, and 9 that did not make AYP are used (11)	The 18 students from Cohorts 11, 12, 13, and 14 that did not make AYP are used (18)

Third, the Chi Square statistic was calculated. For example, on this table, Chi Square = .323, probability = .570, and degrees of freedom = 1. This is not a statistically significant finding (alpha set at .05 for all tests). The conclusion from this example is that there is no statistically significant relationship between attaining AYP and the length of the school week, as compared between the pre-5 and 4-day systems.

Fourth, a statistical tool was used to remove the influence of the sample size.

It is called an “effect size measure” or “fourfold point correlation coefficient,” also known as Phi or Cramer’s statistic. Statistical significance testing is, in general, dependent on sample size. Thus, while a finding from a study with a large sample may be statistically significant, its effect size may be insignificant. Likewise, findings from a small sample may not be statistically significant, but the effect size might be quite impressive. Although interpretation on the fourfold point correlation coefficient is controversial according to Jaccard and Becker (1990) the fourfold point correlation coefficient effect size is interpreted as a Pearson r . Therefore, in the behavioral sciences, an effect size of less than .10 represents a weak relationship, an effect size between .10 and .25 represents a moderate relationship, and an effect size greater than .25 represents a strong relationship. In the sample contingency Table 8, the effect size was .00, which represents an extremely weak effect. Applying this tool to sample table, these questions and answers can be made:

Did 8th graders on the 4-day week make AYP in Reading compared to 8th graders on the Pre 5-day week?

Answer: Yes, because there is no statistically significant relationship between length of school year and AYP.

Regardless of statistical significance, what effect size was noted?

Answer: The effect size of .00 indicates no relationship.

Fifth, another Chi-Square Test of Independence was run to examine the relationship between the 4-day and Post 5-day, and another to examine the relationship between the Pre-5 day and Post-5 day. When using Chi-Square tests, a

caution is that the expected frequencies are nonzero, preferable five and above. For all Chi-Square tests run, the frequencies were greater than or equal to 5. Table 9 gives an overview of the Chi Square Test of Independence information and all statistical formulas and definitions.

Table 9

Chi Square Test of Independence Information

Test	Details	Comments
χ^2 Test	Contingency Table Analysis (Test of Independence)	Family of distributions based on degrees of freedom
Purpose	Use to test if 2 traits or characteristics are related	
H ₀ and H ₁	H ₀ : There is no relationship between__and__. H ₁ : There is a relationship between__and__.	Null: There is no relationship between the length of the school week and number of students making adequate progress. Alternate: There is a relationship between the length. . .
Degrees of Freedom (df)	(Rows-1) times (Columns-1)	df = 1 for a 2 X 2 table
Level of Significance	Set at 0.05	Significance level is also known as Type I error rate
Critical χ^2 value	Based on significance level and degrees of freedom (df)	Significance level set at 0.05 and df for a 2 X 2 table is 1.0
Calculating χ^2	All χ^2 tests are based on the idea of $(f_o - f_e)^2$ so χ^2 is never a negative value.	f_o = observed frequency f_e = expected frequency
Finding f_e	$f_e = \frac{(\text{row tot})(\text{column tot})}{\text{Grand Total}}$	Caution: f_e = should be 5 or more OR if lots of cells, then no more than 20% of cells should have expected frequencies less than 5

Restatement of the Research Objectives

When the archives were closely examined, it was determined that sufficient

data existed to include grades seven and eight from Patagonia Middle School in the study. This expanded the original scope of the project, as it was originally proposed to only look at data from the secondary level. At the secondary level was the significant gap in the literature.

The first two research questions are: (1) what is the effect on secondary and middle school learning, as measured by standardized test scores, when the students move from a five-day school week to a four-day school week? And, (2) what is the effect on secondary and middle school learning, as measured by standardized test scores, when the students move from a four-day week to a five-day school week? Because the districts were mandated to use six different tests over the fifteen year period, the questions had to be answered using the statistical model of Adequate Yearly Progress (AYP). Research question (3) asked: how do standardized test scores compare longitudinally over a fifteen year period in a secondary and middle school as they transition in and out of the four-day school week? The answer to this question is embedded in the answers to the first two questions. Comparisons of AYP using Chi Square Tests are between the pre-five day week and four day week, four day week and post-five day week, and finally, between pre- and post- five day weeks. This methodology covers all variations and provides a fifteen year analysis.

Finally, it was asked: (4) what are the opinions of parents towards the four-day school week while the secondary and middle school are on the program? The survey, as mandated by the Arizona Department of Education, was never designed or intended to be a research-based survey. It was never analyzed in terms of validity or

reliability. It was a simple instrument to give the administration a year-to-year snapshot of community opinion. It is being presented in this study as a side issue, irrelevant to the main research questions. No attempt is made to analyze the results statistically. This is because there is no gap in the literature concerning opinions about the four-day school week, on either side of the issue. A copy of the survey instrument is provided in the next section. The results are provided in Chapter 4.

The null hypothesis states that there will be no significant difference in the scores on the various subtests of a nationally standardized exam before and after the implementation of a four-day school week, as compared to a five-day school week. It further states that there will be no significant differences in the scores on the various subtests of a nationally standardized exam before and after the removal of the four-day school week and a revision to a five-day school week. The statistical methodology detailed in this chapter allows for a valid rejection or non-rejection of the null hypotheses (with alpha set at .05).

Validity and Reliability of Testing Instruments

All of the data comes from standardized tests which are multiple-skill achievement tests. These tests are used to evaluate understanding and knowledge in several areas. They are all norm-referenced tests, as opposed to criterion-referenced or performance tests. Each of the evaluations are group administered screening devices. In the words of Salvia and Ysseldyke, “they are intended to assess the extent to which students have profited from schooling and other life experiences compared to others of the same age or grade” (1995, p. 417). They are all considered useful in

giving teachers, administrators, board members, and parents a considerable amount of information in a relatively short time. All of the tests used in this study were mandated by the Arizona Department of Education for the year in which they were administered. The specific testing dates were also mandated within a two week window of district discretion. All of the student answer sheets were submitted to the Arizona Department of Education for machine scoring by the publishers.

The California Achievement Test (CAT) is a battery of achievement tests that measure academic levels from grades K through 12 (published by CTB and McGraw-Hill). It consists of four main divisions: Reading, Language Arts, Mathematics, and a Supplementary Content Area. The students in Arizona were administered two subtests of the Reading battery, Vocabulary and Comprehension. The Vocabulary subtest measures the students understanding of word meaning. Students must identify words that fit categories, that have the same meaning, or that have opposite meanings. Students are also required to use context clues to identify the intended meaning of words that have multiple meanings” (Salvia & Ysseldyke, 1995, p. 422). The Comprehension subtest “assesses literal, inferential, and evaluative comprehension; students derive meaning from written sentences and passages” (Salvia & Ysseldyke, 1995, p. 423). Middle and high school students did not take the Visual Recognition, Sound Recognition, or Word Analysis subtests of this category. NPR’s for individual students in Reading were reported as a battery score, combining the Vocabulary and Comprehension subtests.

Within the Language Arts battery, Arizona students took the Spelling,

Language Mechanics, and Language Expression subtests. These are all the subtests available under this battery. The Spelling subtest assesses students skill in identifying incorrectly spelled words used in sentences. The Language Mechanics subtest measures capitalization and punctuation skills. Students are required to edit passages presented in differing formats. The Language Expression subtest “assesses the students’ skill in effective written expression, including the use of various parts of speech and the formation and organization of sentences and paragraphs” (Salvia & Ysseldyke, 1995, p. 423). The results of the three subtests were combined for a battery NPR for each student in Language Arts.

Arizona students took all of the subtests under the Mathematics section: Mathematics Computation and Mathematics Concepts and Applications. The Computations section “assesses students’ skill in solving addition, subtraction, multiplication, and division problems involving whole numbers, fractions, mixed numbers, decimals and algebraic expressions.” The Concepts and Applications subtest “assesses students’ skill in understanding and applying a wide range of mathematical concepts involving numeration, number sentences, number theory, problem solving, measurement, and geometry” (Salvia & Ysseldyke, 1995, p. 423). The results of the two subtests were combined for a battery NPR for each student in mathematics.

Students in Arizona did not take any of the subtests of the Supplementary Content Area: Study Skills, Science, and Social Studies.

The California Achievement Test has separate norms for the fall, winter, and

spring. The Fall test used in Arizona was standardized with 109,825 students. There were three separate groups used for the norming: public, private, and Catholic. The public school samples were also “stratified on the basis of geographic region, community type (urban, rural, suburban), district size, and socioeconomic status” (Salvia & Ysseldyke, 1995, p. 424).

The authors of the CAT provide reliability information based on internal consistency estimates. For the Complete Battery, the subtests are generally above .80. The only exceptions are “at grades 11 and 12 for science and social studies, which fall below the .80 level. Data are not reported on test-retest reliability or alternate-forms reliability” (Salvia & Ysseldyke, 1995, p. 424).

In determining validity, individual school districts must determine if the CAT accurately assesses the objectives of their curriculum. The authors of the CAT have made an effort “to ensure content validity and eliminate cultural bias from the test items.” Other measures of validity are limited to an analysis that the mastery of objectives is correlated to an increase in age of the students and the fact that the CAT is correlated with another test that measures learning aptitude: the Test of Cognitive Skills (Salvia & Ysseldyke, 1995, p. 424).

The Iowa Test of Basic Skills, ITBS, is another type of achievement test to assess multiple skills (Riverside Publishing Company). It was used in Arizona for elementary grades. For the purposes of this study, grades 7 and 8 were examined. Its partner, the Tests of Achievement and Proficiency (TAP) is for secondary students, grades 9-12. Both exams are “norm referenced and criterion referenced tests

designed to assess broad general functioning rather than specific facts and content” (Salvia & Ysseldyke, 1995, p. 425). Both tests were designed for the purpose of “(1) determination of students’ developmental levels to assist in adapting instruction, (2) identification of specific qualitative strengths and weaknesses, (3) identification of readiness both to begin instruction and to proceed to the next step in instruction, (4) provision of data to assist in grouping students, (5) evaluation of strengths or weaknesses in entire group performance, (6) provision of information on pupil progress toward meeting instructional goals, and (7) provision to parents of objective, meaningful reports of their children’s progress in learning basic skills” (Salvia & Ysseldyke, 1995, p. 425). Middle school students in Arizona took subtests of the ITBS in Reading Comprehension, Math, Written Expression, Using Sources of Information, Social Studies, and Science. Secondary students in Arizona took the subtests of the TAP in the same categories. Only data from the first three subtests could be used in this study for analysis.

The Reading Comprehension subtest assesses “word recognition, word attack, literal and inferential comprehension, determining vocabulary in context, and generalization” (Salvia & Ysseldyke, 1995, p. 425).

The Written Expression subtest assesses “the skills necessary for expressing ideas in writing. It includes questions on spelling, sentence structure, and the correct use of pronoun references” (Salvia & Ysseldyke, 1995, p. 425).

The Math subtest assesses “knowledge of mathematical concepts, the ability to solve written problems, interpretation of data, understanding of principles, and the

use of basic math in managing the quantitative aspects of everyday living” (Salvia & Ysseldyke, 1995, p. 427).

“The ITBS and TAP were standardized concurrently with the Cognitive Abilities Test. These measures were standardized on a carefully selected stratified national sample of about 170,000 students. All public school districts in the United States were stratified, first on the basis of geographic region, and then on the basis of size of enrollment. Districts were then stratified on the basis of socioeconomic status, based on the percent of students in the district falling below the federal government poverty guideline” (Salvia & Ysseldyke, 1995, p. 428).

Reliability of the two tests is from internal-consistency data based on the original standardization samples. “Reliabilities for the ITBS raw score range from .65 to .94. The reliability coefficients for the TAP raw scores all exceed .80” (Salvia & Ysseldyke, 1995, p. 429).

According to researcher Salvia, the ITBS and TAP were written to ensure content validity through the use of several steps. “Curriculum guides, textbooks, and research were consulted in writing the items. Potential items were tried out on more than 100,000 students from thirty states. Item selection was based on the performance of this sample group, and selected items were reviewed for bias” (1995, p. 429).

The Stanford Achievement Test, SAT, and its partner, the Test of Academic Skills, TASK, are published by The Psychological Corporation. Only data from the TASK could be used in this study for analysis. The TASK is a criterion referenced and norm referenced exam. The subtests administered in Arizona were the Reading

Vocabulary, Reading Comprehension, Language Arts, Language Mechanics, Language Expression, Spelling, Mathematics, Science, Social Studies, and Environment. The Reading Vocabulary and Reading Comprehension were combined for a battery score entitled, Reading. The three Language subtests and the Spelling subtest were combined for a battery score entitled, English. The subtests in Science, Social Studies, and Environment could not be included in this analysis.

The two Reading subtests assess a student's ability to "select words that best fit definitions," and the ability to "read passages that assess textual, functional, and recreational reading skills and then answer questions at the end of each passage, which assess literal and inferential comprehension" (Salvia & Ysseldyke, 1995, p. 433).

The subtest combined for the "English" battery score assess a student's "understanding and using the mechanics of language, forming complete sentences, locating and organizing information, and applying the conventions of spelling." In addition, the subtests assess knowledge of the "conventions of capitalization and punctuation and the use of grammatical concepts." A student's ability to "manipulate words, phrases, and clauses" is also assessed (Salvia & Ysseldyke, 1995, p. 433).

The Mathematics subtest assesses a student's concepts of numbers, ability to do mathematical computations, and ability to do real-world applications.

The SAT and TASK were normed using both fall and spring scores simultaneously with the Otis-Lennon School Ability Test. The sample section used for norming was based on the variables of "geographic region, socioeconomic status,

community type (urban or rural), and public/non-public status” (Salvia & Ysseldyke, 1995, p. 435). A total population of 190,000 students was used.

