Effects of the 4-Day School Week on School Performance Indicators in Missouri High Schools

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Abstract

As an increasing number of school districts across the nation implement the 4-day school week, the possible impact on student academic performance and school performance needed to be considered. The purpose of this study was to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The independent variable in this causal-comparative study was the length of a school week. The dependent variable, school performance, was measured by MSIP 5 performance standards: academic achievement, subgroup achievement, college and career readiness, attendance rate, and graduation rate. The sample included Missouri high schools that attended a 4-day school week and matched Missouri high schools that attended a 5-day school week. The results of the study indicated that schools utilizing the 4-day school week have significantly lower academic achievement scores on English language arts (ELA) and mathematics EOC assessments than schools utilizing the traditional 5-day schedule. The results of the study also indicated that schools operating on the 4-day school week score significantly lower in subgroup achievement scores on ELA and mathematics EOC assessments than schools operating on the 5-day school week. Finally, the results of the study indicated that there are no significant differences in college and career readiness, attendance rates, and graduation rates between schools utilizing the 4-day school week and schools operating on the traditional 5-day school week. The study has implications for the educational community and policymakers making decisions regarding education funding and the use of the 4-day school week. School districts that

are currently utilizing the 4-day schedule and school districts considering a future implementation of the schedule should review the results of this study to determine the future of the 4-day school week within their communities. It is recommended that additional research be conducted, perhaps examining school performance indicators in a school district for the two years before the implementation of the 4-day schedule compared to school performance indicators for the two years after the 4-day schedule was in place. It is also recommended that further research be conducted on potential cost-savings of the 4-day schedule as well as the other possible impacts the 4-day schedule may have on a school and community that are not measurable by school performance indicators.

Dedication

First, I dedicate this dissertation to my two beautiful daughters, Anna and Aryia. The two of you are beyond anything I could have hoped for in life. Your love, support, and patience with me over the last ten years have not gone unnoticed. I appreciate you pushing me to continue each time I wanted to give up. I appreciate you knowing when I needed a little extra help around the house and always being willing to do the extra chores so I could write. More than anything, I appreciate that you know when I need someone to hang out with and watch movies. I am beyond proud of the women you are becoming and hope that I have made you as proud of me as I am of each of you.

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Chapter 1

Introduction

In the earliest years of our nation, education was merely an option for most students. According to Melker and Weber (2014), schoolhouses remained open almost year-round, and students attended whenever possible. Much of the nation was made up of rural, farming communities in which school-aged children were needed during planting and harvest seasons, meaning they would not attend school during the fall and spring months. As time passed and larger communities formed, the shift from farming communities to larger towns and cities began. Fewer children were needed to work on the farms in the spring and fall, and the summer heat in cities and schoolhouses led to lower attendance rates in the summer months, causing a need for a more consistent schedule for students, resulting in the traditional school calendar (Melker & Weber, 2014).

In the early 1900s, there were no defined criteria separating high school education from colleges. Silva, White, and Toch (2015) reported that Carnegie sought to establish a pension system for American higher education professors and recognized a need to set basic standards distinguishing what constitutes a high school education and college education. These basic standards became known as the Carnegie Unit, "the building block of modern American education, serving as the foundation for everything from daily school schedules to graduation requirements, faculty workloads, and eligibility for federal financial aid" (Silva et al., 2015, p. 3).

In her research for The Center for Public Education, O'Brien (2006) discussed how the Carnegie Unit quickly became the basis for school scheduling and calendars in

the American educational system, directly linking credits to the number of hours a student spends learning. To provide consistency, state legislatures developed a minimum number of instructional hours, typically 6 to 7 per day, and a minimum number of days, usually 180 each school year, in which students must attend school (O'Brien, 2006). Naturally, school calendars followed the schedules of most parents in the workforce, Monday through Friday, except a short winter break and an extended summer break.

The traditional school calendar and time requirements held consistent for many decades until the energy crisis of the 1970s. Rural school districts extending numerous square miles were spending substantial amounts of money on fuel and transportation costs. In 1973, an oil embargo led to a shortage in fuel and enormously high fuel prices, leaving many rural schools searching for solutions to cut their budgets, hence the first movement in the 4-day school week (National Conference of State Legislators [NCSL], 2018).

The 4-day school week was short-lived with the oil embargo only lasting one year and the call in America for widespread school reform by the National Commission on Excellence in Education (1983) in its report, *A Nation at Risk: The Imperative for Educational Reform*. In their research, the Commission found instructional time to be a contributor to school inadequacies for American students when compared to other countries' students. Evidence showed American students spent less time on schoolwork than students of different countries and time spent in the classroom was used ineffectively (National Commission on Excellence in Education, 1983), thus igniting education professionals to begin a school reform movement pushing for increased school attendance days to match attendance of nations that were outperforming America.

Throughout the turn of the century, many variations of educational reform were adopted regarding the use of instructional time; however, the cost to increase the minimum number of school days kept most districts from implementing additional school days into the calendar. In fact, by the mid-2000s, cuts to state education and transportation budgets across the nation left small rural school districts looking for ways to cut expenses and save money, once again considering the 4-day school week (NCSL, 2018). As an increasing number of school districts across the nation implemented the 4-day school week, the possible impact on student academic performance and school performance needed to be considered.

Background

In 2009, additional cuts to the Missouri education budget prompted Missouri lawmakers to take action. The Missouri Senate passed Bill 291, Section 171.029, which was later signed into law by Governor Jay Nixon in 2011. Bill 291 allowed any school district to

> establish a four-day school week or other calendar consisting of less than one hundred seventy-four days in lieu of a 5-day school week . . . . Such calendar should include, but not be limited to, a minimum term of one hundred forty-two days and one thousand forty-four hours of actual pupil attendance. (§171.029.1, Missouri Revised Statutes [RSMo.])

In January 2010, faced with economic hardship, Lathrop R-II School District began discussions and research on the 4-day school week. After much debate, Lathrop R-II School District decided to implement the 4-day school week for the 2010-2011 school year, becoming the first school in the state of Missouri to do so (Fine, 2018).

According to the Missouri Department of Elementary and Secondary Education (MoDESE, 2018d), the following school year (2011-2012), four additional Missouri school districts adopted the 4-day school week. Each year thereafter, the number continued to increase, eventually growing to 25 school districts for the 2017-2018 school year (MoDESE, 2018d).

The Missouri high schools selected for this study were disaggregated into two groups based on whether they operated on a 4-day school week or a 5-day school week, and then matched on multiple criteria including 9-12 enrollment; percentage of students receiving free or reduced lunch; percentage of white students; percentage of students with individualized education plans (IEPs); and the location, surrounding community, and make-up of the school district. A listing of Missouri high schools with a 4-day school week (see Table A1) and a listing of matched Missouri high schools with a 5-day school week (see Table A2) selected for this study are found in Appendix A.

Statement of the Problem

As the nation continues to face fluctuations in the economy and further cuts to state and federal education budgets, a rising number of school districts are considering the implementation of the 4-day school week. Gaines (2008) discussed some of the potential benefits of the 4-day school week, including increased attendance rates, longer blocks of instructional time per day, fewer discipline problems, and possible cost-savings for school districts. While some of the cost and morale benefits are well documented and researched, there is not as much research on whether the shortened school week has an impact on school performance and student academic success.

Purpose of the Study

The focus of this study was to determine to what degree the length of a school week is related to school performance indicators. More specifically, the purpose was to determine if there is a difference in academic achievement and subgroup achievement as measured by student performance on Missouri Assessment Program (MAP) End of Course (EOC) assessments in Algebra I, English II, and Government, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Additionally, the purpose was to determine if there is a difference in college and career readiness as measured by student performance on College and Career Readiness (CCR) assessments, student performance on Advanced Placement (AP), International Baccalaureate (IB), or Technical Skills Attainment (TSA) assessments, and student performance in earning college credit between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Lastly, the purpose was to determine if there is a difference in attendance rate and graduation rate as measured by the percentage of students whose attendance rate meets or exceeds the state standard and percentage of students who meet the graduation requirements in 4 years between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Significance of the Study

As cuts to federal and state education funds continue to rise, schools across the nation are looking for ways to save money. The 4-day school week has offered a partial solution to budget concerns, and the number of school districts across the nation operating on the 4-day school week continues to rise. Specifically, in Missouri, the

number of school districts operating on the 4-day school week has increased from nine in the 2014-2015 school year to 25 in the 2017-2018 school year (MoDESE, 2018d). There is currently little research on the effects of the 4-day school week regarding academics, and what research is available does not paint a clear picture of what to expect. This study might give other districts considering the 4-day school week, the background information, benefits, and potential risks faced when the alternative schedule is implemented. The results of this study could also inform school districts currently implementing the 4-day school week of any impact the schedule might have on school performance.

Delimitations

Lunenburg and Irby (2008) described delimitations as pre-determined "boundaries set by the researcher on the purpose and scope of the study" (p. 134). This study is limited to 20 school districts in the state of Missouri with high schools that had operated on a 4-day school week for at least one year prior to the 2018-2019 school year and 20 matched school districts in the state of Missouri with high schools that had operated on a 5-day school week prior to the 2018-2019 school year. School districts were matched based on, in order of importance, 2017-2018 Grades 9 -12 fall enrollment, 2017-2018 percentage of students on free and reduced lunch, 2017-2018 enrollment percentages by ethnicity, 2017-2018 percentage of students with IEPs, and the location of the school district with proximity to major cities. Data collected in this study was limited to Missouri School Improvement Program 5 (MSIP 5) data available from the Missouri Comprehensive Data System for the 2017-2018 school year. The study is limited explicitly to the school performance standards and data found in the MSIP 5 School

Annual Performance Report (APR) Summary Report - Supporting Data (MoDESE, 2019).

Assumptions

Lunenburg and Irby (2008) described assumptions as rules or boundaries that are "accepted as operational for the purposes of the research" (p. 135). While the districts were matched based on multiple criteria including school enrollment, the percentage of free and reduced lunch, ethnicity, special education, and location, it was assumed that communities that make up the school districts are also similar. It was also assumed that all data collected for each school district was reported with accuracy and is the most up-to-date data available.