The reliability studies on the TASK used KR-20 and KR-21 internal-consistency coefficients and alternative-forms coefficients. The internal-consistency coefficients ranged from .60 to .96, with most between .85 and .90. The lower coefficients are from the Environment subtest and are not used in this study. The alternative-forms coefficients ranged from .71 to .95.

The TASK relies primarily on content validity to measure overall validity. “Items for the series were originally written by the test authors and submitted to a group of subject-matter experts to establish content accuracy.” These were edited and then reviewed by editors “for writing clarity.” The possible test items were then submitted to persons representing minority groups “who screened the items of the appropriateness of content for various cultural groups.” Finally, “empirical validity was established on the basis of three factors: the increasing difficulty of items with higher grade levels,” and high relationships with other test series, such as the Otis-Lennon School Ability Test (Salvia & Ysseldyke, 1995, p. 436).

The Metropolitan Achievement Test, MAT, is a fourth achievement test with a battery of subtests to assess multiple skills. It covers fourteen levels, from kindergarten through twelfth. For statistical reasons, the data from this test could not be used as part of the analysis.

Survey Instrument

The following questionnaire, Table 10, was sent to each of the residents of the school district.

Table 10

Questionnaire on the Four Day School Week

<p>The Patagonia School Districts have concluded a school year on the four-day week. The administration is asking for your input as we plan for the following school year. Please answer the following questions, fold, and mail to the District Office. If you wish, the form may be returned to school with your son or daughter, or it may be faxed to the office at the following number: XXX-XXXX</p>	
<hr/>	
<p>1. I am a parent of a student currently enrolled in grades 7-12 in Patagonia:</p>	
YES	NO
<p>2. If I answered YES to Question #1: My child is enrolled in:</p>	
Patagonia Middle School	Patagonia High School
<p>3. For the following school year, I would like to have:</p>	
<p>A. The four-day school week dropped and the districts return to a five-day school week.</p>	
<p>B. The districts remain on the four-day school week.</p>	
<p>C. No opinion provided.</p>	
<hr/>	
<p>If you voted to drop the four-day week and return to a five-day week, please explain your most important reasons:</p>	
<p>1.</p>	
<p>2.</p>	
<p>3.</p>	
<hr/>	
<p>If you voted to keep the four-day week, please explain your most important reasons:</p>	
<p>1.</p>	
<p>2.</p>	
<p>3.</p>	
<hr/>	

Everyone who was a registered voter or who had provided a mailing address

when registering his or her child in the school system received the form. Parents of out-of-district students, who had received governing board permission to attend school in Patagonia, were also sent the survey. It was sent once a year for each of the five years the districts were on the four-day school week. It was sent out in English and Spanish versions. There was not any pre-survey before implementing the four-day school week. There was not any post-survey when the district returned to a five-day school week.

Data Collection and Preparation

The data was collected from the archives of Patagonia Middle and High Schools. It was analyzed using Microsoft Excel 2000 and SPSS Version 10, Statistical Package for the Social Sciences.

Summary

Chapter Three gives an overview of the methodology used to answer the research questions. It is written so that other researchers could duplicate this work. A detailed review of the data reduced the options for valid statistical analysis. AYP, or Adequate Yearly Progress, was the only option to fit the nature of the data. A sample of the data presentation and a Chi-Square Contingency Table were presented in Figure 1 and Table 8. The validity and reliability of the testing instruments were explained. The demographics of the student population were explained in terms of the history of the community and the current programs.

Chapter Four will present the actual data from the comparisons of the various subtests. It will detail the Chi-Square values, the statistical significances, and the

effect sizes of each comparison. It will conclude with a presentation of the survey data.

CHAPTER FOUR

FINDINGS

Introduction

This chapter presents the results of the statistical analysis of the test scores and the questionnaire from the two school districts. For each grade, seven through twelve, the test score data are introduced with a graph of the results in the three categories: Pre 5-day week, 4-day week, and Post 5-day week for each of the three subject areas. For each grade, results in reading are presented first, followed by math and then language arts. After each grade and subject area, Chi Square Contingency tables are presented. The “p-value” concludes each table with the final results indicating “stat significant,” or “not significant.” Statistically, the p-value is also called the “significance level,” or the “probability value.” It provides a criterion for comparing the observed difference with the difference one would expect to encounter in the natural course of observing the variable. The significance test indicates whether the observed difference between experimental and control groups is greater than the difference that would be expected due to these sources of variation. In other words, it “assesses how likely it is that the observed difference is due to chance” (Smith & Glass, 1987, p. 98). A p-value less than 0.05 indicates that the observed difference would occur by chance less than five times out of one hundred. Depending on the p-value, the research can show that the difference in test scores was statistically significant, or not significant.

As explained in Chapter Three, AYP stands for Adequate Yearly Progress. It

refers to the fact that a student has made a year's worth of progress in a particular subject area from one school year to the next. For the data presented in this chapter, AYP was defined as "being made" if the NPR from one year to the next was the same, greater than, or no fewer than three NPR's.

Also explained in Chapter Three, cohorts of students were used for this longitudinal study. To be included as a member of a particular cohort, the student must begin and end with his or her cohort group, be continually enrolled in school, and be present for testing. Tables 6 and 7 (pages 77 and 78) from Chapter Three are also reproduced here to illustrate the grade level and test used for each cohort's data presented in this chapter.

Table 6 (from Chapter 3)

Interpretative Legend for Table 7

-	Not in study
*	No usable test
	Pre 5-day week
	4-day week
	Post 5-day week
F-F	Fall to Fall testing
F-S	Fall to Spring testing

Table 7 (from Chapter 3)

Meaningful Comparisons across Cohorts and Grades

Cohort	7 th	8 th	9 th	10 th	11 th	12 th
1	-	-	-	-	-	*
2	-	-	-	-	CAT F-F	*
3	-	-	-	CAT F-F	CAT F-F	CAT F-S
4	-	-	CAT F-F	CAT F-F	CAT F-S	*
5	-	CAT F-F	CAT F-F	CAT F-S	*	CAT F-S
6	CAT F-F	CAT F-F	CAT F-S	*	CAT F-S CAT F-F	*
7	CAT F-F	CAT F-S	*	CAT F-S CAT F-F	*	*
8	CAT F-S	*	CAT F-S CAT F-F	*	*	TASK
9	*	CAT F-S CAT F-F	*	*	TASK	TASK
10	CAT F-S CAT F-F	*	*	*	TASK	*
11	*	ITBS	*	*	*	TAP
12	*	ITBS	*	*	TAP	TAP
13	*	ITBS	*	TAP	TAP	*
14	*	ITBS	*	TAP	*	*
15	*	ITBS	*	*	*	*
16	*	ITBS	*	*	*	-

The following summarizes the data to be presented in Chapter Four:

1. 7th grade: A graphical comparison of the AYP 4 cohorts made in Reading, Math, and Language on a Pre 5-day school week. No data were available for 4-day and Post 5-day week comparisons. No effect sizes calculated.
2. 8th grade: A graphical comparison of Pre 5-day, 4-day, and Post 5-day AYP in reading, math, and language. Chi-Square Tests of

Independence used to determine if there were relationships between school week and number of students making AYP. Effect sizes calculated.

3. 9th grade: A graphical comparison of the AYP 4 cohorts made in Reading, Math, and Language on the Pre 5-day school week. No data were available for 4-day and Post 5-day week comparisons. No effect sizes calculated.

4. 10th grade: A graphical comparison of the AYP made in Reading, Math, and Language on the Pre 5-day school week compared to the Post 5-day school week. Chi-Square Tests of Independence used to determine if there were relationships between Pre and Post 5-day school weeks and number of students making AYP. Effect sizes calculated. No data were available for any 4-day week comparisons.

5. 11th grade: A graphical comparison of Pre 5-day, 4-day, and Post 5-day AYP in reading, math, and language. Chi-Square Tests of Independence used to determine if there were relationships between school week and number of students making AYP. Effect sizes calculated.

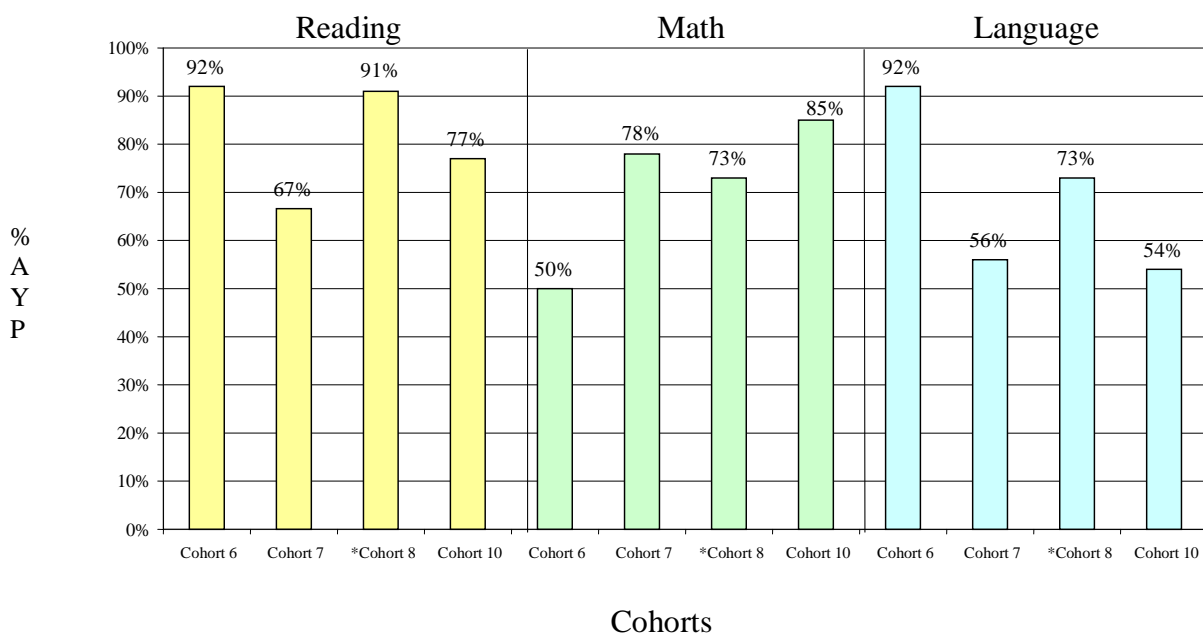
6. 12th grade: A graphical comparison of Pre 5-day, 4-day, and Post 5-day AYP in reading, math, and language. Chi-Square Tests of Independence used to determine if there were relationships between the school week and number of students making AYP. Effect sizes calculated.

7. For all the Chi Square Contingency Tables, UR, UL, LR, and LL refer to upper right, upper left, lower right, and lower left, respectfully. All “expected frequencies” are nonzero and preferably five or greater.

The chapter concludes with an overall summary of the test data. All results are summarized visually in Tables 41 and 42, on pages 146 and 147. Significant

results are underlined. These findings are then related to the hypothesis and null hypothesis. Following this is a presentation of the survey data from the questionnaire and a brief analysis of the results.

Figure 2



7th Grade Pre 5-day Week AYP Results in Reading, Mathematics, and Language

The vertical axis represents the percentage of 7th graders who made AYP.

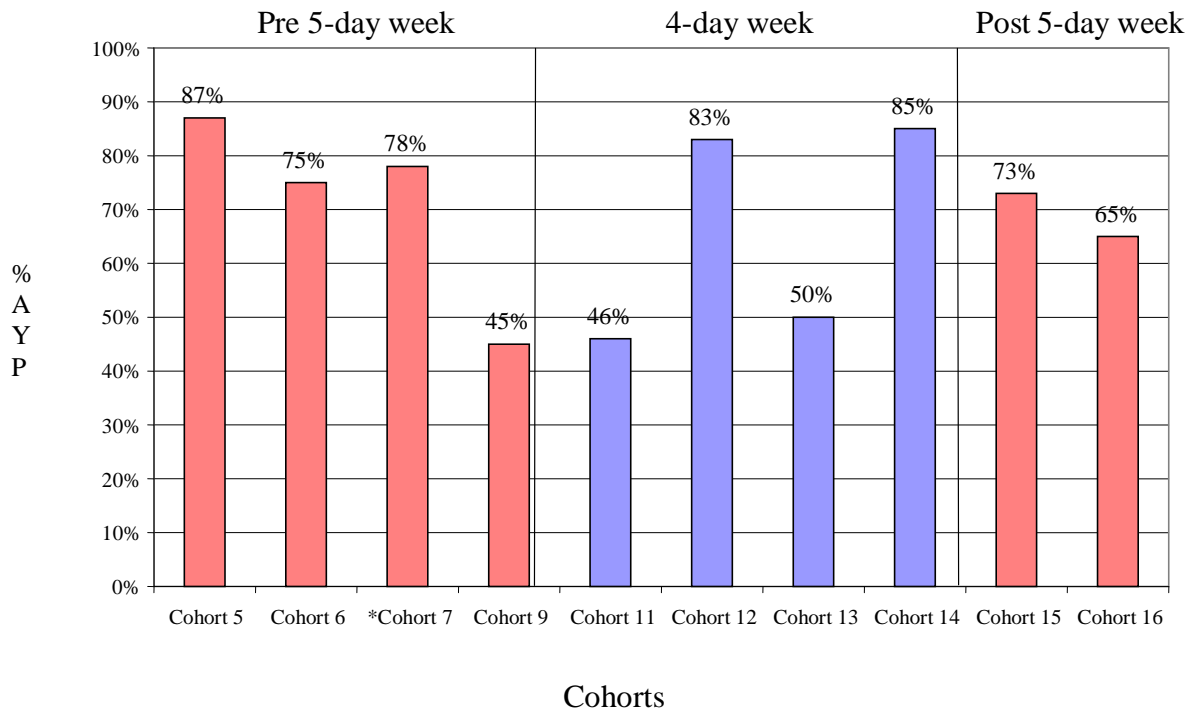
The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All the Cohorts represent Fall to Fall testing except Cohort 8 (*) that reflects Fall to Spring testing.

The majority of 7th graders on the Pre 5-day week made AYP. In reading, an average of the four Cohorts shows that 82% made AYP; in math, an average of 71% made AYP; and in language, an average of 69% made AYP. No other comparisons

could be made with this grade.

The 8th grade represents the first group for which all comparisons could be made between the 4-day week, the Pre 5-day, and the Post 5-day week (see Figure 3).

Figure 3



8th Grade 4-day Week AYP Results in Reading

The vertical axis represents the percentage of 8th graders who made AYP in reading. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 7 (*) that reflects Fall to Spring testing

A simple visual comparison of the three categories in Figure 3 is difficult to interpret. Taking the averages of the three categories shows that 71% with the Pre 5-

day made AYP, 66% with the 4-day, and 69% with the Post 5-day. The lowest percentage is with the 4-day, but is this difference significant? In order to answer this question with this grade and each of the other grades and subjects, Chi Square tests were performed to demonstrate any significant differences (see Table 8 for sample and explanation). Tables 11, 12, and 13 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 11

8th graders on 4-day week AYP in Reading compared to 8th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	27	34			
AYP No	11	18			
			90		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	35.24	25.76	12.24	16.76	
Chi Square Statistic=	0.323				
Degrees of Freedom=	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.57; Not Significant				

The differences between the scores on the Pre 5-day week and the 4-day week in reading are not statistically significant.

Table 12

8th graders on 4-day week AYP in Reading compared to 8th graders on Post 5-day Week

	4-day	Post 5-day	
AYP Yes	34	19	
AYP No	18	9	
			80

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 18.55 34.45 17.55 9.45

Chi Square Statistic = 0.05

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.823; Not Significant

The differences between the scores on the 4-day week and the Post 5-day week in reading are not statistically significant.

Table 13

8th graders on Pre 5-day week AYP in Reading compared to 8th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	27	19
AYP No	11	9
		66

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 19.52 26.48 11.52 8.48

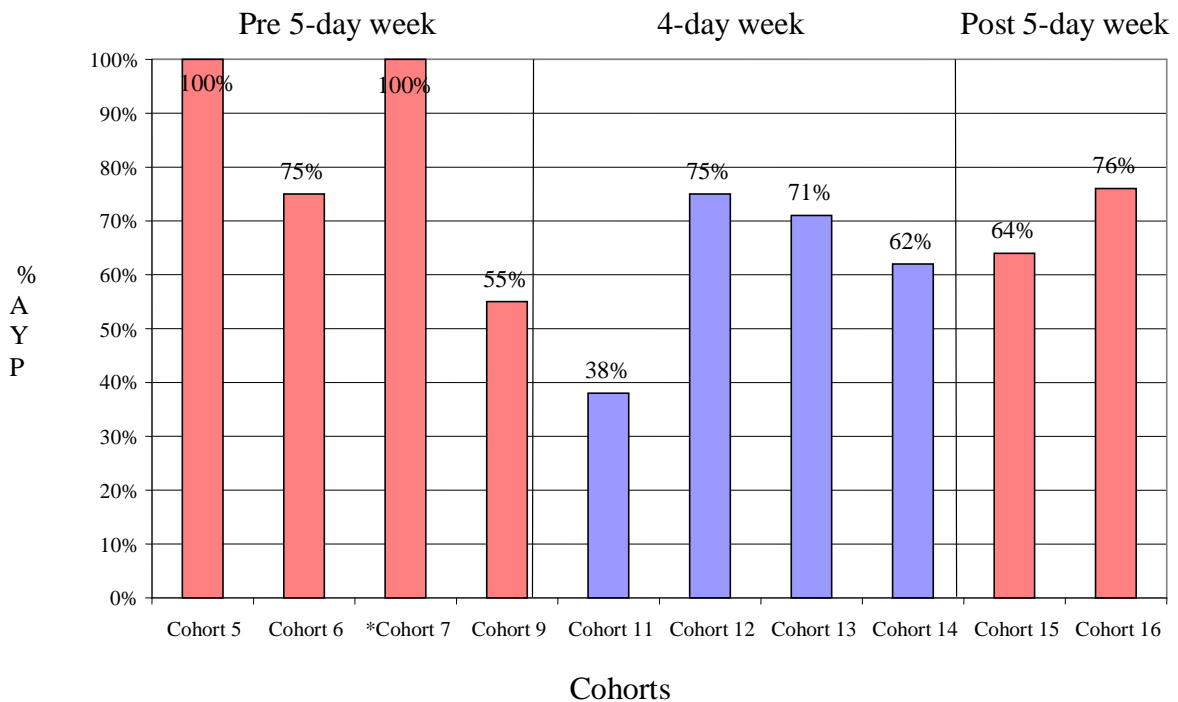
Chi Square Statistic = 0.078

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.78; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in reading are not statistically significant.

Figure 4



8th Grade 4-day Week AYP Results in Mathematics

The vertical axis represents the percentage of 8th graders who made AYP in math. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 7 (*) that reflects Fall to Spring testing.

A visual comparison of Figure 4 seems to indicate that the highest scores among Cohorts occurred under the Pre 5-day week. Averages for each category shows that under the Pre 5-day week, the average for all Cohorts of students making AYP is 83%. Under the 4-day week it is 62% and 70% under the Post 5-day week.

Chi Square tests were performed using individual student scores to truly determine if differences are significant. Tables 14, 15, and 16 outline the Chi Square tests between the 4-day week, the Pre 5-day week, and the Post 5-day week.

Table 14

8th graders on 4-day week AYP in Math compared to 8th graders on Pre 5-day Week

	Pre 5-day	4-Day	
AYP Yes	30	32	
AYP No	8	20	
			90

Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell
	35.82	26.18	11.82	16.18

Chi Square Statistic = 3.105

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.078; Not Significant

The differences between scores on the 4-day week and the Pre 5-day week in math are not statistically significant.

Table 15

8th graders on 4-day week AYP in Math compared to 8th graders on Post 5-day Week

	4-day	Post 5-day	
AYP Yes	32	20	
AYP No	20	8	
			80

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 18.20 33.80 18.20 9.80

Chi Square Statistic = 0.783

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.376; Not Significant

The differences between scores on the 4-day week and the Post 5-day week in math are not statistically significant.

Table 16

8th graders on Pre 5-day week AYP in Math compared to 8th graders on Post 5-day Week

	Pre 5-day	Post 5-day	
AYP Yes	30	20	
AYP No	8	8	
			66

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 21.21 28.79 9.21 6.79

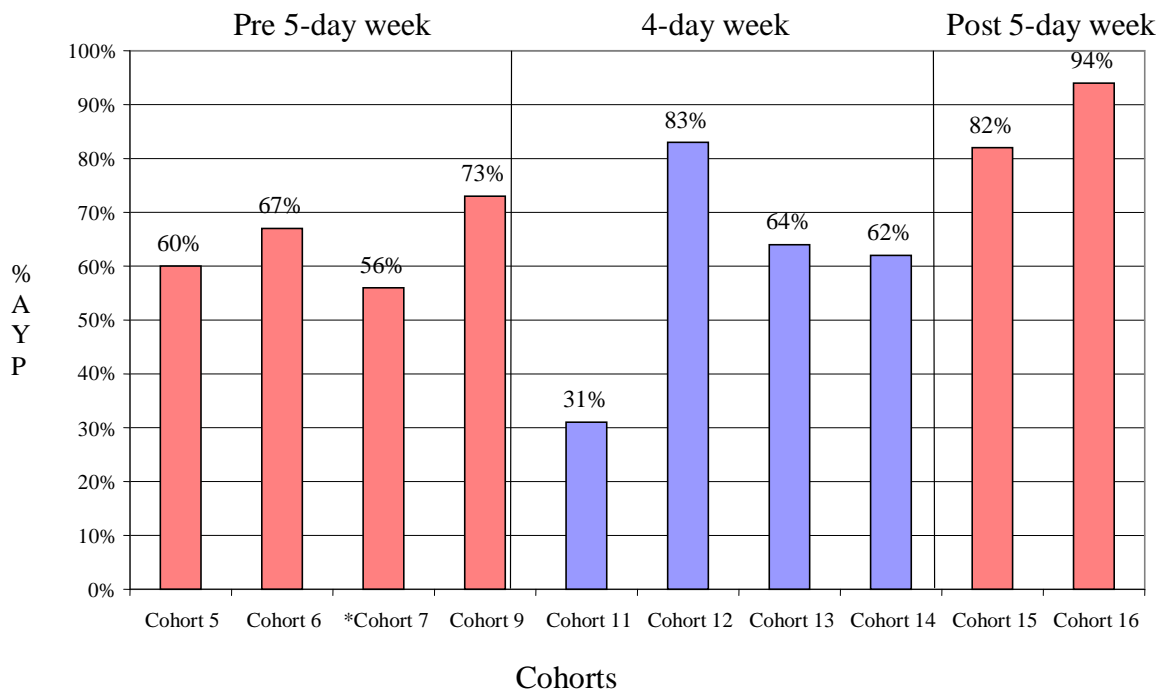
Chi Square Statistic = 0.496

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.481; Not Significant

The differences between scores on the Pre 5-day week and the Post 5-day week in math are not statistically significant.

Figure 5



8th Grade 4-day Week AYP Results in Language

The vertical axis represents the percentage of 8th graders who made AYP in language. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 7 (*) that reflects Fall to Spring testing.

A visual comparison of Figure 5 seems to indicate that the highest scores among Cohorts occurred under the Post 5-day week. Averages for each category shows that under the Pre 5-day week, the average for all Cohorts of students making AYP is 64%. Under the 4-day week it is 60% and 88% under the Post 5-day week. Chi Square tests were performed using individual student scores to truly determine if

differences are significant. Tables 17, 18, and 19 outline the Chi Square tests between the 4-day week, the Pre 5-day week, and the Post 5-day week.

Table 17

8th graders on 4-day week AYP in Language compared to 8th graders on Pre 5-day

Week

	Pre 5-day	4-Day			
AYP Yes	25	31			
AYP No	13	21			
			90		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	32.36	23.64	14.36	19.64	
Chi Square Statistic =	0.356				
Degrees of Freedom =	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.551; Not Significant				

The differences between scores on the 4-day week and the Pre 5-day week in language are not statistically significant.

Table 18

8th graders on 4-day week AYP in Language compared to 8th graders on Post 5-day Week

	4-day	Post 5-day	
AYP Yes	31	25	
AYP No	21	3	
			80

Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell
	19.60	36.40	15.60	8.40

Chi Square Statistic = 7.630

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.006; Stat Significant

The differences between scores on the 4-day week and the Post 5-day week in language are statistically significant.

Table 19

8th graders on Pre 5-day week AYP in Language compared to 8th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	25	25
AYP No	13	3
		66

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 21.21 28.79 9.21 6.79

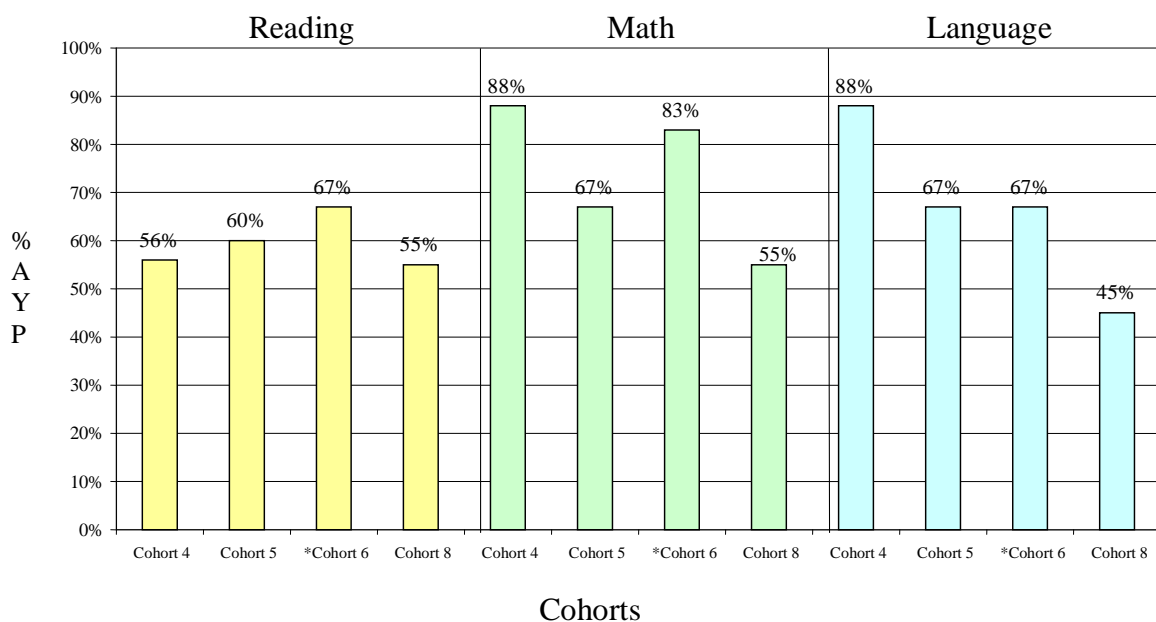
Chi Square Statistic = 4.846

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.028; Stat Significant

The differences between scores on the Pre 5-day week and the Post 5-day week in language are statistically significant.