Research Questions

As more school districts look for ways to save money and turn to the alternative 4-day school week, there is a need for additional research on the impact such a change may have on school performance. To determine the extent school performance indicators are related to the length of a school week, the following research questions were posed.

RQ1. To what extent is there a difference in school academic achievement, as measured by the 2018 MAP Performance Index (MPI), between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ2. To what extent is there a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ3. To what extent is there a difference in school subgroup achievement, as measured by the 2018 MPI, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ4. To what extent is there a difference in school subgroup achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ5. To what extent is there a difference in college and career readiness, as measured by the percentage of students at or above the state standards, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ6. To what extent is there a difference in school attendance rate, as measured by the percentage of students at or above 90% attendance, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

RQ7. To what extent is there a difference in school graduation rate, as measured by the 4-year graduation percentage, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Definition of Terms

To provide a common understanding throughout the study, an understanding of terms must be developed. Lunenburg and Irby (2008) stated, "You should define all key terms central to your study" (p. 118). For this study, the following definitions have been provided.

4-day school week. For this study, the 4-day school week is defined as four days of school from Monday through Thursday or Tuesday through Friday. Minutes of the school day are extended approximately one and one-half hours per day, and the emphasis is on instructional hours (1044 hours per year) with a minimum of 142 attendance days (Bush, Ryan, & Rose, 2011).

5-day school week. For this study, the 5-day school week is defined as five days per week, Monday through Friday, with approximately six and one-half hour days. The emphasis in a 5-day school week is on the number of attendance days (174 days per year) with a minimum of 1044 instructional hours (Bush et al., 2011).

Academic achievement performance standard. For this study, the academic achievement performance standard is defined as a measure of academic achievement, demonstrating performance improvement of its students over time. Academic achievement is measured at the high school level with EOC assessments in Algebra I, English II, Biology I, and Government. Three factors are used to measure achievement: (a) EOC student performance meets or exceeds the state standard or exhibits growth over time, (b) the percentage of students tested on each required EOC assessment meets or exceeds the state standard, and (c) student growth expectations are met or exceeded through growth data (MoDESE, 2018a).

Attendance rate performance standard. For this study, the attendance rate performance standard is defined as whether state standards are met or exceeded or show required improvement by the percent of students regularly attending school (MoDESE, 2018a).

College and career readiness (CCR) assessments. CCR assessments are defined as any department-approved measure of college and career readiness, for example, the American College Testing (ACT), Scholastic Aptitude Test (SAT), Computer-adaptive Placement Assessment and Support System (COMPASS), Armed Services Vocational Aptitude Battery (ASVAB), or ACCUPLACER (MoDESE, 2018a).

College and career readiness performance standard. MoDESE (2018a) defined the college and career readiness performance standard as the district's proof of adequate postsecondary preparation for all students. Six criteria are used by school districts to show college and career readiness (MoDESE, 2018a).

College and career readiness performance standard criteria 1-3. MoDESE (2018a) defined college and career readiness performance standard criteria 1-3 as the percentage of graduates who scored at or above the state standard on any CCR assessment, the district's average composite score(s) on any CCR assessment that meet(s) or exceed(s) the state standard, and the percentage of graduates who participated in any CCR assessment that meets or exceeds the state standard.

College and career readiness performance standard criteria 4. MoDESE (2018a) defined college and career readiness performance standard criteria 4 as the percentage of high school seniors who have earned a qualifying score on an AP, IB, or TSA assessment and/or received college credit through a dual credit course meeting or exceeding the state standard or demonstrating improvement.

College and career readiness performance standard criteria 5-6. MoDESE (2018a) defined college and career readiness performance standard criteria 5-6 as the percentage of graduates that attend a 2-year, 4-year, or technical institution within 6

months of graduating, or who have completed career education programs in high school and are working in occupations directly related to their training meeting or exceeding the state standard or demonstrating improvement.

Graduation rate performance standard. MoDESE (2018a) defined the graduation rate performance standard as the percentage of students completing the graduation requirements as established by the board within a standard 4-year timeframe meets or exceeds the state standard or demonstrates required improvement.

MAP Performance Index (MPI). MoDESE (2018a) defined MPI as "a single composite number that represents the MAP assessment performance of every student by awarding points to each student based on the four achievement levels" (p. 18).

Missouri School Improvement Program 5 (MSIP 5). Missouri's fifth version of the accountability system for reviewing and accrediting public school districts is MSIP 5, which measures academic performance, subgroup performance, college and career readiness, attendance rate, and graduation rate for all Missouri high schools (MoDESE, 2018a).

Subgroup achievement performance standard. MoDESE (2018a) defined the subgroup achievement performance standard as identified subgroups (free and reduced-price lunch, racial and ethnic background, English language learners, and students with disabilities) meeting or exceeding the state standard or demonstrating required improvement (MoDESE, 2018a).

Super subgroup. MoDESE (2018a) defined super subgroup as a group of students in which a student is included as a single count if he or she identifies as at least

one of the historically underachieving subgroups: Black, Hispanic, low-income students, students with disabilities, and English language learners.

Organization of the Study

This study is organized into five chapters. The first chapter included the background, the statement of the problem, the purpose and significance of the study, the delimitations, the assumptions, and the definition of terms relevant to the study. Chapter 2 offers a comprehensive literature review including the history of the 4-day school week, advantages and disadvantages, stakeholder perceptions, and the impact the 4-day school week has on school performance indicators. The methodology and research design of the study, as well as information about the participants, measurement and data collection, and the data analysis and hypothesis testing are included in Chapter 3. The results of the study are presented in Chapter 4. Included in Chapter 5 are the study summary, findings related to the research, and the conclusions.

Chapter 2

Review of the Literature

While little has changed in the foundations and traditions of educational institutions over the last century, an emphasis on school performance has continued to grow as educational funding simultaneously depletes. Since the 1983 report, *A Nation at Risk: The Imperative for Educational Reform*, increasing school performance, and holding schools accountable has been at the forefront of educational policy and reform. Laws, including the *No Child Left Behind Act* from 2002 and the *Every Student Succeeds Act* from 2015, have mandated that schools are held accountable for adequate student success and closing achievement gaps (U.S. Department of Education, 2019). While lawmakers are pushing for higher student achievement, the same lawmakers are also cutting state and federal education budgets, regardless of research that shows adequate educational funding is positively associated with student outcomes (Baker, 2017). With increasing accountability for school performance and diminishing budgets, schools across the nation have resorted to finding creative ways to cut costs without affecting the quality of education being offered. In an attempt to save on operating expenses, one progressively-popular solution is to increase the length of the school day while reducing the total number of attendance days. The structural change in the schedule allows schools to maintain equivalent amounts of instructional time delivered over four days in a week instead of five, also known as the 4-day school week.

The purpose of this study was to explore the relationship between the length of a school week and school performance indicators. More specifically, the study was designed to determine if there is a difference in academic achievement, subgroup

achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Chapter 2 includes a review of literature relevant to the 4-day school week: the history of the 4-day school week, advantages and disadvantages of the 4-day school week, stakeholder perceptions of the 4-day school week, and impact of the 4-day week on school performance indicators.

History of the 4-Day School Week

While little attention has been given to the idea, the history of the 4-day school week dates as early as 1931 in Madison, South Dakota. The Madison Schools operated on a schedule in which students went to the four core subjects over four days, and the fifth day was used for extra-curricular activities (Wilmoth, 1995). It was not until the energy crisis in the 1970s that the idea of a 4-day school week began to catch on across rural America. Rural school districts in Maine, New Mexico, and Massachusetts started looking for ways to cut rising transportation costs and experimented with the 4-day schedule (Cummings, 2015; Sherwood, 2019). The Cimarron School District in New Mexico, now known as the longest-running 4-day school in the United States, implemented the 4-day schedule in 1973 after the state passed a law allowing small rural school districts (with enrollment less than 500) to eliminate a day from the school week to cut transportation costs and electric bills (Reeves, 1999).

In 2018, 25 states were reported to have schools operating on the 4-day schedule, with Colorado, Montana, Oklahoma, and Oregon having the largest number of schools utilizing it (Heyward, 2018: NCSL, 2018). Colorado currently has the most significant percentage of its schools operating on the 4-day school week. Since the 1980s, when

Colorado lawmakers first introduced a law allowing schools to schedule instructional time in terms of hours instead of days, the number of school districts utilizing the 4-day school week has continued to grow to over 100 of its 178 school districts (Colorado Department of Education, Office of Field Services, 2018). Most schools utilizing the 4-day school week are in small, rural, remote communities; however, the trend is slowly gaining the attention of larger school districts (Heyward, 2018). Quinton (2018) reported that a suburban school district, 27J near Denver, Colorado switched to the 4-day schedule in the fall of 2018, becoming the largest school district in the country to operate on a 4-day school week. The 27J district, which had 28 schools and served approximately 18,000 students, made the change to recruit and retain more qualified teachers (Chakrabarti, 2019). The superintendent of the 27J district stated that a lack of funding has made it impossible to compete with surrounding communities regarding teacher pay, and every time the school district has gone to the voters to increase taxes for additional funding, the measure has failed (Chakrabarti, 2019).

Brown (2017) reported that the number of 4-day schools in Oklahoma continues to rise as the state continues to cut education funding. "School districts staring down deep budget holes have turned to shorter weeks in desperation as a way to save a little bit of money and persuade increasingly hard-to-find teachers to take some of the nation's lowest-paying jobs" (Brown, 2017, para. 4). In fact, Quinton (2018) reported that the number of schools in Oklahoma on a 4-day schedule nearly doubled from 2017 to 2018 due to teacher shortages and state budget cuts and teachers striking to demand additional funding.

The most recent influx in the number of states allowing schools to calculate instructional time based on total hours in place of total days occurred in the early 2000s during the Great Recession when Idaho, South Dakota, Montana, and Missouri introduced laws permitting school districts to implement a 4-day school week (Heyward, 2018). In the early 2000s, much of the United States was thriving, especially in terms of real estate. School districts across the country depend on property taxes for a portion of their funding, and amid the real estate boom, many lawmakers began cutting property taxes (Richert, 2015a). Within two years of this very prosperous time, the Great Recession began, leaving schools scrambling to find operating funds and resorting to the 4-day school week to save money (Richert, 2015b). Even though the schedule was utilized prior to the Great Recession, the 4-day school week truly gained widespread popularity across the country during this time. Heyward (2017) reported 120 districts were utilizing the 4-day schedule in 2009, and that number grew to 292 by 2011. The 4-day school week became so popular that school districts across the nation have continued to make the change, even after the economy made a comeback (Heyward, 2018). While saving money was still a motivating factor, with the recession over, school districts cited other reasons for choosing to implement the 4-day schedule, including attracting new teachers and increasing teacher retention, more professional development opportunities for teachers, and intervention days for struggling students (Heyward, 2017). By 2018, the number of school districts utilizing the 4-day schedule had grown to over 550 districts across the nation (Heyward, 2018).

Much like all school districts in every other state during the Great Recession, Missouri schools were faced with a shortage of funding. In 2009, the state legislature

introduced a bill that allowed schools to calculate time in terms of hours instead of days, changing the required number of school attendance days from 174 days to 142 days or 1044 hours (§171.029.1, RSMo.). Shortly after the bill was passed, the Lathrop R-II School District saw this as an opportunity to save money and implemented the 4-day schedule for the 2010-2011 school year, becoming the first school in Missouri to do so (Fine, 2018). The following year, four additional school districts also made the change to a 4-day school week (MoDESE, 2018d). Montgomery County R-II School District, which implemented the schedule in the 2011-2012 school year and is still currently utilizing the 4-day week, originally only made a two-year commitment to the schedule, deciding that if student achievement were affected negatively, they would revert to the 5-day schedule (Crouch, 2012). While the legislation does require a school on the 4-day schedule to return to the 5-day school week if the district does not meet the MSIP 5 performance standards two years in a row, only one school district in Missouri that changed to the 4-day school week has done so; however, the district did not revert to the 5-day schedule due to performance, but cited the length of the school day had a negative impact on elementary-age children (Newman, Pavolva, & Luna, 2016).

While the economy did make a comeback after the recession, Missouri schools continued to face a shortage of education funding that was allocated by the state funding formula. Levin (2016) reported that in the 2016-2017 school year, "the gap between what lawmakers allocated and what the formula called for was $398 million for all Missouri schools" (para. 4). The number of school districts in Missouri utilizing the 4-day school week has grown dramatically since 2010, reaching 34 school districts for the 2018-2019 school year (MoDESE, 2018d). Most of the 34 school districts in Missouri

currently on the 4-day schedule are small rural districts. In 2019, however, Warren County School District was the first suburban and largest school in Missouri to move to the 4-day school week (Byers, 2019). While the district expected the move to save them some money, the superintendent stated it was not about the money but more about retaining quality teachers. Byers (2019) stated that because the district serves a very low-income community and is close to a lot of wealthier school districts, retaining teachers had been problematic, citing a 20% turnover rate, which the superintendent hoped the 4-day schedule might help change.

With increasing accountability placed on schools and a direct link between time and learning, the 4-day school week "runs contrary to the push in many parts of the country to provide more time for learning – and daily reinforcement – as a key way to improve achievement" (Brown, 2017, para. 2). Because of the concern for potential negative impacts on student achievement, many states are beginning to implement additional requirements for a school district that wants to switch to the 4-day school week. Heyward (2018) reported that in 2013, California lawmakers passed a bill requiring districts not meeting academic standards to revert to the 5-day schedule. In 2014, Minnesota took similar measures stating schools not making adequate progress would have to return to the 5-day schedule, and then in 2018, determined that the state would not allow any additional school districts to change to the 4-day school week (Heyward, 2018). As the number of schools across the nation utilizing the 4-day school week continues to rise, the potential advantages and disadvantages for schools and student achievement need to be considered.

Advantages and Disadvantages of the 4-day School Week

Even though the 4-day school week had been growing increasingly common for nearly half a century, Creno and Vanek (2015) noted there is a lack of research on the potential impact the schedule may have on school quality or student success. Richert (2015a) also discussed the lack of research over the years, citing a document dated 2008 from the Idaho State Department of Education's website that points out the lack of evidence of the impact of the 4-day school week. Richert (2015a) further stated that seven years later, the Idaho State Department of Education still had not completed any additional research. While research on the advantages and disadvantages of the 4-day school week is lacking, some common themes have been identified by school districts that have implemented the schedule. The most frequently reported topics that have instances of both advantages and disadvantages are cost savings, impact on teachers (attendance, curriculum, retention, and professional development), impact on students (attendance, academics, discipline, and food insecurity), impact on families and the community, and fifth-day activities.

Cost savings. The majority of school districts that have adopted the 4-day week schedule have done so for financial reasons. Shrinking federal and state funding and times of recession have forced schools to make difficult decisions regarding cuts. School districts have adopted the schedule in hopes of cutting costs on transportation, utilities, and salaries; however, over the years, the cost savings realized by these schools seem to be significantly declining.

In the early years of the 4-day school week, Culbertson (1982) found one of the most attractive benefits of a school district moving to a 4-day schedule is the potential

cost savings. Statistics from 12 Colorado school districts showed cost savings of up to 25% in heating fuel and gasoline for buses, up to an 18% savings in school bus maintenance costs, as much as a 23% savings in electricity, and up to a 20% savings in gasoline costs for teachers and driving age students (Culbertson, 1982). An additional cost-saving described by Culbertson (1982) came from reduced teacher absences resulting in hiring fewer substitute teachers, not only benefiting the district financially but benefiting the students by having more time with highly trained teachers in the classroom.

In the earlier years of the 4-day school week, Sagness and Salzman (1993) researched the potential impact the schedule had on schools, finding that while the schools studied did have some savings in transportation and utilities, the most significant financial savings were found in substitute teacher salaries. While the school district only realized a 1.6% reduction in spending, over half of that was because they did not have to hire as many substitute teachers after switching to the 4-day school week (Sagness & Salzman, 1993). Wilmoth (1995) reported that of the 84 school administrators who responded to his survey, almost 80% said the school was able to save financially on a 4-day school week. While most of the administrators reported a savings of less than 10%, 15% of the administrators found a financial saving of between 16% and 20% (Wilmoth, 1995).

Griffith (2011) discussed the different sources for potential cost savings and debunked the perception that reducing student attendance days by 20% would produce a cost savings of 20%. Griffith (2011) explained that nearly 80% of expenses in public education come from teacher and support staff salaries and benefits, which are rarely

reduced when changing to a 4-day school week. With nearly 80% of the expenses unaffected, additional analysis showed the most substantial potential savings a 4-day school week could produce comes from daily operating costs and transportation costs. Griffith (2011) reported that "[Education Commission of the States] ECS has determined that the average district could produce a maximum savings of 5.43% of its total budget by moving to a 4-day week" (p. 1). While 5.43% was the maximum predicted savings, Griffith (2011) also reported that of the districts utilizing a 4-day week, "have experienced actual savings of only 0.4% and 2.5%" (p. 1).

Two school districts included in Griffith's (2011) report confirmed the cost savings were not as significant as they had hoped; however, the savings benefitted the district enough to continue with a 4-day school week. "In the Duval school district, moving to a 4-day week produce only a 0.7% savings, yet that resulted in a budget reduction of $7 million. That $7 million could be used to retain up to 70 teaching positions" (Griffith, 2011, p. 6). Rosenberg (2015) reported a small school district in Arizona made the switch to a 4-day school week in 2009 in hopes of saving money. The school hoped to save close to 17% on utility costs, transportation expenses, and custodial costs, totaling only around $154,000, 2.5% of the operating budget. While the total savings does not seem like much, it was enough for the school to make the change and stick with it (Rosenberg, 2015). The Colorado Department of Education (2019) reported that while total savings will differ from district to district, there are some areas of savings districts contemplating the change can expect. The most significant savings (about 20%) found were in transportation and food service, and while savings in utilities are possible, they tend to be insignificant as school buildings tend to stay open on the fifth day

(Colorado Department of Education, 2019). To realize the maximum savings in transportation, a school must be committed to limiting transportation for activities on non-attendance days as well as reductions in transportation staff pay (Colorado Department of Education, 2019).

For some schools, the switch to a 4-day school week did not produce the savings they had hoped they would see. A school district in Arizona was reported to have returned to the 5-day school week after three years of the 4-day schedule due to not saving any money (Creno & Vanek, 2015). Levin (2016) reported the Lexington School District in Missouri reverted to the 5-day schedule after two years when the cost savings were not significant enough to outweigh the longer days for students. Stewart (2017) noted that an Oklahoma lawmaker unhappy with the number of schools utilizing the 4-day school week proposed a bill that would require school schools to use a 5-day schedule unless they can demonstrate substantial cost savings.

Most school districts making the change to a 4-day school week do so with financial savings motivations; however, several researchers reported that the overall savings are statistically insignificant when compared to the spending of a 5-day school (Braun, 2018; Jennewein, 2016; Leiseth, 2008). In Braun's (2018) study, the savings for transportation, utilities, and classified staff were found to be insignificant while the only significant savings found was in food service personnel. Jennewein (2016) suggested that some schools might be saving money in some areas, however choosing to spend it in other areas making the overall savings insignificant. Too many of a school's expenses are fixed, specifically teacher salaries, and not expendable, resulting in little savings (Heyward, 2017; Hill & Heyward, 2017; Rosenberg, 2015). School districts are also

seeing cost increases they did not initially expect from leaving the school building open longer each day and opening the school building on the fifth day for teacher meetings, sporting events, or day off programs (Heyward, 2017; Hill & Heyward, 2017; Leiseth, 2008).