Figure 6



9th Grade Pre 5-day Week AYP Results in Reading, Mathematics, and Language

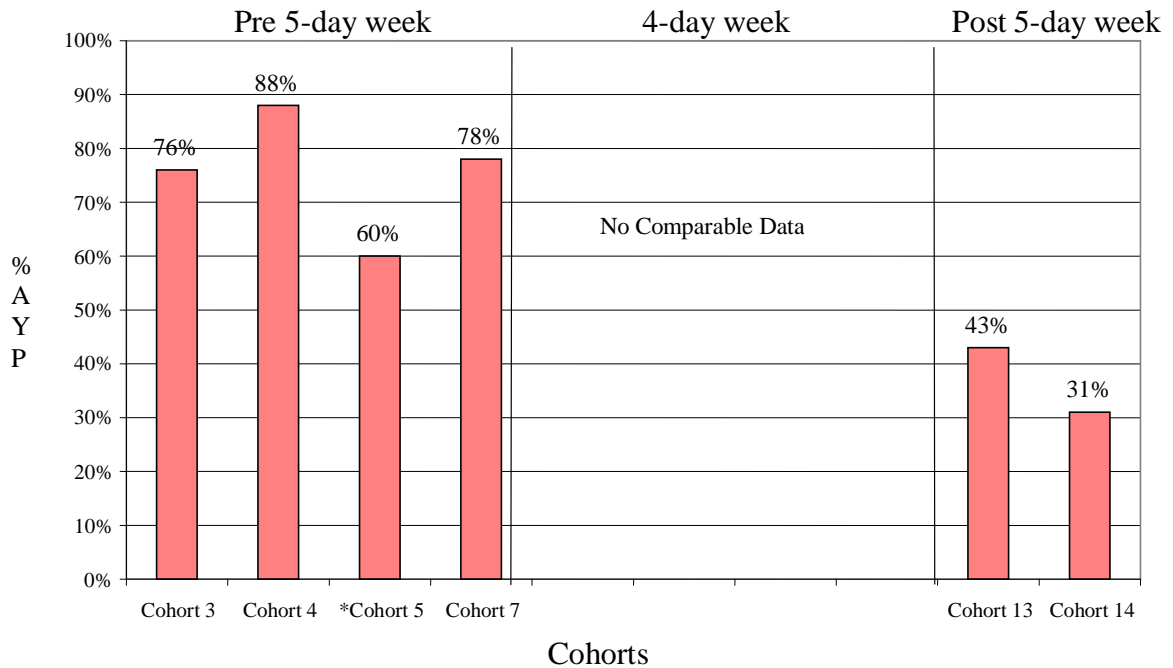
The vertical axis represents the percentage of 9th graders who made AYP.

The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All the Cohorts represent Fall to Fall testing except Cohort 6 (*) that reflects Fall to Spring testing.

The majority of 9th graders on the Pre 5-day week made AYP. In reading, an average of the four Cohorts shows that 60% made AYP; in math, an average of 73% made AYP; and in language, an average of 67% made AYP. No other comparisons could be made with this grade.

For the 10th graders, only comparisons between Pre and Post 5-day week could be made in each of the three subject areas (see Figures 7, 8, and 9).

Figure 7



10th Grade Pre 5-day Week AYP Results in Reading

The vertical axis represents the percentage of 10th grade students making AYP in reading. The horizontal axis represents the various Cohorts which met the definition for inclusion in the study. All of the Cohorts represent Fall to Fall testing except Cohort 5 (*) which represents Fall to Spring testing.

A visual inspection of Figure 7 seems to indicate a significant difference between the Pre and Post 5-day week percentages of students making AYP. The average for the Pre 5-day week is 76%. The average for the Post 5-day week is 37%. Table 20 is the Chi Square test between the Pre and Post 5-day week in reading for 10th graders.

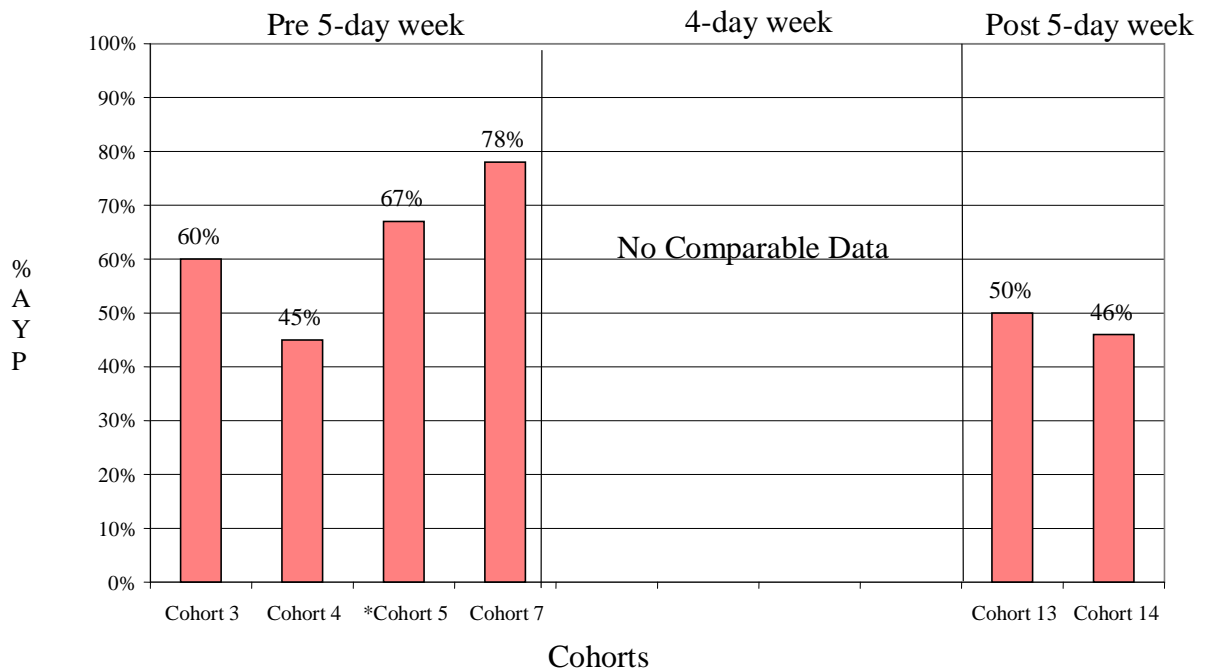
Table 20

10th graders on Pre 5-day week AYP in Reading compared to 10th graders on Post 5-day Week

	Pre 5-day	Post 5-day			
AYP Yes	40	10			
AYP No	10	17			
			77		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	17.53	32.47	17.53	9.47	
Chi Square Statistic =	14.213				
Degrees of Freedom =	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.000; Stat Significant				

The differences between scores on the Pre 5-day week and the Post 5-day week in reading are statistically significant.

Figure 8



10th Grade Pre 5-day Week AYP Results in Mathematics

The vertical axis represents the percentage of 10th grade students making AYP in math. The horizontal axis represents the various Cohorts which met the definition for inclusion in the study. All of the Cohorts represent Fall to Fall testing except Cohort 5 (*) which represents Fall to Spring testing.

The average AYP for the Pre 5-day cohorts is 63%. The average AYP for the Post 5-day cohorts is 48%. Table 21 is the Chi Square test between the Pre and Post 5-day cohorts in math for the 10th grade.

Table 21

10th graders on Pre 5-day week AYP in Math compared to 10th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	27	13
AYP No	23	14
	77	

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 14.03 25.97 24.03 12.97

Chi Square Statistic = 0.241

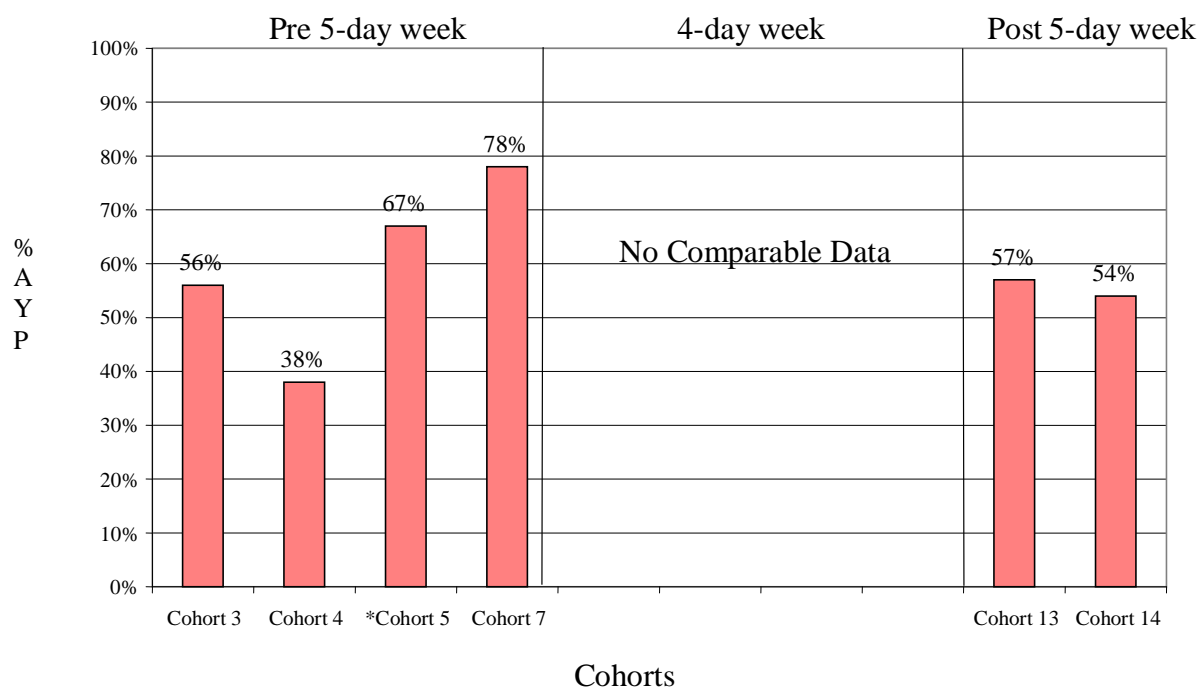
Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.624; Not Significant

The differences between scores on the Pre 5-day week and the Post 5-day week in math for 10th graders are not statistically significant.

The final graph for the 10th graders is under Figure 9. It shows the comparison between the Pre and Post 5-day week scores in Language. As with the scores in math and reading, there were no comparable data for the 4-day week.

Figure 9



10th Grade Pre 5-day Week AYP Results in Language

The vertical axis represents the percentage of 10th grade students making AYP in language. The horizontal axis represents the various Cohorts which met the definition for inclusion in the study. All of the Cohorts represent Fall to Fall testing except Cohort 5 (*) which represents Fall to Spring testing.

The average AYP for the Pre 5-day cohorts is 60%. The average AYP for the Post 5-day cohorts is 56%. Table 22 is the Chi Square test between the Pre and Post 5-day cohorts in language for the 10th grade.

Table 22

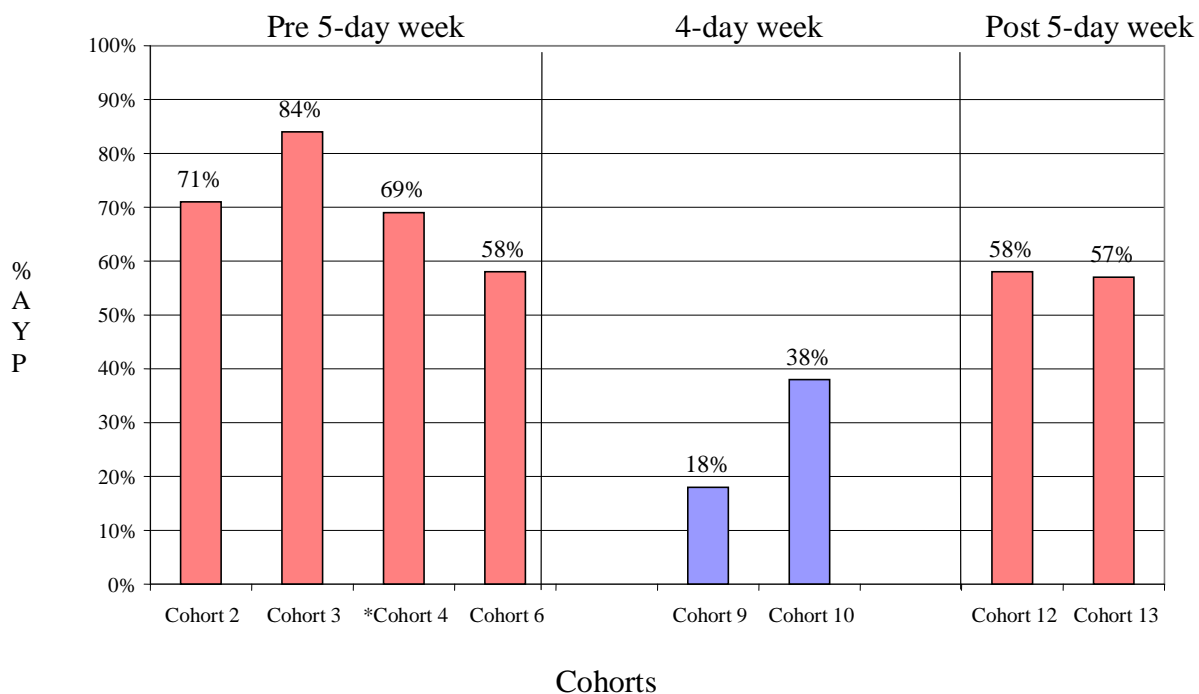
10th graders on Pre 5-day week AYP in Language compared to 10th graders on Post 5-day Week

	Pre 5-day	Post 5-day			
AYP Yes	27	15			
AYP No	23	12			
			77		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	14.73	27.27	22.73	12.27	
Chi Square Statistic =	0.017				
Degrees of Freedom =	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.896; Not Significant				

The differences between scores on the Pre 5-day week and the Post 5-day week in language for 10th graders are not statistically significant.