Impact on teachers. Although the cost savings of the 4-day school week was not as high as many school districts intended, the number of schools implementing the schedule has continued to rise. Many researchers report that while schools hope to save money, the intentions behind the change to the 4-day week are partially motivated by the potential benefits to teachers in terms of recruitment, retention, morale, and professional development opportunities (Brown, 2017; Cummings, 2015; Heyward, 2017; Hill & Heyward, 2015; Levin, 2016; Long, 2016; NCSL, 2018; Richert, 2015a; Rosenberg, 2015).

Creno and Vanek (2015) reported that a small school district in Arizona decided to make the change to a 4-day school week after experiencing a teacher turnover of nearly 30% each year. Teachers surveyed said they would be more likely to stay in the district if they were on the 4-day schedule (Creno & Vanek, 2015). Another school district in rural Missouri made the change to the 4-day school week with the hopes of increasing teacher retention. The district was able to increase its teacher retention rate from a low of 70% to nearly 85% after the first year of implementation (Levin, 2016). Teachers report having the extra day off to work on curriculum or paperwork allows them to have an actual weekend instead of attending to those out of classroom duties on Saturdays, ultimately increasing job satisfaction and morale (Levin, 2016; Savage, 2018). Marion (2018) reported that some school districts were not only receiving a larger

number of more qualified applicants for job openings after they switched to the 4-day school week, but the applicants had more prior experience and were accepting jobs that were less pay to work four days instead of five.

Quinton (2018) found that while the potential cost savings for District 27J in Colorado was less than 1% of its budget, the district decided to go ahead and make the schedule change. Surrounded by better-funded school districts with higher teacher salaries, District 27J was struggling to keep highly qualified teachers. "Cost savings were never our number one goal. It is about retaining high-quality teachers and creating a clean, clear and concise schedule," said the district's public information officer in an interview (Quinton, 2018, para. 19). The school district hopes that the 4-day school week will not only help attract teachers, but the additional day off will give teachers more time to plan higher quality lessons, participate in professional development opportunities, and collaborate, in turn improving the teaching as well as student achievement (Quinton, 2018).

Another intended outcome of the 4-day school week is utilizing the fifth day for teacher professional development. School districts hoped to not only increase teacher morale with the extra day out of the classroom, but to increase the quality of instruction through a more concentrated professional development schedule implemented several times a month (Levin, 2016; Sheehy, 2013; Turner, Finch, & Ximena, 2018). Yarbrough and Gilman (2006) concluded the 4-day school week was a unique opportunity to work on developing active professional learning communities, giving teachers more opportunity to collaborate, plan inter-disciplinary curriculum, build research teams, and use data to drive instruction.

Lewis (2018) described high-quality professional development as one of the most significant advantages the 4-day school week brings to schools. Lewis (2018) concluded that the 4-day schedule not only allowed more time for professional learning communities but helped to foster an environment of trust and communication between teachers, resulting in "a continuous cycle of instructional improvement" (p. 115). Many schools held professional development throughout the school year utilizing early release days or late start days, causing frequent interruptions to student learning; however, the 4-day school week allows schools to schedule an entire day for professional learning without those interruptions (Cummings, 2015; Lewis, 2018; Rycroft-Smith, 2015).

Like with any change, some critics have concerns that the immediate benefits of increased professional development will be short-lived. Hill and Heyward (2017) reported that in one of their studies, the good intentions of increased professional development wore away as the 4-day school week became the norm, and new teachers entered the district. Cummings (2015) addressed the same concerns that motivation could deteriorate over time, and if high expectations were not upheld, the 4-day school week could prove detrimental to teacher professional development and in turn, student learning.

Impact on students. As the number of school districts utilizing the 4-day school week continues to rise, the most significant concern stakeholders have is related to the potential effects fewer school attendance days would have on students. The potential impacts the 4-day schedule has on students are endless, some positive and some negative. Many researchers have found some of these benefits and concerns regarding the effects

on students in terms of student attendance rates, morale, academics, and discipline rates (NCSL, 2018; Sherwood, 2019).

The most frequently identified benefit to students from the 4-day school week is the decrease in student absences. Bell (2011) reported that students and teachers attending school on the 4-day school week had a combined 3.1 fewer absences in a school year than teachers and students on the 5-day school week. Sheehy (2012) reported that one school district in Colorado saw an increase in student attendance after the switch to a 4-day school week. School officials felt that students were more inclined to schedule appointments on their day off, and athletes were less likely to need to leave school for events because the district purposely scheduled their day off on Fridays, the day with the most athletic events (Sheehy, 2012). Several researchers report that student absenteeism decreases after a school changes to a 4-day schedule, but most also say it is necessary to develop a culture among parents and students that appointments and activities should be scheduled on the day off (Heyward, 2017; Richert, 2015a; Sheehy, 2012).

Even though the 4-day schedule seems as though students would be in the classroom less, a lot of 4-day schools end up with more classroom minutes than 5-day schools, due to the lengthened school day. With higher student attendance rates, school districts that utilize the 4-day school week would also hope that more time in the classroom would equate to an increase in academics. There is currently little research on the effects of the 4-day school week regarding academics, and existing research does not paint a clear picture of what to expect.

Reeves (1999) reported that the 4-day school week had been the right choice for many schools academically because it allows a school to save money while maintaining

programs. A small school district in Idaho reportedly made the switch to the 4-day school week in hopes of increasing academic success for students and was happy with the results. Teachers in the district felt the "four-day schedules allow for more in-depth instruction during the school week" (Cummings, 2015, para. 6). Pant (2015) stated that one school district in Georgia was able to improve on six of eight end of course exams after switching to the 4-day school week. Long (2016) reported that in the Apache Junction Unified District in Arizona, teachers felt the extra day of planning was allowing them to plan lessons more thoroughly, giving students superior learning experiences. Teachers also reported the extended day on the 4-day week allowed them to do more activities in one class period instead of having to spread them out over several days as they would have needed to on the 5-day schedule (Long, 2016). Not all school districts have reported an increase in state test scores and classroom performance after switching to the 4-day school week; however, district leaders have reported that the changes they did see were proving not to be detrimental to students and assessment scores have not decreased (Amys, 2016; Stewart, 2017).

Not all schools are having long-term academic gains from the 4-day schedule. Cummings (2015) reported that a school district in Idaho decided to revert the elementary school-age students to the traditional 5-day school week after parents and teachers decided the day was too long for them to stay engaged. Eger and Habib (2015) reported a school district in Oklahoma decided to switch back to the 5-day school week in hopes of improving student performance on state assessments. The district felt the 4-day schedule was hindering student academics, and the 5-day school week would give the students an additional month of school days before state assessments (Eger & Habib, 2015).

Heyward (2018) shared that a school district in Kentucky reverted to a traditional 5-day schedule after 10 years due to a decline in test scores. It was also reported that Minnesota required 7 of the 11 school districts utilizing the 4-day schedule to return to the traditional 5-day school week for inadequate academic progress. A concern many critics have is how the 4-day school week is affecting elementary age students and students with IEPs (Colorado Department of Education, 2019).

An unexpected outcome that some school districts are reporting after the change to a 4-day school week is a decrease in the discipline referral rate. Sheehy (2012) shared that student discipline write-ups in high schools had dropped almost 80% in the three years after the implementation of the 4-day schedule. Bradley (2019) reported that a school district in Georgia saw a 73% decrease in discipline referrals in their first year of the 4-day school week. Not all research shows a reduction in discipline referrals; Hale (2007) reported that in 6 out of 12 South Dakota school districts surveyed saw an increase in both in-school suspensions and out-of-school suspensions (Hale, 2007).

Unfortunately, a majority of the school districts that make the change to a 4-day school week are rural and typically have a high percentage of families in the community with food insecurities. One of the biggest concerns for school officials is that the change to a 4-day week leaves many students without a full meal for three consecutive days (Heyward, 2018). After finding the 4-day school week was not producing academic gains, one school district in Oklahoma that was nearly 88% free and reduced lunch decided to revert to the 5-day schedule to ensure students were getting nutritional meals (Brown, 2017; Long, 2016). Quinton (2018) stated that one of the most significant faults of the 4-day school week is the potential impact the reduced day may have on low-

income families. Colorado District 27J has an almost 80% free or reduced lunch rate and had a substantial concern that with the reduction in school days, these low-income students could potentially go three days without a nourishing meal (Quinton, 2018). Richert (2015c) reported that one school district in rural Idaho with a large portion of students that qualified for free and reduced lunch worried that passing the expense off to parents would leave kids hungry, so they partnered with a local food pantry to ensure families were able to keep food on the table over the long weekends.

Impact on families and the community. The impact of the 4-day school week on families varies considerably from family to family. The schedule will most likely impact a single-parent household differently than a two-parent household with a stay at home parent. In all the research, similar themes about the impact on families and communities of the 4-day school week emerged, including day-care, extra-curricular activities, internships and job opportunities for older students, and family time.

One of the most significant impacts the 4-day school week has on families is the additional day of daycare needed for elementary age students. Richert (2015c) found that almost 30% of families in Idaho have incomes less than twice the poverty level, making it very difficult to find room in the budget for an extra day of childcare. Lake (2015) reported that one school district estimated that the 4-day school week could potentially cost families as much as $600 per child extra in a school year. Cummings (2015) described that one community banded together and opened churches on the additional day school was not in session, providing enrichment opportunities for students as well as relief from the extra expense for struggling families. Small communities have united and utilized older high school-aged children as babysitters on the extra day off, saving money

for families as well (Colorado Department of Education, 2019; Julie, 2003). One community in Missouri planned to open churches on the day school was not in session only to find there was very little demand as most families had worked it out with little cost (Crouch, 2012). Quinton (2018) reported that while most families from rural districts had secured their own daycare, parents in the more suburban 27J school district in Colorado jumped at the opportunity to sign up for the school daycare program with over 700 pre-registering.

Fifth-day activities. One impact the 4-day school week has on students, parents, and the community is the open possibilities of what students will do with their time on the fifth day. There is little direct research done regarding the use of the fifth day for schools operating on a 4-day school week. The available literature did offer some emerging themes from school districts regarding how students were using this time, including extracurricular activities, work, educational enrichment, and in some cases, trouble.

Researchers have found positive activities students are engaging in on the fifth day of the week, including spending more time with family, spending more time playing sports, working a part-time job, or even using the time to complete college courses (Hill & Heyward, 2015; Savage, 2018). Some communities have united to offer fifth-day educational programs, and some schools have used the fifth day to provide struggling students with additional tutoring (Heyward, 2018; Sheehy, 2013). Sheehy (2012) reported that in one community, an internship program was developed so that students could get experience at different jobs on their day off. Quinton (2018) found most of the school districts that utilize the 4-day school week do so in hopes of cutting spending, and

there is rarely funding to implement programs on the students' day off. Quinton (2018) reported that many districts try to set up internships or jobs for high school students while one Colorado school district even secured grant money to offer "a full day of optional art, music, dance, cooking and theater activities" taught by teachers and community members (para. 36).

Critics of the 4-day school week often voice the concern of school-age children not only losing instructional time but concern for what the students might be engaging in on their day off. Several critics worry that the day off will give students extra time to get in trouble, increasing juvenile crime rates and teen pregnancy (Fischer & Argyle, 2016; Henton, 2015; Heyward, 2017). Fischer and Argyle (2016) reported that while students had extra time off from the 4-day school week, there was no significant change in juvenile crime rates. Amys (2016) also reported on the concern that students would engage in reckless behavior on their day off, noting that the actions of students are strongly influenced by the parents and community in which students grew up, and the 4-day week had no significant impact on student choices.

Stakeholder Perceptions of the 4-Day School Week

One factor related to the success of the 4-day school week is the perception of the teachers and administration, the parents and students, and the community in which the schedule is being implemented. While the ultimate objective of many schools that make the change is to save money, the final deciding factor in whether to make the change or even to stay with the schedule after the change has been made is based on the perceptions of the stakeholders. Researchers have suggested that while the schedule change is not

always popular among stakeholders when first proposed, many of the people affected by the 4-day school week eventually like the change (Hedtke, 2014; Turner et al., 2018).

Teachers and administrators. Today, the perceptions of the 4-day school week vary widely; however, in the early years of the cost-savings trend, Culbertson (1982) reported, "It has proven popular with students, teachers, and the communities in the school districts and colleges which have tried it" (p. 3). In her report, Culbertson (1982) cited that 94.7% of teachers in all Colorado schools supported the idea of a 4-day school week. While many of the benefits listed by teachers of the 3-day weekend were related to their family lives and personal time, many teachers also listed they enjoyed having the day off to work on instructional needs for the classroom or attend professional development (Culbertson, 1982).

While elementary teachers did find they had to make some adjustments to maintain effectiveness, according to Culbertson (1982), elementary teachers also backed the idea of the 4-day school week stating, "Many teachers believe they are more productive because the students are happy with the extra day off, are more rested, and look forward to coming back" (p. 3). Secondary teachers also indicated that the lengthier day allowed them to cover the material more in-depth and provide additional time in class for students to get support with assignments (Culbertson, 1982). Depending on whether the 4-day school chose to take Friday or Monday off, many teachers reported fewer class time interruptions for extra-curricular activities. While it seemed that most teachers were in support of the 4-day school week, Culbertson (1982) did indicate that teachers with low-achieving students preferred a 5-day school week, stating that "their students needed the extra day for repetition rather than a longer time span" (p. 3).

Wilmoth (1995) reported that of the 84 school districts operating on a 4-day school week with administrators from across the United States that responded to his survey, all reported a 100% approval rating from both students and staff and a 96% approval rating from the communities in which the students were on the 4-day schedule. In his results, Wilmoth (1995) listed some of the perceived advantages of the 4-day school week as reported by administrators in school districts from across the United States. Administrators reported improved morale for staff and students, an increase in attendance for staff and students, which led to hiring fewer substitutes, and teachers seemed more focused with the extra plan time as well as an improvement in teacher professional development (Wilmoth, 1995). The administrators did list some perceived disadvantages in their survey responses, including a dislike of the lengthier day for elementary students and low achieving students who struggled to keep up. The administrators also reported it was a struggle to schedule extra-curricular activities with surrounding schools that operated on a 5-day schedule (Wilmoth, 1995).

Administrators and teachers perceived one of the most significant impacts of the 4-day schedule was to improve the morale of the school staff as well as the students in different ways. Bronson (2010) reported Oregon teachers felt the 4-day school week had positive effects on their every-day lives by giving them more time with family, and the extra day of rest helped them to have more energy throughout the week. Bell (2011) reported in one Georgia school district, administrators, and staff working in a 4-day school week had significantly higher job satisfaction after switching. Jennewein (2016) collected survey data from administrators, teachers, and support staff in Missouri school districts utilizing the 4-day school week and reported most felt the morale across the

district had improved since changing to the 4-day schedule. Gower (2017) stated that in some Missouri schools, teacher job satisfaction was better, and teacher retention was improved after schools changed to the 4-day school week. In a separate study of Missouri schools utilizing the 4-day schedule, Marion (2018) not only reported an increase in teacher retention but said that teachers felt the shortened school week was an incentive for experienced teachers to stay in the profession longer.

While teachers were mostly positive about the 4-day school week, Hale (2007) reported that in some South Dakota school districts, teachers felt it was exhausting when first making the change. Cummings (2015) said one superintendent in Idaho stated that the 4-day schedule just made busy lives busier by forcing families to squeeze everything into four days instead of five days. Savage (2018) reported that some teachers felt it was a disadvantage to students in regards to the curriculum they could cover, stating most teachers thought they were behind and not including all the content. Vernon (2018) reported that teachers in Oklahoma felt the 4-day schedule allowed for better collaboration and professional development opportunities. Not all research suggests teachers see it as an advantage. While overall, teachers in the Arizona school district said they would not want to return to the 5-day schedule, some teachers felt resentment about being required to work on the fifth day of the week for teacher professional development (Savage, 2018). Based on the results of these studies, teacher perceptions of the 4-day school week are mixed related to whether they see it as a benefit.

Administrators and teachers also perceive some benefits to students attending school on the 4-day schedule. Hedtke (2014) surveyed administrators in South Dakota 4-day schools and found most believed their students had an academic advantage having an

extra day off school, as students could use the day to get extra help from teachers. Hedtke (2014) also reported administrators felt students could get more rest with the extra day off, making them more attentive during school hours, and the benefit of students being able to work on the fifth day or get an internship helped them academically. Long (2016) reported one Colorado teacher felt that students were more engaged during the 4-day schedule than they were with five days of classes and felt her students improved academically on the shorter week. While many administrators and teachers felt the 4-day school week had benefits to students, researchers have reported some administrators and teachers had concerns about how the schedule was affecting special education and at-risk students (Gower, 2017; Quinton, 2018; Richert, 2015a; Turner et al., 2018).

Parents and students. The perceptions of parents and students need to be considered when a school district is contemplating a move to the 4-day school week. While not much research was found related to the perceptions of parents and students, existing research suggests those attitudes and beliefs toward the 4-day school week tend to start negative, but change after implementation (Henton, 2015). Aamot (2010) reported one principal in a Minnesota school district felt the students were more resilient and adapted to the 4-day schedule and the length of the day better than teachers and parents.

Culbertson (1982) indicated that of the parents with students attending school on a 4-day school week, 91% had positive perceptions and wanted to continue with the schedule. Parents noted they enjoyed having a day they could schedule appointments without their student having to miss school as one of the most significant benefits, as well

as more time for family activities and what seemed to be a more positive attitude toward school from their children. While most of the parents had positive perceptions, Culbertson (1982) indicated that some parents commented on their children being overly tired during the school week due to longer days while others missed having an additional helping hand on the farm or frustrations with needing a babysitter on the extra day off. Additionally, she stated the perceptions of K-11th grade Colorado students attending school on the 4-day school week were supportive of the schedule. Students gave reasons "that they learned more, had fewer absences, and had a feeling that school was better this year" (Culbertson, 1982, p. 4).

Sagness and Salzman (1993) reported parents in Idaho did not agree on whether the 4-day school week was positive for their students. Sagness and Salzman (1993) reported most parents felt the shortened school week had a positive impact on student attitudes toward school and enjoyed spending more time with their children; however, some felt the schedule made their students more tired and stressed during the school week. Hale (2007) reported parents in South Dakota found advantages to the 4-day week as it allowed them to schedule appointments without their children missing school. Bronson (2010) stated many parents in Oregon liked the 4-day school week after they adjusted their work schedules to mirror it, giving them more time at home with their kids. While most parents enjoyed the 4-day schedule and had positive perceptions, some parents did not have the luxury of matching their child's schedule and mentioned not liking that they had to find daycare for their students an extra day each week (Bronson, 2010). Creno and Vanek (2015) reported that many Arizona parents were concerned with the potential academic downfalls having fewer school days could cause. One parent was

specifically concerned about how the 4-day school week would affect special education students and felt the 4-day school week was just the wrong thing to do for students with special needs (Creno & Vanek, 2015). Quinton (2018) reported that some parents in a suburban school district outside of Denver, Colorado, were upset when the school district decided to switch to the 4-day schedule stating it would be challenging to get the children to school at an earlier time and were concerned the length of the school day would be hard on the students.

Parents have been more cautious of the 4-day school week than teachers and students; however, after experiencing the schedule, the concerns tend to disappear (Duchscherer, 2011). In one Missouri school district, parents were distraught when the district made the change to the 4-day schedule; however, since the change, parents opinions changed, and they began citing benefits to the new shortened school week including more time with family as well as the schedule making it easier to get to appointments without the students missing school (Crouch, 2012). Brown (2017) reported that Oklahoma parents have grown to like the 4-day school week as it gives them more family time with their children. In her study on the impact of the 4-day school week on Arizona schools, Savage (2018) reported that parent perceptions seemed to be dependent on the age of children. Parents with elementary age students had more concerns regarding the 4-day schedule than parents with high school age students, citing child-care on the fifth day as the most commonly listed concern (Savage, 2018). While some parents listed concerns, Savage (2018) also found most parents felt the advantages outweighed those uncertainties.