The 11th and 12th graders, like the 8th graders, represent classes for which complete comparisons can be made.

Figure 10



11th Grade 4-day Week AYP Results in Reading

The vertical axis represents the percentage of 11th graders who made AYP in reading. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 4 (*) that reflects Fall to Spring testing.

A visual comparison of the three categories in Figure 10 seems to indicate a considerable difference between the blue and red bar graphs. Taking the averages of the three categories shows that 71% with the Pre 5-day made AYP, 28% with the 4-day, and 58% with the Post 5-day. The lowest percentage is with the 4-day week, but is this difference significant between individual student scores? This question is

answered with Chi Square tests between each of the categories. Tables 23, 24, and 25 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 23

11th graders on 4-day week AYP in Reading compared to 11th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	53	7			
AYP No	19	17			
			96		

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 15.00 45.00 27.00 9.00

Chi Square Statistic= 15.170

Degrees of Freedom= 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.000; Stat Significant

The differences between the scores on the Pre 5-day week and the 4-day week in reading are statistically significant.

Table 24

11th graders on 4-day week AYP in Reading compared to 11th graders on Post 5-day Week

	4-day	Post 5-day	
AYP Yes	7	15	
AYP No	17	11	
			50

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 11.44 10.56 13.44 14.56

Chi Square Statistic = 4.121

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.042; Stat Significant

The differences between the scores on the 4-day week and the Post 5-day week in reading are statistically significant.

Table 25

11th graders on Pre 5-day week AYP in Reading compared to 11th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	53	15
AYP No	19	11
		98

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 18.04 49.96 22.04 7.96

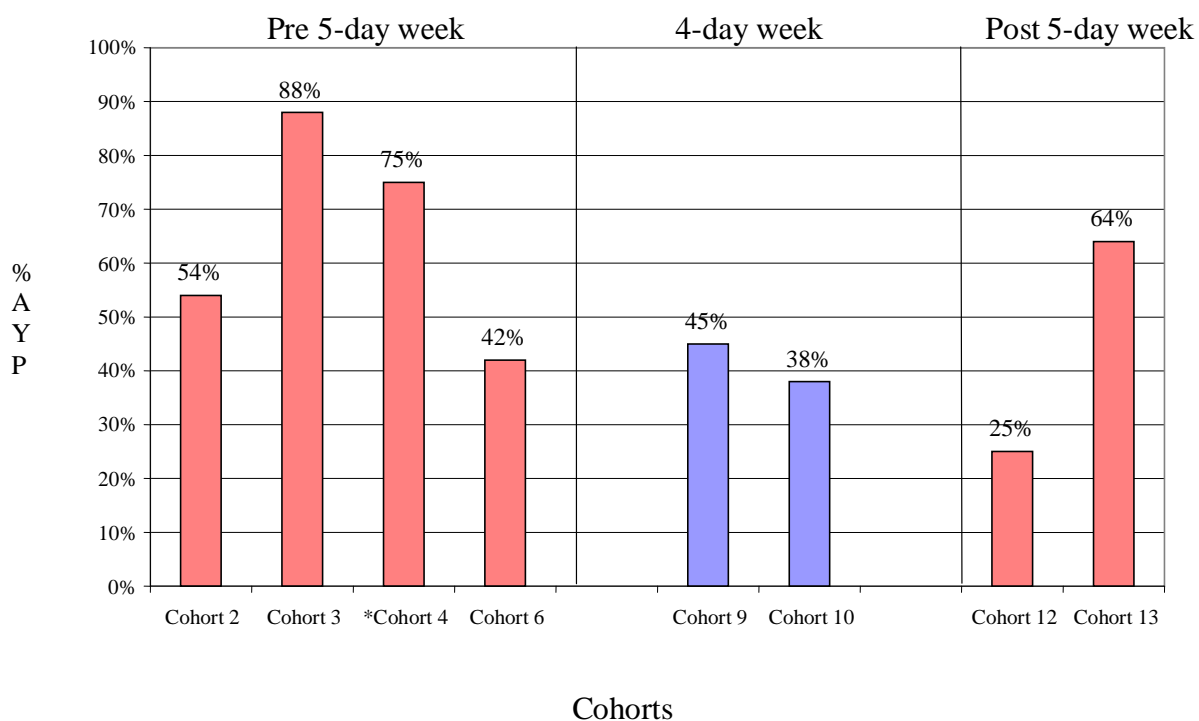
Chi Square Statistic = 2.279

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.131; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in reading are not statistically significant.

Figure 11



11th Grade 4-day Week AYP Results in Mathematics

The vertical axis represents the percentage of 11th graders who made AYP in math. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 4 (*) that reflects Fall to Spring testing.

A visual comparison of the three categories in Figure 11 seems to indicate comparable scores between some of the Cohorts. Taking the averages of the three categories shows that 65% with the Pre 5-day made AYP, 42% with the 4-day, and 45% with the Post 5-day. The lowest percentage is with the 4-day, but is this difference significant between individual student scores? This question is answered

with Chi Square tests between each of the categories. Tables 26, 27, and 28 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 26

11th graders on 4-day week AYP in Math compared to 11th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	46	10			
AYP No	26	14			
			96		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	14.00	42.00	30.00	10.00	
Chi Square Statistic=	3.657				
Degrees of Freedom=	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.056; Not Significant				

The differences between the scores on the Pre 5-day week and the 4-day week in math are not statistically significant.

Table 27

11th graders on 4-day week AYP in Math compared to 11th graders on Post 5-day

Week

	4-day	Post 5-day	
AYP Yes	10	12	
AYP No	14	14	
			50

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 11.44 10.56 13.44 14.56

Chi Square Statistic = 0.102

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.749; Not Significant

The differences between the scores on the 4-day week and the Post 5-day week in math are not statistically significant.

Table 28

11th graders on Pre 5-day week AYP in Math compared to 11th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	46	12
AYP No	26	14
	98	

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 15.39 42.61 29.39 10.61

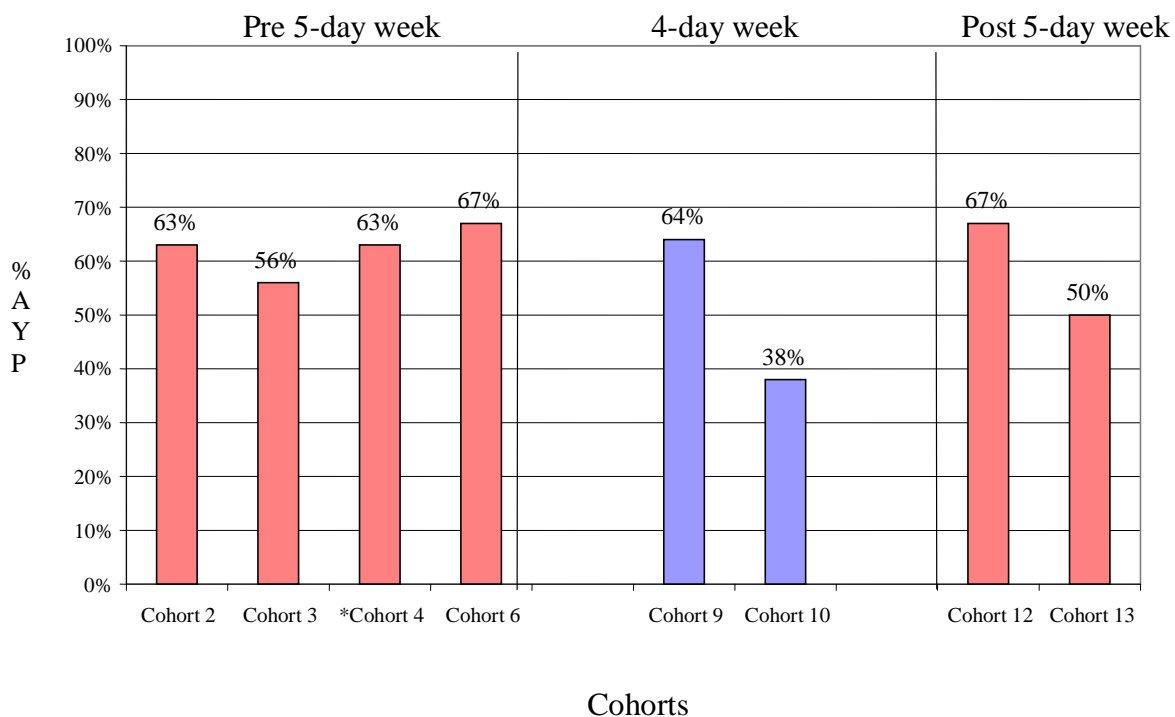
Chi Square Statistic = 2.487

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.115; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in math are not statistically significant.

Figure 12



11th Grade 4-day Week AYP Results in Language

The vertical axis represents the percentage of 11th graders who made AYP in language. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohort 4 (*) that reflects Fall to Spring testing.

A visual comparison of the three categories in Figure 12 seems to indicate one Cohort on the 4-day week scoring significantly below the other Cohorts. Taking the averages of the three categories shows that 62% with the Pre 5-day made AYP, 51% with the 4-day, and 59% with the Post 5-day. The lowest percentage is with the 4-day, but is this difference significant between individual student scores? This

question is answered with Chi Square tests between each of the categories. Tables 29, 30, and 31 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 29

11th graders on 4-day week AYP in Language compared to 11th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	44	12			
AYP No	28	12			
			96		

Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell
	14.00	42.00	30.00	10.00
Chi Square Statistic=	0.914			
Degrees of Freedom=	1 for a 2 X 2 Table			
Chi Distribution (p value) =	0.339; Not Significant			

The differences between the scores on the Pre 5-day week and the 4-day week in language are not statistically significant.

Table 30

11th graders on 4-day week AYP in Language compared to 11th graders on Post 5-day

Week

	4-day	Post 5-day	
AYP Yes	12	15	
AYP No	12	11	
			50

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 14.04 12.96 11.04 11.96

Chi Square Statistic = 0.297

Degrees of Freedom = 1 for a 2 X 2 Table (for a 2 X 2 Table)

Chi Distribution (p value) = 0.586; Not Significant

The differences between the scores on the 4-day week and the Post 5-day week in language are not statistically significant.

Table 31

11th graders on Pre 5-day week AYP in Language compared to 11th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	44	15
AYP No	28	11
		98

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 15.65 43.35 28.65 10.35

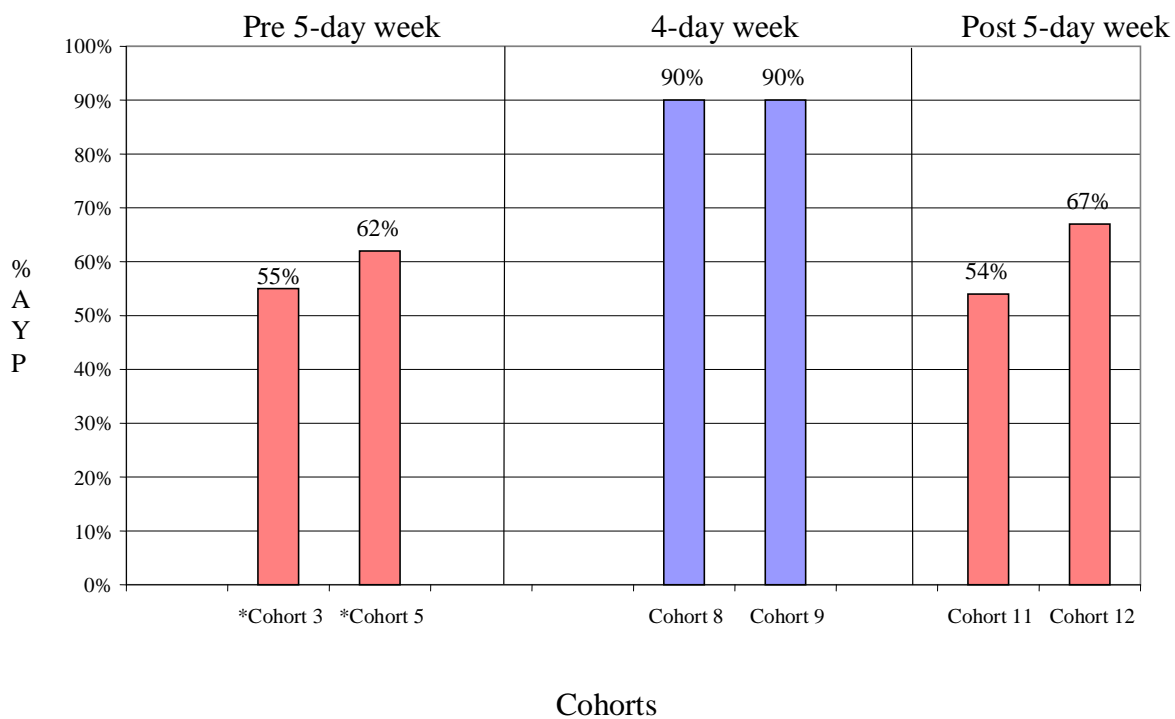
Chi Square Statistic = 0.093

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.760; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in language are not statistically significant.

Figure 13



12th Grade 4-day Week Results in Reading

The vertical axis represents the percentage of 12th graders who made AYP in reading. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohorts 3 and 5 (*) that reflect Fall to Spring testing.