The majority of student perceptions of the 4-day school week are positive. Leiseth (2008) reported students from the upper Midwest generally liked the 4-day school week, with higher approval ratings from secondary students. Crouch (2012) reported some Missouri students felt the 4-day schedule has helped to improve their grades because they have more time to study. Levin (2016) stated some students enjoyed the 4-day schedule due to the additional time it gives them with their families as well as the extra time to finish homework. Brown (2017) reported that the morale of students was much higher after changing to the 4-day school week with one Oklahoma student mentioning they no longer dread coming to school every day. Bradley (2019) reported students in 4-day schools from around the United States expressed many advantages to the schedule, including feeling less stressed with more opportunity to rest as well as a more significant chance to pursue educational goals and job experience on their extra day off.

While most of the research results showed positive perceptions from students regarding the 4-day school week, some students mentioned there were drawbacks. Sagness and Salzman (1993) reported suburban Idaho students listed various disadvantages, including less time for homework, being more tired from longer classes, and less time to study after school activities had ended so late. Hale (2007) reported that some secondary students in South Dakota that were enrolled in harder classes felt rushed and did not like having to do extra work on their own on their day off. Leiseth (2008) reported students in the upper Midwest attending school on the 4-day schedule did not like how early they had to start school. Brown (2017) reported an elementary-age student complained about feeling rushed during school.

Community. One set of stakeholder perceptions that is most likely overlooked when a school is considering the 4-day school week is the perceptions of the community surrounding the school. The existing research on the perceptions of the 4-day school week from members of the communities is limited. What little research was found suggests most communities are skeptical before the change but feel that after the schedule was implemented, the 4-day school week had a positive effect on students, staff, and the community (Bronson, 2010; Hill & Heyward, 2015; Ray, 2003).

Ray (2003) reported that in a Gallup poll administered across the United States, almost three-fourths of Americans opposed utilizing the 4-day week in schools. Henton (2015) stated that one school district in Minnesota that was considering switching to a 4-day school week faced opposition from the community as they were concerned with the possible negative impact the change would have on parents and students as well as what the unsupervised teenagers would be doing in the community on their extra day off. Hill and Heyward (2015) reported that some communities in Georgia were concerned the 4-day schedule would eventually affect the quality of schools within each community, ultimately affecting the economic growth of the area.

Bronson (2010) reported that in one Oregon community, constituents felt the 4-day school week was a positive change for the students and teachers. Community members perceived students as having more time for rest leaving students refreshed for school and felt the 4-day schedule helped to keep students in school, as they could make appointments on the extra day (Bronson, 2010). The Colorado Department of Education (2019) reported an almost 90% approval rating for the 4-day school week from communities that have schools operating on the schedule while the only negative

perceptions suggested school employees be required to continue to work five days a week. Some school districts in Colorado that considered reverting to the 5-day schedule reported more opposition from the community returning to the traditional schedule than they had when first transitioning to a 4-day school week and ultimately decided to keep the shortened schedule as a result (Colorado Department of Education, 2019). Quinton (2018) reported that while survey data shows teachers and parents generally support the 4-day school week, business owners in the communities with 4-day school weeks tend to support the schedule as it allows an extra day for older students to work.

Legislation and opposition. Whether or not a state allows schools to utilize the 4-day school week is controlled by the legislature. While the research surrounding legislative members' perceptions of the 4-day school week is limited, it was evident that the largest group of critics of the schedule is politicians. Faced with making decisions between educational budget cuts and how students are affected, various politicians have voiced their concerns about the 4-day school week.

Larrabee, Sanders, and Jones (2009) reported that one Florida senator who worked directly with education funding was concerned students would get in trouble on their extra day off if schools began cutting back to the 4-day schedule to save money. Aamot (2010) reported the governor of Minnesota felt students attending school on the 4-day school week were at a disadvantage from other students as society continues to get more competitive. Sheehy (2012) reported that the U.S. Secretary of Education took a position against the 4-day school week, causing some states to reject legislation that would allow schools to implement the schedule. A former dean of Harvard University spoke out against the growing 4-day school week trend, saying students needed more

academic attention, and going to school fewer days was a move in the wrong direction (Pant, 2015). Worried about the possible long-term side effects of the 4-day school week, Cummings (2015) reported some critics felt the change to the 4-day school week was more about adults liking the schedule than about what was best for students. Eger and Habib (2015) reported the Oklahoma State Superintendent also felt the 4-day schedule was more about what adults wanted, and schools were utilizing it to attract teachers at the expense of student academics. Brown (2017) reported the governor of Oklahoma felt students were better prepared academically by going to school five days a week as the longer days on the 4-day schedule make it difficult to keep focus (Larrabee et al., 2009).

Impact of the 4-Day School Week on School Performance Indicators

As the 4-day school week has continued to grow in popularity, school districts need to consider the advantages and disadvantages of the 4-day school week as well as the perceptions of stakeholders. However, the most imperative thing that must be considered is the potential impact the 4-day school week will have on school performance. The 4-day school week has the potential to impact school performance in many different aspects, including academic achievement, subgroup academic achievement, college and career readiness, attendance rate, and graduation rate.

Academic performance. Even in the early years of the 4-day school week, one of the most significant concerns was what effect fewer school days would have on student achievement. Critics have argued that removing one day from each school week has a potential negative impact on student achievement, while proponents say that the additional minutes added to each day as well as the morale boost from the 4-day school

week help to increase student achievement. Researchers exploring the 4-day school week have found a variety of outcomes concerning whether the schedule helps or hinders student and school performance (Cummings, 2015).

Although the results of the research found regarding the impact of the 4-day school week on student academics vary widely, the majority of researchers have concluded that the effect (positive or negative) is so small, there is no way to determine if any of the differences are a cause of the schedule. In one of the earliest studies of the 4-day school week, Culbertson (1982) found student achievement after switching to the schedule was comparable to student achievement before the change, stating, "There is no reason to suspect that the shorter week hinders students" (p. 3). Much like Culbertson's research, many of the researchers determined any differences found were insignificant (Anderson & Walker, 2013; Domier, 2009; Reeves, 1999; Yarbrough & Gilman, 2006).

Reeves (1999) reported on a school district in Arkansas that made the change to a 4-day school week in hopes of improving test scores. In addition to the 4-day school week, the district implemented supplemental tutoring for struggling students on the non-attendance day. The school district did see some improvements; however, the district was disappointed after one year when gains in test scores were determined insignificant (Reeves, 1999).

Yarbrough and Gilman (2006) reported that a school district in Kentucky tracked student performance on state assessments two years before switching to the 4-day week and two years after the switch. The school district did show significant improvement across all areas on the state assessments; however, the scores in the previous two years had already been increasing. While the increase in assessment scores was encouraging,

they could only determine because of the prior two-year upward trend, the 4-day week was not the cause of the growth, nor did it hinder student achievement (Yarbrough & Gilman, 2006).

Several researchers studied the effects of the 4-day school week by comparing 4-day school student academic performance to similarly matched 5-day school student academic performance. Domier (2009) studied the impact of the 4-day school week on elementary student achievement in Colorado school districts by comparing state assessment scores in 4-day schools to similar 5-day schools. Domier (2009) found no significant difference in student test scores in reading, writing, and mathematics between 4-day school and 5-day schools. Anderson and Walker (2013) also studied the effects of the 4-day school week on student performance on Colorado state assessments by comparing similar schools and found students in the 4-day school week had slightly higher scores than students in the 5-day week. Anderson and Walker (2013) reported that the most considerable shift upward in scores was students moving from slightly below proficient into the proficient level. Even though the 4-day schools' scores were somewhat higher than the 5-day school scores, Anderson and Walker (2013) reported the difference in scores was not enough to say the 4-day week was the cause.

Another method researchers used to study the effects of the 4-day school week was to look at student academic performance in a school before switching to the 4-day schedule and after the change. Sheehy (2013) reported a school district in Idaho had seen some academic successes after making the change to a 4-day school week; however, the district was not ready to attribute those changes to the schedule. The district reported that each class is different, and ups and downs in academics are expected, regardless of the

number of student attendance days in the school week (Sheehy, 2013). Thomason (2013) collected four years of Algebra I and English II EOC data from a rural Missouri high school, two years prior to 4-day school week and 2-years after the change, and reported that while there was an increase in student test scores, the increase was not statistically significant. Creno and Vanek (2015) stated one Arizona school district was very conscientious when transitioning to the 4-day school and compared academic performance each year to the last year the students still attended school on the 5-day week, finding that while the historically low-performing school saw some slight improvements in student performance, ultimately the schedule had no effect on student achievement.

Several researchers found mixed results when studying the impact of the 4-day school week on student performance. Some researchers found positive effects in specific grade levels, while others found varying results based on the subject area assessed. In the earlier years of the 4-day school week, Sagness and Salzman (1993) compared Idaho state assessment scores in one school for Grades 3 through 11 before changing to the 4-day school week to after switching to the 4-day schedule. Sagness and Salzman (1993) found elementary students were more likely to increase performance on state assessments across all subtests, while middle school age students are likely to see little change and high school age students were most likely to see a decrease in student performance on state assessments in the first year of 4-day school week implementation.

Wilmoth (1995) collected survey data from administrators from 84 of the 104 school districts operating on a 4-day school week across the United States and reported that based on standard achievement and teacher observations, over two-thirds of the

administrators surveyed saw an increase in student achievement, around one-fifth felt there was no change in student achievement, while only 5% of the administrators reported a decrease in student achievement. Wilmoth (1995) also stated that of the schools included in the survey, administrators felt that the most significant increase in student achievement occurred in Grades 10-12. In the same study, Wilmoth (1995) reported that over 50% of the 84 school districts on the 4-day schedule that responded to the survey had an above-average student ranking when compared to both the state and national levels.

Some researchers found mixed results based on the timeframe in which the data was collected and the length of time the school district had been utilizing the 4-day school week. Patton (2004) completed a study on 4-day school week student achievement for Oregon eighth grade mathematics assessments over two years. Patton (2004) found students attending the 4-day school week had significantly higher math scores in the first year; however, scores decreased in the second year while 5-day school week scores increased in the second year.