A visual comparison of the three categories in Figure 13 seems to indicate a considerable improvement with the 4-day week. Taking the averages of the three categories shows that 59% with the Pre 5-day made AYP, 90% with the 4-day, and 61% with the Post 5-day. The highest percentage is with the 4-day week, but is this

difference significant between individual student scores? This question is answered with Chi Square tests between each of the categories. Tables 32, 33, and 34 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 32

12th graders on 4-day week AYP in Reading compared to 12th graders on Pre 5-day Week

	Pre 5-day	4-day	
AYP Yes	20	18	
AYP No	15	2	
			55

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 13.82 24.18 10.82 6.18

Chi Square Statistic= 6.434

Degrees of Freedom= 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.011; Stat Significant

The differences between the scores on the Pre 5-day week and the 4-day week in reading are statistically significant.

Table 33

12th graders on 4-day week AYP in Reading compared to 12th graders on Post 5-day

Week

	4-day	Post 5-day	
AYP Yes	18	15	
AYP No	2	10	
			45

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 18.33 14.67 5.33 6.67

Chi Square Statistic = 5.114

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.024; Stat Significant

The differences between the scores on the 4-day week and the Post 5-day week in reading are statistically significant.

Table 34

12th graders on Pre 5-day week AYP in Reading compared to 12th graders on Post 5-day Week

	Pre 5-day	Post 5-day
AYP Yes	20	15
AYP No	15	10
	60	

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 14.58 20.42 14.58 10.42

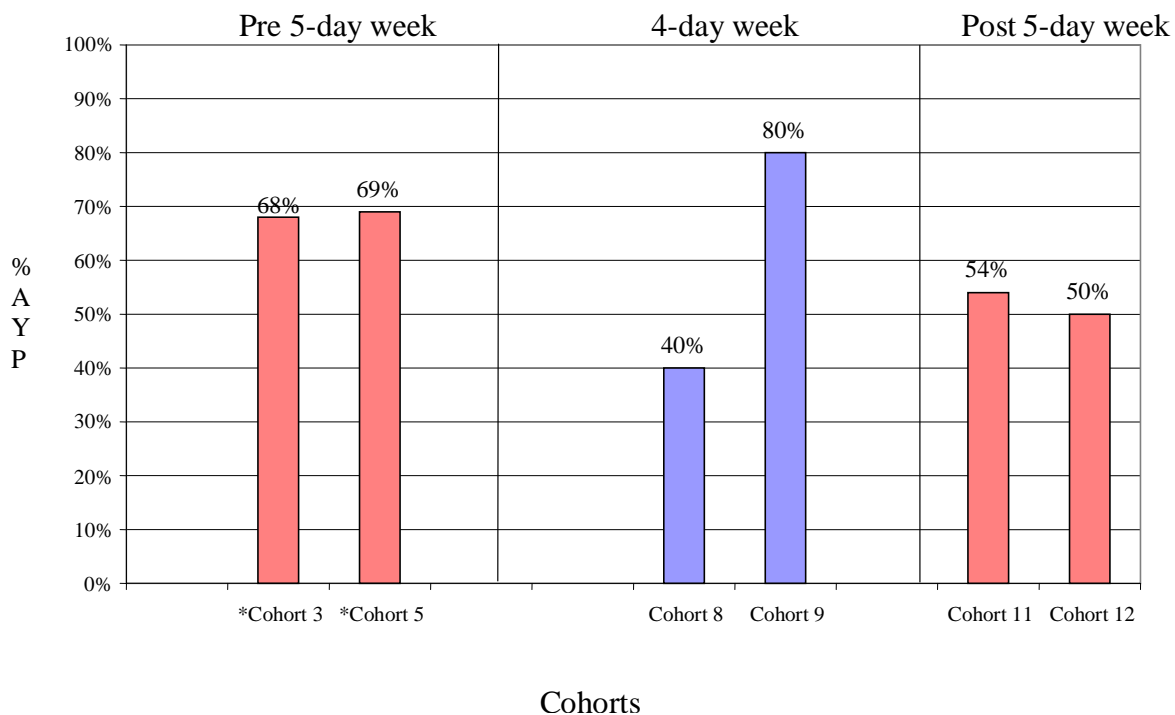
Chi Square Statistic = 0.049

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.825; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in reading are not statistically significant.

Figure 14



12th Grade 4-day Week AYP Results in Mathematics

The vertical axis represents the percentage of 12th graders who made AYP in math. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohorts 3 and 5 (*) that reflect Fall to Spring testing.

A visual comparison of the three categories in Figure 14 seems to indicate a wide disparity between the two Cohorts under the 4-day week. Taking the averages of the three categories shows that 69% with the Pre 5-day made AYP, 60% with the

4-day, and 52% with the Post 5-day. The percentages are all fairly close, but are there significant differences between the groups? This question is answered with Chi Square tests between each of the categories. Tables 35, 36, and 37 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 35

12th graders on 4-day week AYP in Math compared to 12th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	24	12			
AYP No	11	8			
			55		

Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell
	13.09	22.91	12.09	6.91
Chi Square Statistic=	0.414			
Degrees of Freedom=	1 for a 2 X 2 Table			
Chi Distribution (p value) =	0.520; Not Significant			

The differences between the scores on the Pre 5-day week and the 4-day week in math are not statistically significant.

Table 36

12th graders on 4-day week AYP in Math compared to 12th graders on Post 5-day Week

	4-day	Post 5-day	
AYP Yes	12	13	
AYP No	8	12	
			45

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 13.89 11.11 8.89 11.11

Chi Square Statistic = 0.288

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.592; Not Significant

The differences between the scores on the 4-day week and the Post 5-day week in math are not statistically significant.

Table 37

12th graders on Pre 5-day week AYP in Math compared to 12th graders on Post 5-day

Week

	Pre 5-day	Post 5-day
AYP Yes	24	13
AYP No	11	12
		60

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 15.42 21.58 13.42 9.58

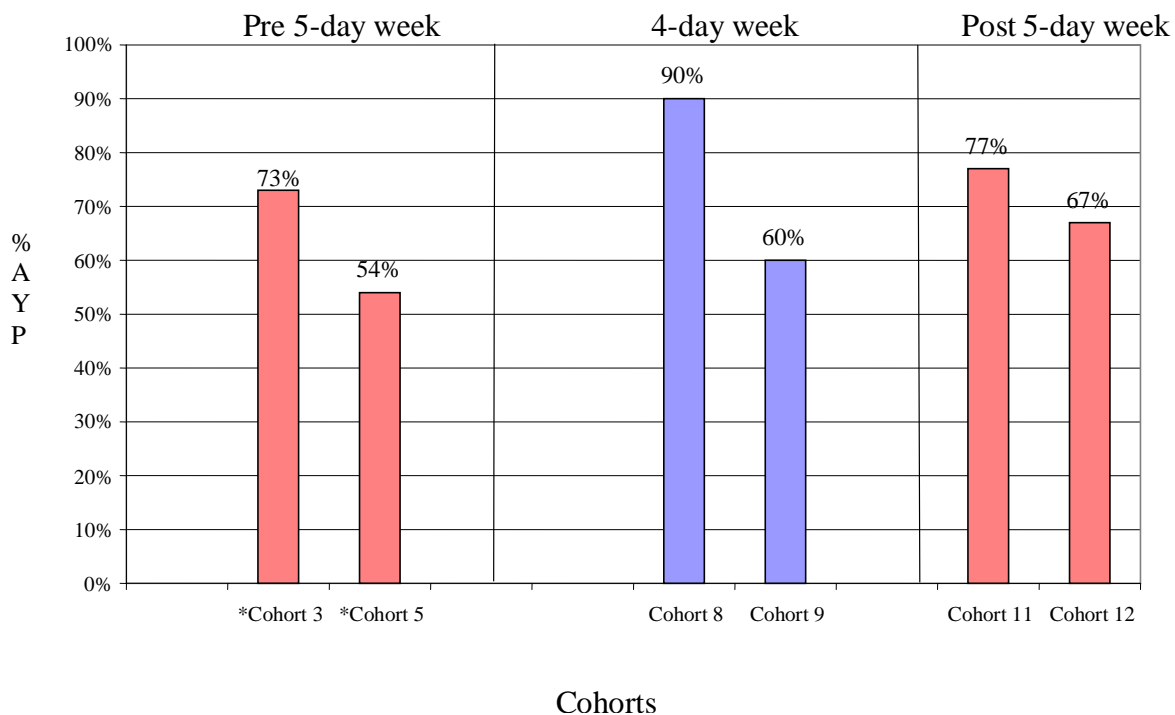
Chi Square Statistic = 1.694

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.193; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in math are not statistically significant.

Figure 15



12th Grade 4-day Week AYP Results in Language

The vertical axis represents the percentage of 12th graders who made AYP in language. The horizontal axis represents the various Cohorts who met the definition for inclusion in the study. All Cohorts represent Fall to Fall testing except Cohorts 3 and 5 (*) that reflect Fall to Spring testing.

A visual comparison of the three categories in Figure 15 seems to indicate very comparable scores between all the Cohorts. Taking the averages of the three categories shows that 64% with the Pre 5-day made AYP, 75% with the 4-day, and

72% with the Post 5-day. The percentages are all fairly close, but are there significant differences between the groups? This question is answered with Chi Square tests between each of the categories. Tables 38, 39, and 40 outline the Chi Square tests between the 4-day week, the Pre 5-day, and Post 5-day week.

Table 38

12th graders on 4-day week AYP in Language compared to 12th graders on Pre 5-day Week

	Pre 5-day	4-day			
AYP Yes	23	15			
AYP No	12	5			
			55		
Expected Frequencies=	UR Cell	UL Cell	LL Cell	LR Cell	
	13.82	24.18	10.82	6.18	
Chi Square Statistic=	0.514				
Degrees of Freedom=	1 for a 2 X 2 Table				
Chi Distribution (p value) =	0.473; Not Significant				

The differences between the scores on the Pre 5-day week and the 4-day week in language are not statistically significant.

Table 39

12th graders on 4-day week AYP in Language compared to 12th graders on Post 5-day

Week

	4-day	Post 5-day	
AYP Yes	15	18	
AYP No	5	7	
			45

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 18.33 14.67 5.33 6.67

Chi Square Statistic = 0.051

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.821; Not Significant

The differences between the scores on the 4-day week and the Post 5-day week in language are not statistically significant.

Table 40

12th graders on Pre 5-day week AYP in Language compared to 12th graders on Post 5-day Week

	Pre 5-day	Post 5-day			
AYP Yes	23	18			
AYP No	12	7			
			60		

Expected Frequencies= UR Cell UL Cell LL Cell LR Cell
 17.08 23.92 11.08 7.92

Chi Square Statistic = 0.266

Degrees of Freedom = 1 for a 2 X 2 Table

Chi Distribution (p value) = 0.606; Not Significant

The differences between the scores on the Pre 5-day week and the Post 5-day week in language are not statistically significant.

Summary of Test Score Analysis

The majority of seventh graders on the Pre 5-day week made AYP. In reading, an average of 82% made AYP; in math, an average of 71% made AYP, and in language, an average of 69% made AYP. The ninth graders on the Pre 5-day week also made AYP. In reading, an average of 59% made AYP; in math, an average of 74% made AYP; and in language, an average of 69% made AYP. No other comparisons could be made.

In the tenth grade, only comparisons between the Pre and Post 5-day week could be made. For the tenth graders 76% made AYP in reading on the Pre 5-day week and 37% made AYP on the Post 5-day week. There was a statistically

significant relationship ($\chi^2 = 14.213$, $p = .000$, $df = 1$) between number of students making AYP and the pre/post study periods. This was a moderate effect as evidenced by a fourfold point correlation coefficient of .18. In math, 63% made AYP on the Pre 5-day week and 48% made AYP on the Post 5-day week. No statistically significant relationship was found. Any effect found was extremely weak as evidenced by a fourfold point correlation coefficient of .00. In language, 60% made AYP on the Pre 5-day week and 56% made AYP on the Post 5-day week. No statistically significant relationship was found and any effect was extremely weak as evidenced by a fourfold point correlation coefficient of .00.

For the eighth graders, there was no relationship between length of school week and number of students making AYP for the 4-day compared to the Pre 5-day in reading, math, and language. When the 4-day is compared to the Post 5-day, no relationship is found for reading and for math, but a statistically significant relationship is found between the 4-day (60% made AYP) and Post 5-day (88% made AYP) in language ($\chi^2 = 7.630$, $p = .006$, $df = 1$, effect size = .10). ► In eighth grade language, this is evidence against the 4-day week as a successful intervention. It must be noted that in language, the Post 5-day also made more AYP than did the Pre 5-day.

For the eleventh graders, there was no relationship between length of school week and number of students making AYP for the 4-day compared to the Pre 5-day in either math or language. In reading, however, length of school week and number of students making AYP was statistically significant for the 4-day (28% made AYP) versus Pre 5-day (71% made AYP) comparison ($\chi^2 = 15.170$, $p = .000$, $df = 1$, effect size = .16) and the 4-day (28% made AYP) versus Post 5-day (58% made AYP) comparison ($\chi^2 = 4.121$, $p = .042$, $df = 1$, effect size = .08) and for both comparisons the percent of student making AYP in the 4-day week was less than in either 5-day weeks. ► In eleventh grade reading, this is evidence against the 4-day week as a successful intervention.

For the twelfth graders, there was no relationship between length of school week and number of students making AYP for the 4-day compared to the Pre 5-day in

either math or language. In reading, however, length of school week and number of students making AYP was statistically significant for the 4-day (90% made AYP) versus Pre 5-day (59% made AYP) comparison ($\chi^2 = 6.434$, $p = .011$, $df = 1$, effect size = .12) and the 4-day (90% made AYP) versus Post 5-day (61% made AYP) comparison ($\chi^2 = 5.114$, $p = .024$, $df = 1$, effect size = .12), and for both comparisons the percent of student making AYP in the 4-day week was greater than in either 5-day weeks. ► In twelfth grade reading, this is evidence for the 4-day week as a successful intervention.

See Tables 41 and 42 for a summary of all results.