Lefly and Penn (2011) studied the difference in Colorado state assessment scores in reading and math between schools utilizing a 4-day school week and schools operating on a 5-day week, specifically grouping the schools by size (fewer than 300 students, fewer than 600 students, and 600 or more students). Lefly and Penn (2011) found that for reading, 5-day schools, both with fewer than 300 students and fewer than 600 students, had scores slightly higher than their 4-day counterparts, while there was no significant difference in scores between districts with 600 or more students. When comparing math scores, Lefly and Penn (2011) found no difference in elementary student scores between

4-day and 5-day schools, however, for middle school and high school students, 5-day school math scores were significantly higher than the 4-day schools of the same size.

Similar to Sagness and Salzman (1993), Hewitt and Denny (2011) found mixed results of the impact of the 4-day school week based on specific grade levels. Hewitt and Denny (2011) studied student achievement on state assessments in which Colorado 4-day schools were matched with 5-day schools according to enrollment and socioeconomic status. Hewitt and Denny (2011) found that even though test scores from 5-day schools were slightly higher than test scores from 4-day schools, only scores in elementary reading were significantly higher. One researcher also found mixed results by subject area assessed. During a 5-year study, Savage (2018) found that in one Arizona school district, student scores on the state reading test remained unchanged; however, student scores on the state math test dropped significantly after changing to a 4-day school week.

NCSL (2018) discussed three different studies on the effects a 4-day school week had on academic performance and found all three had varying results. Anderson and Walker (2013) studied student assessment scores in Colorado and showed students in a 4-day school week significantly improved in mathematics while a different study in Colorado by Hewitt and Denny (2011) found no difference in student performance between schools on a 4-day school week and a 5-day school week. In a third study, Thompson (1999) reported that minority, low-income, and special education students in one Oregon school district showed a slight decline in academic performance when first implementing the 4-day schedule; however, after four years, there was no significant difference in student performance to students in 4-day schools. "These results make it

difficult to draw conclusions about the effects on student outcomes" (NCSL, 2018, para. 11).

While most of the research on the impact of the 4-day school week suggests it does not affect student performance, some research has pointed to some potential adverse effects on student academic performance. Tharp (2014) reported that while many Montana school districts utilizing the 4-day school week demonstrated an increase in student achievement scores on state assessments in their first few years of implementation, the longer a school district operated on the 4-day schedule, the more likely students were to fall behind their 5-day counterparts. Tharp (2014) studied student state test scores for Montana schools utilizing the 4-day school week for longer than five years were compared to student test scores from 5-day schools and found that,

> Not only are the students in four day weeks achieving proficient and advanced at a lower rate than the state average, the difference between the student scores in four-day week schools compared to the state is growing at an increasing rate. (p. 66)

Hedtke (2014) studied the effects of the 4-day school week in South Dakota schools by comparing the percentage of students scoring proficient and advanced on the state assessment within the 4-day schools from before the switch to after as well as compared scores to 5-day schools. Hedtke (2014) found that when 4-day schools were compared to similar 5-day schools, in the majority of schools across all grade levels, the 5-day schools had a significantly higher percentage of students scoring proficient and advanced than the 4-day counterparts in both math and reading. When 4-day schools were compared to themselves prior to the schedule change, Hedtke (2014) found that

while some schools did show small improvements in the proficient category, the majority of schools did not perform as well on the state assessments, losing students from the advanced group.

Tharp, Matt, and O'Reilly (2016) reviewed student achievement scores between students in a 4-day school and students in a 5-day school in Montana for over six years. Tharp et al. (2016) determined through the causal-comparative study that "the four-day school week had a negative impact on student achievement in reading and mathematics as measured by the [Montana] criterion referenced test" (p. 127). Tharp et al. (2016) found that while the student achievement in the first two years of utilizing a 4-day school week was consistently higher than that of students in 5-day schools; over time, the student achievement in the 4-day schools fell dramatically while the performance of students in 5-day schools was increasing in both mathematics and reading. The researchers felt the decrease in student achievement had to do with complacency and the 4-day school week becoming a part of the culture of the school. Tharp et al. (2016) urged schools considering the switch to a 4-day school week to have a comprehensive plan in place that would monitor student achievement over time.

Subgroup achievement. Most research on the impact of the 4-day school week has been on academic performance. However, a few researchers have been concerned about the lack of studies regarding the effects of the 4-day week on low-income and minority students (Anderson & Walker, 2013; Cummings, 2015). Hill and Heyward (2015) discussed that while school districts have measured the effects of the 4-day week on student academics, few schools could say whether some students were making gains at the expense of others. The Minnesota Department of Education began to require school

districts to return to the 5-day week if low-income students, specifically, are not progressing academically (Pant, 2015).

Thompson (2019) completed a study specifically to determine the effects of the 4-day school week on different subgroups, specifically special education, English as a second language, low-income, and minority students. Thompson (2019) found that while white students attending school on a 4-day schedule are less likely to score proficient in math and reading assessments than their 5-day week counterparts, the effect was even more significant for minority students. Thompson (2019) also found male student performance in both reading and math was more negatively impacted by the 4-day week than female students, and low-income and special education students seemed to be the most negatively impacted, while the effect on English as a second language students was not significant.

College and career readiness. A potential effect of the 4-day school week on student performance that needs to be considered is the impact it might have on student college and career readiness. To date, little research has been conducted on the effects the 4-day school week has on college and career readiness. The 4-day school week could potentially affect scores on college entrance exams, advanced coursework and dual credit, or college and career placement after high school and needs to be considered.

Most of the research on the impact of the 4-day school week on college and career readiness has been done on college placement exams, specifically the ACT. The results of the existing research vary in terms of whether the shortened school week has helped students score higher on the college entrance exams to the 4-day week having no significant effect on scores. One of the first researchers to study the impact of the 4-day

school week found positive results for student scores. Reeves (1999) reported that the first school in Louisiana to implement the 4-day school week was able to raise ACT scores to the highest the district had ever seen.

Feaster (2002) studied college entrance exam scores over seven years in one South Dakota school that utilized the 4-day schedule. Feaster (2002) compared college entrance exam scores to the state average and found that while there were some shifts in how the school was scoring in comparison to the state, the district stayed close to or slightly above the state average in all years except for two. Hale (2007) studied ACT scores in nine South Dakota school districts after the schools had made the change to a 4-day school week. Six of the nine school districts surveyed demonstrated an increase in the average ACT score after changing to the 4-day schedule. However, Hale (2007) did not attribute the gains to the 4-day schedule but to quality instruction.

Leiseth (2008) reported that in one school district in the Midwest, student ACT scores fell in the first year of utilizing the 4-day schedule. ACT scores, however, went up dramatically the following year, suggesting schools might go through an adjustment period (Leiseth, 2008). In a similarly designed study, Knapp (2014) researched the effects of the 4-day school week on ACT scores in four Missouri school districts by comparing ACT scores before the schedule and after. Knapp (2014) found no significant difference in ACT scores in three out of the four schools. In the fourth school, Knapp (2014) found ACT scores were significantly higher after switching to the 4-day week.

One researcher found the 4-day school week had a negative impact not only on student achievement on college entrance exams but on the percentage of students who went on to attend college. Richert (2015a) reported that in a study conducted by Idaho

Education News, Idaho students attending school on a 4-day schedule were scoring lower on college entrance exams than their 5-day counterparts. Also, he reported that a lower percentage of 4-day week students were going on to attend college than 5-day week students (Richert, 2015a).

A majority of the researchers found that while college entrance exam scores might have gone up or gone down after the 4-day schedule was implemented, most of the researchers found the changes were insignificant and not due to the schedule change. Lake (2015) reported that in one Missouri school district, student ACT scores fell by 0.7 points after the district switched to a 4-day school week; however, the change was not significant enough to say there was a difference. Gower (2017) collected ACT data from 7 Missouri school districts before and after switching to the 4-day schedule and determined no significant difference in scores. Dolezal (2018) studied ACT scores in South Dakota schools utilizing the 4-day school week and found that even though scores seemed to drop slightly after the switch, the decrease was not significant.

Braun (2018) conducted a study on the effects of the 4-day school week on ACT scores between 18 Kansas high schools utilizing the 4-day school week and 13 similar Kansas high schools operating on the 5-day school week. Even though the average ACT score was 1.4 points lower for the 4-day schools, the overall difference was not significant. However, Braun (2018) did find a substantial difference in the average ACT score for schools with higher minority rates utilizing the 4-day school week than schools with similar minority rates using the 5-day schedule. The results were similar when looking at the gap between schools with more significant percentages of free and reduced

lunch students with students attending 4-day schools with ACT scores as much as 2.7 points lower than their 5-day counterparts (Braun, 2018).

College and career readiness is more than students taking college entrance exams and includes advanced and dual credit courses as well as postsecondary placement plans. However, Heyward (2018) reported that there is little to no research regarding how the 4-day school week affects college or career placement after high school. There is also no current research on how the 4-day school week affects high school students taking advanced courses and dual credit courses while in high school.

Attendance rate. One additional effect of the 4-day school week on school performance that needs to be considered is the effect the schedule has on student attendance. Many advocates of the 4-day school week claim student and teacher attendance goes up after the schedule change (Heyward, 2017; Richert, 2015a; Sheehy, 2012). Almost all researchers agree that after a school switches to the 4-day schedule, student attendance rates increase.

In one of the first studies on the effects of the 4-day schedule on attendance rates, Sagness and Salzman (1993) found schools in the state of Idaho saw an increase in student, teacher, and staff attendance rates after switching to the 4-day school week. In a later study, Feaster (2002) studied student attendance rates in 4-day schools in the state of South Dakota and found that while attendance rates were slightly lower in the first year of implementation, attendance rose in the second year and continued to rise each year after, remaining consistently higher than the state average.