Table 41

Summary of evidence, based on Chi Square results, for and against the 4-day school week, as compared to the Pre 5-day week and the Post 5-day week

Gr	Subj	Results	Chi-Square Value	Statistic. Significant ?	Effect Size	Type of Evidence	COMMENT
7 th	Lang Math Read	----	----	----	----	----	No comparative data
8 th	Read	4-day = Pre 5	.323	p = .570, NO	.00 none	No difference	
	Read	4-day = Post 5	.050	p = .823, NO	.00 none	No difference	
	Math	4-day = Pre 5	3.105	p = .078, NO	.04 weak	No difference	
	Math	4-day = Post 5	.783	p = .376, NO	.10 moderate	No difference	
	Lang	4-day = Pre 5	.356	p = .551, NO	.00 none	No difference	
	Lang	4-day < Post 5	7.630	p = .006, YES	<u>.10</u> moderate	<u>Against 4-day</u>	Post 5 also > Pre 5
9 th	Lang Math Read	----	----	----	----	----	No comparative data
10 th	Lang Math Read	----	----	----	----	----	No comparative data
11 th	Read	4-day < Pre 5	15.170	p = .000, YES	<u>.16</u> moderate	<u>Against 4-day</u>	
	Read	4-day < Post 5	4.121	p = .042, YES	<u>.08</u> weak	<u>Against 4-day</u>	
	Math	4-day = Pre 5	3.657	p = .056, NO	.04 weak	No difference	
	Math	4-day = Post 5	.102	p = .749, NO	.00 none	No difference	
	Lang	4-day = Pre 5	.914	p = .339, NO	.00 none	No difference	
	Lang	4-day = Post 5	.297	p = .586, NO	.01 weak	No difference	
12 th	Read	4-day > Pre 5	6.434	p = .011, YES	<u>.12</u> moderate	<u>For 4-day</u>	Pre 5-day based on Fall to Spring tesing
	Read	4-day > Post 5	5.114	p = .024, YES	<u>.12</u> moderate	<u>For 4-day</u>	
	Math	4-day = Pre 5	.414	p = .520, NO	.01 weak	No difference	Pre 5-day based on Fall to Spring tesing
	Math	4-day = Post 5	.288	p = .592, NO	.01 weak	No difference	
	Lang	4-day = Pre 5	.514	p = .473, NO	.01 weak	No difference	Pre 5-day based on Fall to Spring tesing
	Lang	4-day = Post 5	.051	p = .821, NO	.00 none	No difference	

► In general, the number of students attaining AYP was not related to the length of the school week. The 4-day school week was not detrimental to students and the AYP progress they were able to achieve.

Table 42

Summary of evidence, based on Chi Square results, used to determine the relationships between the Pre 5-day and Post 5-day groups

Gr	Subject	Results	Chi-Square Value	Statistic. Significant?	Effect Size	EVIDENCE
7th	Read Math Lang	No comparative data				----
8 th	Read	Pre 5 = Post 5	.078	p = .780, NO	.01 weak	No difference
	Math	Pre 5 = Post 5	.496	p = .481, NO	.01 weak	No difference
	Lang	Pre 5 < Post 5	4.846	p = .028, YES	<u>.07 weak</u>	<u>For Post 5</u>
9th	Read Math Lang	No comparative data				----
10 th	Read	Pre 5 > Post 5	14.213	p = .000, YES	<u>.18 moderate</u>	<u>For Pre 5</u>
	Math	Pre 5 = Post 5	.241	p = .624, NO	.00 none	No difference
	Lang	Pre 5 = Post 5	.017	p = .896, NO	.01 weak	No difference
11th	Read	Pre 5 = Post 5	2.279	p = .131, NO	.02 weak	No difference
	Math	Pre 5 = Post 5	2.487	p = .115, NO	.03 weak	No difference
	Lang	Pre 5 = Post 5	.093	p = .760, NO	.03 weak	No difference
12th	Read	Pre 5 = Post 5	.049	p = .825, NO	.03 weak	No difference
	Math	Pre 5 = Post 5	1.694	p = .193, NO	.03 weak	No difference
	Lang	Pre 5 = Post 5	.266	p = .606, NO	.07 weak	No difference

► In general, the number of students attaining AYP was not related to the length of the school week when only Pre 5-day and Post 5-day weeks were compared.

Hypothesis and Null Hypothesis

► In 13 comparisons *no relationship* was found between scores and school week length.

- 8th graders in reading, mathematics, and language (for language only the 4-day was not related to Pre 5-day)
- 11th graders in mathematics and language
- 12th graders in mathematics and language

► Evidence *against the 4-day week*: In 3 comparisons, a relationship was found between the 5-day week and 4-day week.

- 8th grade language where the number of students making AYP was greater for the Post 5-day than for the 4-day week.
- 11th grade reading where the number of students making AYP was greater for the Post 5-day than for the 4-day week.
- 11th grade reading where the number of students making AYP was greater for the Pre 5-day than for the 4-day week.

► Evidence *for the 4-day week*: In 2 comparisons, a relationship was found between the 5-day week and 4-day week.

- 12th grade reading where the number of students making AYP was greater for the 4-day week than for the Post 5-day week
- 12th grade reading where the number of students making AYP was greater for the 4-day week than for the Pre5-day week

Additionally, an assessment of the relationship between length of school year (i.e., Pre-5 versus Post-5) supports the interpretation that the majority of students in the school are making AYP across the 15-year study interval. Only 2 out of 12 Pre 5-day/Post 5-day comparisons found a relationship. It is interesting that in 8th grade language, a larger percentage of students made AYP in language on the Post 5-day compared to the Pre 5-day week; this also held true for 8th grade language where the percentage of students making AYP was greater for the Post-5 than for the 4-day week. Measures of effect size also support these interpretations.

By using the number of students attaining AYP as the dependent variable in the analyses, it was possible to get a measure of growth that was independent of student ability level and minimized the effect of an outlying student. Analyses using mean NPR or G.E., or a variety of other scores, are susceptible to outliers and ability level. For example, an average NPR of 85 for a class would indicate that class was academically able. The class, however, might not make AYP. Sample size was small for an individual cohort but not for statistical tests when cohorts were collapsed. These results, therefore, are generalizable to the school population.

Research Question #1: What is the effect on secondary and middle school learning (as measured by standardized test scores) when the students move from a five-day school week to a four-day school week?

Response: There was no effect on learning, as measured by test scores.

Research Question #2: What is the effect on secondary and middle school learning (as measured by standardized test scores) when the students move from a four-day school week to a five-day school week?

Response: There was no effect on learning, as measured by test scores.

Research Question #3: How do standardized test scores compare longitudinally over a fifteen year period in a secondary and middle school as they transition in and out of the four-day school week?

Response: Test scores remain stable with the majority of students making AYP under either system.

Research Question #4: What are the opinions of parents towards the four-day school week while the secondary and middle school are on the program?

Response: See the following section, “Summary of Questionnaire Data.”

The null hypothesis states that there will be no significant difference in the scores on the various subtests (reading, math, and language) of the nationally standardized exams before and after the implementation of a four-day school week, as compared to a five-day school week. The null hypothesis is supported.

The research hypothesis states that the unanticipated benefits which accrue under a four-day school week (see Chapter 1) will catalyze a significant improvement in student learning, as measured with standardized test score results. The null hypothesis could not be rejected, therefore the hypothesis is not supported.

Summary of Questionnaire Data

Numerous research articles already deal with survey data on the four-day school week. The value of the information presented here is to see the opinions of parents and community members in conjunction with the academic success or failure of the four-day week, as indicated by the standardized test scores. Table 43 presents a summary of the overall data for the five years on the four-day school week.

Table 43

Summary of Questionnaire Data

	Year 1	Year 2	Year 3	Year 4	Year 5
Total # of surveys mailed	1120	1120	1183	1183	1228
Total # of surveys returned	163	127	115	112	113
# from parent of student	107	98	101	95	103
# not parent of student	56	29	14	17	10
# supportive with positive comments	99	86	79	85	92
# against with negative comments	64	41	36	27	21
# with no opinion	0	0	0	0	0

The following table expresses much of the same information in percentage format.

Table 44

Summary of Questionnaire Data in Percentages

	Year 1	Year 2	Year 3	Year 4	Year 5
% of surveys returned	15	11	10	9	9
% of returned surveys from parents	66	77	88	85	91
% of returned surveys not from parents	34	23	12	15	9
% of surveys supportive	61	68	69	76	81
% of surveys against	39	32	31	24	19
% of surveys with no opinion	0	0	0	0	0

An examination of the tables reveals interesting trends. Over the five year period on the four-day week, there is a gradual decrease in the number of surveys returned, ranging from 15% down to 9%. The last three years on the program, the percentage remains almost constant. Over the same time period, the percentage of

returned surveys which come from parents of students, gradually increases from 66% to 91%. Additionally, the percentage of returned surveys from persons without children under the plan gradually decreases from 34% to 9%. These two trends are mirrored in the nature of comments submitted on the questionnaire: the percentage of positive comments gradually increases and the percentage of negative comments gradually decreases over the five year period. Interestingly, there were no surveys returned with a “no opinion.”

A review of the basic nature of the comments is also revealing. The comments were divided into two categories: those that have an educational basis and those that do not have an educational basis. Under the positive comments, 97% are based on an educational reason. For example, a common positive comment is, “My child is learning more because of fewer interruptions to the classroom.” Only 3% of the positive comments had a personal foundation. For example, some parents said that the “three-day weekend provided more time together as a family.” Under the negative comments, this pattern was reversed: 86% of the negative comments had a personal foundation, the most common being, “Who is going to tend my children on Friday? I have to work!” The remaining 14% of the negative comments had an educational foundation, the most common being, “the longer school days are harder on the younger children.” There were a few isolated comments that were hard to put into either category. For example, a prominent local rancher said, “The four-day week is a communist plot to ruin America!”

Chapter Five gives a summary of the first three chapters of this dissertation. It

then states the final conclusions derived from the presentation of the data in this chapter. It discusses the implications of the conclusions and makes recommendations, including practical suggestions for implementation of the findings. It suggests future research studies that would be helpful to clarify other points and questions generated by this project. It suggests how the findings of this research should be used to improve education. It concludes with an overall summary of the dissertation.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Overview

The use of time, in terms of the school calendar and school day, is one of the great sacred cows of American education. The four-day school week is one of the few programs to step outside the boundaries and restructure the school in a major way. The purpose of this research is to measure its effect on academic achievement at the middle and secondary levels. In order to do this, it was necessary to find a school district that had used the four-day week for a substantial amount of time. It was also essential for this district to have the necessary test score data to compare before and after scenarios. The Patagonia School Districts of Southern Arizona were selected because data were available representing a fifteen year period: five years on a traditional five-day calendar, five years on the four-day week, and then five more years on a traditional calendar. This is a substantial amount of time and represents an opportunity to gauge the effects of the four-day week with a high degree of validity.

It is hoped that this research will also provide the administrators of small and rural school districts the information necessary in making decisions concerning the merits of the four-day school week. The program has been found effective in solving non-academic problems for rural schools. Its academic impact has been the missing link.

This chapter begins with a summary of the first three chapters of the dissertation. This is followed with a presentation of the conclusions from the data

presented in Chapter Four and a discussion of these conclusions. The chapter concludes with recommendations for the implementation of the findings and suggestions for further research.

The National Commission on Time and Learning issued its final report with the recommendation to use time in better and new ways. It also recommended that districts examine the time now available and try to re-configure this resource. This report was issued at the peak of the year-round education movement in the United States. It was probably not envisioned by its authors to be a recommendation to move the other direction and reduce the number of school days to a four-day week.

The four-day school week has been used as a tool of last resort, principally by small and rural school districts, for over thirty year. It was found to be effective in the five critical areas of school finances, school facilities, teacher recruitment and retention, quality curriculum, and academic segregation. Because of its controversial nature, there are very few school districts to adopt the plan and remain for a considerable amount of time. The Colorado Department of Public Education has published the only long-term study involving the state's rural elementary schools. There are no published long-term studies involving middle or high schools. There have been several attempts, with good intentions, to collect such data, but the schools did not remain on the program for an extended period of time. For those districts that have remained on the program, for whatever reasons, attempts to analyze their data have not been made. If an educated guess were to be offered as to the reason for the lack of studies, it is because the administrations of small and rural schools are

extremely pressed for time. Lack of staff and resources makes such long-term analyses extremely difficult.

It was felt by this researcher that the many movements for academic accountability throughout the nation would put renewed pressure on small and rural schools to find creative solutions. With exit examinations and other new mandates, schools are being forced to meet higher standards. As these initiatives percolate down to the level of individual students and the pressure to graduate, many will be forced between the choices of academics or participation in extra-curricular activities. This clear-cut division has not existed before. The four-day school week offers administrators of small and rural schools one possible solution.

Because of the tremendous gap in the literature on this program, this researcher felt it important to measure the academic impact of the four-day school week at the middle and secondary levels. This had to be measured with a quality tool: nationally standardized test score results. Fifteen years of test scores data were analyzed covering the history of two small and rural school districts as they transition in and out of the program.

In Chapter Two of this dissertation, the use of time is traced from its earliest beginnings in public and private education. Formal instruction in the time of Plato is shown to create the first formalized curriculum with benchmarks for certain ages. The first exit examinations were used for progress to the next level. This legacy is followed forward with today's states' standards and curricula, each with an approved scope and sequence.

The ideas of Aristotle are also followed into the future and shown to be the foundation of the conflict between vocational education and a liberal education. The nature of this conflict is examined from the negative aspects of tracking to the final implications for the management of time.

The contributions of educational pioneers (Komensky, Locke, Rousseau, Pestalozzi, Herbart, Froebel, Spencer, Dewey, Montessori, Counts, Piaget, and Hutchins) are explored in terms of impact to the use of time in modern public schools. The ideas of each person are shown to form continuous threads that have woven the system of education today.

The significance of the ten national education reports (1983-1991) is also explained in terms of the use of time.

The chapter concludes with an in-depth examination of the four programs to restructure the use of time in a major way: (1) extended calendars, (2) block scheduling, (3) year round education, and (4) the four-day school week.

Chapter Three outlines the methodology used for the research design. Students were divided into cohorts. For membership in a cohort, three conditions had to be met: (1) the student must begin and end with his or her cohort group; (2) the student must be continually enrolled in school; and (3) the student must be present for testing. Sixteen cohorts are created from data beginning in 1979 and ending in 1994. The use and statistical importance of "Adequate Yearly Progress" (AYP) is defined. Because of the variety of tests and other constraints, it is demonstrated why AYP, as the dependent variable, is the only valid measure to use. The use of contingency

tables and the chi square statistic are explained to show significant differences in test scores between the pre-five day week and four-day week, the four-day week and post-five day week, and the pre- and post-five day weeks. The chapter concludes with an in-depth examination of the validity and reliability of the six testing instruments.

Conclusions

The greatest hindrances to this study are (a) across the fifteen year time interval, six different standardized achievement tests (CAT, ITBS, TASK, SAT, TAP, MAT) were used; (b) no data were available in the archives for the 1982-1983 school year; (c) the change in tests sometimes occurred at the critical transition periods between the 5-day school week and 4-day school week; and (d) the differing combinations of fall to spring and spring to fall testing that occurred at the critical periods. For these reasons, individually and collectively, it was difficult to form meaningful comparisons with all grade levels. But, enough comparisons were available to make valid judgments for eighth, eleventh, and twelfth grade students across reading, mathematics, and language subject areas.

It is the opinion of the author that meager evidence supports that there is a relationship between students' standardized achievement test scores and the length of the school week. Consider the following evidence:

- ▶ In 13 comparisons *no relationship* was found between scores and school week length.
 - 8th graders in reading, mathematics, and language (all comparisons except for language, the 4-day was not related to Pre 5-day)

- 11th graders in mathematics and language (all comparisons)
- 12th graders in mathematics and language (all comparisons)

▶ Evidence *against the 4-day week*: In 3 comparisons, a relationship was found between the 5-day week and 4-day week.

- 8th grade language where the number of students making AYP was greater for the Post 5-day than for the 4-day week.
- 11th grade reading where the number of students making AYP was greater for the Post 5-day than for the 4-day week.
- 11th grade reading where the number of students making AYP was greater for the Pre 5-day than for the 4-day week.

▶ Evidence *for the 4-day week*: In 2 comparisons, a relationship was found between the 5-day week and 4-day week.

- 12th grade reading where the number of students making AYP was greater for the 4-day week than for the Post 5-day week
- 12th grade reading where the number of students making AYP was greater for the 4-day week than for the Pre 5-day week

Additionally, an assessment of the relationship between the lengths of the school year (Pre-5 versus Post-5 school weeks) supports the interpretation that the majority of students in the school are making AYP across the fifteen year study interval. Only two out of twelve Pre 5-day/Post 5-day comparisons found a relationship. It is interesting that in eighth grade language, a larger percentage of students made AYP in language on the Post 5-day compared to the Pre 5-day week;

this also held true for eighth grade language where the percentage of students making AYP was greater for the Post-5 than for the 4-day week.

Measures of effect size also support these interpretations. Results from a study such as this may be statistically significant in certain comparisons, but have no practical significance. Most researchers agree that when effect sizes reach 0.33 or higher, the results are considered to have practical significance (Gall, Gall, & Borg, 1999). Effect sizes are also important because the final results are transformed into comparable units of measure (Gall, Gall, & Borg, 1999). The use of effect sizes in this study allows the results to be compared even though different tests were used for different school years. In the five comparisons where the results were statistically significant and gave direct support for or against the four-day school week, the effect sizes were in the moderate to weak range, indicating that the results had little or no practical significance. This indicates that in *all* comparisons, there was no relationship between scores and the length of the school week.

By using the number of students attaining AYP as the dependent variable in the analyses, it was possible to get a measure of growth that was independent of student ability level and minimized the effect of an outlying student. Analyses using mean NPR or G.E., or a variety of other scores, are susceptible to outliers and ability level. For example, an average NPR of 85 for a class would indicate that class was academically able. The class, however, might not make AYP. Sample size was small for an individual cohort but not for statistical tests when cohorts were collapsed. I feel confident that the results are generalizable to the school population.

This research is one piece of evidence suggesting that there are no detrimental effects to students' standardized achievement test scores when the four-day school week is used. As always, there is the need to triangulate—to consider community, student, and faculty input, morale, and the cost of running a school—when important decisions are made.

These findings have significant implications for the use of time. Administrators of small and rural school districts have found the four-day school week to be tremendously helpful in solving many of their problems. It is well-documented that it helps financially. By closing the school one day in five, a saving of approximately twenty percent can be realized in some areas of the budget. These savings, in return, could be applied to the second problem: aging facilities. The four-day school week generates the extra money to make repairs possible without the necessity of an override or bonding.

The literature documents that the four-day school week is also very helpful with teacher recruitment and retention, two of the most vexing problems facing isolated school districts. The distance from a major city, shopping, cultural, and social isolation, all combine to make employment in a rural district very unattractive to many teachers. When these factors are combined with traditionally lower salaries and a lack of affordable housing, staffing becomes a monumental obstacle for many administrators. But, with the four-day school week, many teachers place a higher value on a three-day weekend than the many negative drawbacks. Many administrators report that for the first time there is a solid choice between applicants

for a teaching position with the end result being an increase in the overall quality of the staff.

With the ability to hire quality faculty and staff, other improvements are immediately realized in the curriculum. The applicants with the regular teaching certificates have completed a college major in their subject area as well as the teacher preparation courses. Having the entire faculty with regular teaching credentials results in full accreditation, without warnings from national accrediting agencies. The teachers with regular certificates bring a competence and professional attitude to the job that is rarely found in those persons entering education with an emergency certificate because they could not find employment in their first choice. They are typically lacking most, if not all of the education classes and training offered through a College of Education.

The savings generated in the school's budget by closing down one day in five also improve the curriculum. These improvements typically fall in the area of course offerings on the schedule of classes. Many rural schools only provide a basic curriculum in classes required by their state's board of education for graduation. There is usually not funding available for a wide variety of elective classes. The four-day school week can provide some of the funding to enrich the curriculum.

Finally, the four-day school week achieves a wonderful segregation between academics and extra-curricular programs. By isolating extra-curricular events, especially athletics, on the fifth day, there is a truly remarkable increase in academic

learning time. All of these factors synergize to substantially improve morale and school climate.

Because of the many improvements from the four-day school week, it has become a favorite tool of administrators in small and rural schools. The great controversy has always been, “Yes, but what about academics?” When the governing board of the Patagonia School Districts implemented the program, the president of the board apologized, in advance, to the many parents filling the board room, for all the negative things that were going to happen academically. It was a natural assumption that less time, in terms of number of days, would automatically impact grades and test scores. For some rural administrators, this has not been a major concern. Fiscal survival and the improvements in the other areas have been so substantial that the question of academic impact was pushed to the back of the controversy.

Yet, the question of academic impact remained. It has always been the weapon of choice for parents fighting against the four-day school week. Because long-term studies are extremely few in number objections have usually been based on academic reasons. This was really just the tip of the iceberg. Survey studies have shown that the real objection to the program has always been the babysitting issue. With the increase in single-parent and dual-income households, it has become an American tradition for the school system to provide this service for five days each week. For a parent to object to the program for a personal reason, such as the need for free babysitting, might appear selfish. This image would be aggravated if the program was generating substantial improvements in other areas. Now, this research

indicates that the administration can reap the non-academic benefits without any negative academic impact. This is the key finding of this dissertation.

It was anticipated by this researcher that the many ancillary benefits of the four-day week would catalyze a significant improvement in academics. The results do not show this to be true. But, on the other hand, there was no significant decrease in academics either. If test scores can remain stable over a fifteen year period, as a district transitions in and out of the four-day school week and, at the same time, the district can realize substantial improvements in the other problem areas, then the four-day school week is an issue that should be given serious attention. It would be a powerful tool for school improvement.

There is also the question of the generalizability of this research to other small and rural schools. By definition, these school districts typically have unique cultural and historical legacies. Because of this uniqueness in identity, can any research generated within a single school district be applied to other districts? It has been documented that the problems facing smaller districts are similar in nature, even though the foundational backgrounds of the schools are dissimilar. Because the conclusions of this research are based on academic improvements within individual students, independent of their relative starting positions, many of the competing or alternate hypotheses are minimized. For this reason, it is asserted that the results are applicable to students in other small and rural schools.

The results of the questionnaire are comparable to other published studies. During the era of the four-day school week, the percentage of questionnaires returned

gradually decreased from a high of 14.5% to a low of 8.3% over the five year period. This suggests two things: (1) most of the residents of the school district do not care, one way or another, what the school does as 86% to 92% of the surveys were not returned; and (2) after the initial interest in the implementation of the program, there was a gradual acceptance by those persons interested enough to submit a survey in the first place.

The questionnaire also shows that from year to year, as might be expected, most of the surveys are from community members who are parents of students. This percentage ranged from a high of 91.2% to a low of 65.6%. As in most small and rural schools, this supports the fact that parents are closely interested in the decisions of the district. Predictably, with such a controversial program, there were no surveys returned with “no opinion.”

As mentioned in Chapter Four, the nature of the comments differed sharply. Most of the positive comments were for educational reasons. Most of the negative comments were for personal reasons. This fact illuminates the really interesting thing about this research: how often does a school system have to make the clear-cut choice, with no middle ground, between educational improvement and disruption to lifestyles? Rarely is the American public forced into this corner. The choices that are made clearly show the public’s attitude towards public education and overall priorities.

Discussion

Students in Arizona, where this research took place, must meet strict academic

standards. Faculty must teach the state's approved academic standards with performance objectives for each grade. These are assessed at grades three, five, eight, and ten. This research indicates that students made Adequate Yearly Progress (AYP) over the entire fifteen year period, regardless of the number of days in session.

This speaks to a larger issue facing all schools, besides supporting an administrative tool for small and rural administrations. The report of the National Education Commission on Time and Learning was very critical of the nation's schools, because the management of time had become petrified. Most schools start and end at the same time. Most schools have the same number of days in their calendars. And, most periods were the same length in time. This research indicates that even with an extreme restructuring of time, academic learning remains stable. This strongly supports the idea that learning is not dependent on time.

This remarkable notion is also supported by the year-round education movement. The literature is split, approximately fifty-fifty, as to academic improvements under the program. Like the four-day school week, it points to the fact that within certain limits, the amount of time spent in school is extraneous to learning.

If time does not matter, what then is the critical factor? It is this researcher's contention that the national focus should be on quality rather than quantity. Teachers should be highly trained professionals. Teachers should not spend the first half of their careers developing lesson plans and only get to the critical area of pedagogy near the end. Instruction should be highly individualized across all segments of the bell curve. Teachers should receive a salary appropriate to their education and

expertise. Administrators should have the freedom to be creative and unburdened, to the extent possible, from state and federal mandates, most of which are imposed without funding. When these conditions are met, learning becomes independent of time. As teachers, we have all experienced those wonderful moments when the material is presented in just the right manner and the students have that “Ah-Hah” moment. If the four-day school week, year-round education, or any other radical restructuring works for a district’s special circumstances, then it should be implemented. This may sound idealistic and impractical, but to do less is to compromise the mission, goals, and belief statement of the district.

This research also speaks to the larger issue of education professionalism. When it comes to teaching, everyone is an armchair expert. It has only been in the last thirty years that the vocabulary used within education has become extremely specialized and unique to the profession. The four-day school week represents one of those dilemmas between professionalism and the needs of the public. If the number one priority of education is to educate, then true professionals would have the freedom to pursue that goal wherever it leads. If the four-day school week, or any other radical restructuring of time improves the schools, then administrators should have the freedom to implement those programs regardless of child care issues. To do less is to step away from education being a true profession and an abjuration of our motives for entering the field.

Recommendations

If the reduction of the school week does not impact academics, the next

question would be to ascertain if movement in the other direction impacts academics. It would be interesting to find a school district that had a six-day schedule and do a similar study.

The results of this study also point to the fact that despite all the research, improvements, and innovations in modern education, we still do not really understand how students learn. If learning is independent of time, within certain boundaries, what is the determining factor or factors?

Published results of long-term longitudinal studies on the four-day school week are very few in number. Rarely does such a program ever get past the discussion phase. This reflects the fact that the disruption of the school day or school calendar is highly controversial. When this is implemented, it is no longer an in-school issue; it immediately impacts the families. This is one of the tragedies of modern education. People have become so busy and their personal schedules are so complicated that schools are relegated to trying to make improvements within set boundaries. If a satisfactory solution exists outside of these boundaries, it will probably be doomed to failure. This is reflected in other areas such as the use of out-of-school suspensions as opposed to in-school suspensions. Many districts do not suspend out-of-school, except for the most severe cases. It has become too disruptive of the parent's schedules. If the consequence is kept in-house, there are no waves. Further studies should examine the management of time in terms of in-house versus out-of-house solutions. This study would not just be about school schedules and calendars, but about discipline procedures, parent-teacher meetings, and any other

school function that impacts lives and schedules outside the school. The goal would be to effectively measure the extent to which educators are prisoners of time, and how that situation is restraining learning.

To the administrators of small and rural schools who are contemplating the use of the four-day school week, it is recommended that this information be used in conjunction with other factors before implementation. The needs of the students, busing distances, finances, teacher recruitment and retention, morale, and instructional mandates have to be used together to reach decisions.

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