Hale (2007) researched the impact of the 4-day school week on student attendance rates in South Dakota and found that over half of the schools studied went up in student

attendance. Even though not all the 4-day schools went up in student attendance, overall stakeholders believed the 4-day school week had a positive impact on student attendance (Hale, 2007). Farris (2013) also reported an increase in student attendance over a period in his study on one rural Idaho school. Farris (2013) stated that in the first year the increase in student attendance was minimal, however by the sixth year of the 4-day school week, the school had raised its attendance rate over 3% when compared to the last year the school was on the 5-day schedule. Gower (2017) collected attendance data from Missouri school districts utilizing the 4-day school week and found a significant difference in attendance rates between 4-day and 5-day schools. Gower (2017) reported 4-day schools had a significantly higher attendance rate than similar 5-day schools.

Some school districts reported significant increases in student attendance after switching to the 4-day school week. One of the most considerable changes to student attendance was described by Lake (2015), where one Montana school district saw student attendance increase by 19% after switching to a 4-day school week. Bradley (2019) reported that two school districts in Montana stated they saw improvements in student attendance after switching to the 4-day school week, one of those districts claiming it raised more than 20% over two years after the change.

Not all researchers found attendance rate increase to be significant. Bell (2011) found that attendance rates in one Georgia school had no significant change after switching to a 4-day school week. Richert (2015c) reported that in Idaho, 4-day school week attendance was only slightly higher than the state average; therefore, the schedule could not be determined to have a significant impact on student attendance. Savage (2018) researched the effects of the 4-day school week on student and teacher attendance

in the state of Arizona and found that while student attendance increased slightly, it was not significant, and teacher attendance rates went down. Dolezal (2018) studied the effects of the 4-day school week on attendance rates in South Dakota schools. He found that while most of the schools in the sample had lower attendance rates after switching to the 4-day school week, it was not enough of a difference to suggest the 4-day school week caused attendance rates to drop (Dolezal, 2018).

Graduation rate. A potential effect of the 4-day school week on students and school performance that needs to be considered is the impact on graduation rates or drop-out rates. To date, very little research has been conducted on the impact the 4-day school week has on graduation rates or drop-out rates. The existing research on graduation rates and drop-out rates is mixed.

Hale (2007) researched the impact of the 4-day school week on high school drop-out rates and graduation rates in South Dakota schools. Hale (2007) reported that while not all schools utilizing the 4-day schedule were able to improve their drop-out rate, 42% of the schools saw improvements in the drop-out rate in the first year of implementation. In addition to several of the schools improving their drop-out rates, all schools utilizing the 4-day schedule were able to increase their graduation rate by 11% in the first year of implementation (Hale, 2007).

One researcher found a significant decrease in graduation rate after a district switched to the 4-day schedule. Leiseth (2008) reported that in one Midwestern school, the graduation rate decreased by 8% in the first year of 4-day school week implementation. No additional information was provided around the dramatic drop in

graduation rate, so there was no way to determine whether the decrease was an effect of the 4-day school week.

Lefly and Penn (2011) reported 4-year graduation rates of Colorado school districts utilizing the 4-day schedule; however, they did not provide any basis of comparison to know if the 4-day school week had an impact. Lefly and Penn (2011) reported one-third of the 4-day schools to have 4-year graduation rates above 90%, almost one half to have graduation rates between 70% and 89%, and the rest had 4-year graduation rates fall below 70%.

Instead of looking at graduation rates, Gower (2017) studied the effect of the 4-day school week on Missouri high school drop-out rates. Gower (2017) found that in the schools that had been utilizing the 4-day schedule for four or more years, the drop-out rate did decrease. The decrease, however, was not significant enough to determine the improvement in the drop-out rate was due to the 4-day schedule.

Summary

The purpose of this study was to explore the relationship between the length of a school week and school performance indicators. More specifically, the study was designed to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Chapter 2 included a review of literature relevant to the 4-day school week. In the first section, the history of the 4-day week is reviewed, including the history specific to the state of Missouri. The second section reviewed the reported advantages and disadvantages of the 4-day school week. In the third section, stakeholder

perceptions of the 4-day week were discussed, including teacher and administrator perceptions, parent and student perceptions, and the perceptions of the community, legislature, and opposition. Finally, in the last section, the impact of the 4-day week on school performance indicators, including student academic performance, subgroup performance, college and career readiness, attendance rates, and graduation rates were presented. Chapter 3 includes details on the research methodology utilized in this study.

Chapter 3

Methods

The focus of this study was to explore the relationship between the length of a school week and school performance indicators. More specifically, the study was designed to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. An explanation of the research design, the selection of the participants, the measurement, data collection procedures, the data analysis and hypothesis testing, and the limitations of the study are included in Chapter 3.

Research Design

Salkind (2010) defined a causal-comparative research design as "a design used to investigate relationships between independent and dependent variables after an event has already occurred" (p. 124). He further explained that the goal of causal-comparative research is to "determine whether the independent variable affected the dependent variable by comparing two or more groups of individuals" (Salkind, 2010, p. 124). This quantitative study involved a causal-comparative design of matched pairs to examine the relationship between the length of a school week and school performance indicators. Specifically, this study was conducted to determine if a difference exists in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The independent variable, the length of a school week, was identified as the 4-day school week and the 5-day school week. The dependent variable, school performance, was measured by MSIP 5 performance standards: academic achievement, subgroup achievement, college and career readiness, attendance rate, and graduation rate. Academic achievement was measured by the percentage of students proficient and advanced and MPI on the 2017-2018 ELA, mathematics, and social studies EOC assessments. Subgroup achievement was measured by the percentage of students proficient and advanced and MPI on the 2017-2018 ELA, mathematics, and social studies EOC assessments. College and career readiness was measured by the percentage of students scoring at or above the state standard on 2017-2018 CCR assessments, advanced placement courses, and postsecondary placement. The attendance rate was measured by the percentage of students at or above 90% attendance for the 2017-2018 school year. The graduation rate was measured by the 4-year graduation percentage for the 2017-2018 school year.

Selection of Participants

The population included all Missouri high schools, excluding charter, alternative, special education, career, vocational, and technical schools. The sample was a matched pair in which the first group was Missouri high schools that operated on a 4-day school week during the 2017-2018 school year. These schools were identified from the document, *Districts and Charters Attending a 4-Day Week*, downloaded through the Missouri Comprehensive Data System under Directory, Calendar, and Maps (MoDESE, 2018d). Of the 25 school districts listed, five of the districts were K-8 school districts and were excluded from the study. The high schools from the 20 remaining districts were

selected as the sample that was matched to Missouri high schools that operated on a 5-day school week during the 2017-2018 school year.

To identify the matched high schools, two spreadsheets were combined, *Building Demographic Data 2006-2017* and *Building Enrollment 1991-2017*, downloaded through the Missouri Comprehensive Data System under Students, Enrollment & Demographics (MoDESE, 2018a; MoDESE, 2018c). To ensure the populations were the same in both documents, charter, alternative, special education, career, vocational, and technical schools were deleted as well as all years except 2016 and 2017. Elementary and middle school demographic and enrollment data were not removed to ensure similarity throughout each district from which high schools were selected. Once the data in the two spreadsheets matched, the columns for the variables K-8 enrollment and 9-12 enrollment were exported from *Building Enrollment 1991-2017* and inserted into *Building Demographic Data 2006-2017*, to look at specific high school enrollment alongside demographic data by building. Merging the two spreadsheets was necessary as some school districts house Grade 7 and Grade 8 in the same building as Grades 9-12, and to match high school buildings accordingly, enrollment data was filtered to only include Grades 9-12.

District-wide enrollment and demographic data from the 20 districts with high schools that operated on a 4-day school week, previously identified in the document *Districts and Charters Attending a 4-Day Week*, were transferred into a new spreadsheet to organize and identify the specific values for each variable being matched. The National Center for Education Statistics (NCES, 2006) classifies schools into four major locale categories: city, suburban, town, and rural. To ensure the locales of the matched

high schools were similar, a column was added at the end of the spreadsheet in which the locale of each high school was identified. To identify the locale of each high school, each high school was searched by school name on the NCES website, and the locale was added into the last column following enrollment and demographic data.

To begin matching 5-day week high schools with the previously identified 4-day week high schools, the revised document *Building Demographic Data 2006-2017* was sorted in the following order: 9-12 enrollment, percentage of students receiving free and reduced lunch, percentage of white students, and percentage of students with IEPs. Once the spreadsheet was sorted, each 4-day week high school was located within the document and then matched with two to three 5-day week high schools according to the following criteria: 9-12 enrollment within 25 students, free and reduced lunch rate within 10%, white enrollment rate within 10%, and IEP incidence rate within 10%. The district data for each high school was then retrieved by filtering the spreadsheet according to the county/district code and then transferred to the matched pair spreadsheet. The locale of each matched 5-day week high school was searched and identified from the NCES website and entered into the last column. Once all the data was transferred into the matched pair spreadsheet; the two to three matched 5-day week high schools were narrowed down to one best overall match. The best overall match was selected according to the following criteria in order of importance: closest free and reduced lunch rate, closest white enrollment percentage, closest IEP incidence rate, the locale, and the configuration of the district.

Grades 9-12 enrollment in both the 4-day week high schools and 5-day week high schools were similar with a mean difference in student enrollment between matched pairs

of 6.45 students (MoDESE, 2018c). The percentage of students receiving free and reduced lunch for both the 4-day week high schools and 5-day week high schools were also similar with a mean difference in the percentage of students receiving free and reduced lunch between matched pairs of 2.9%. The percentage of white, non-minority students, at both the 4-day week high schools and 5-day week high schools were also similar with a mean difference between matched pairs of 2.9%. There were two outliers (83.9% and 84.9%) in the 4-day week high schools in which the percentage of white students was considerably lower compared to the rest of the group and compared to the percentage of white students in the matched 5-day week high schools. The percentage of students with IEPs between the two groups were also similar, with a mean difference between matched pairs of 2.1%. There were two outliers (22% and 27.4%) in the 5-day week high schools in which the percentage of students with IEPs was considerably high compared to the rest of the group and compared to the percentage of students with IEPs in the matched 4-day week high schools (MoDESE, 2018b). All 20 of the high schools utilizing the 4-day week were considered to be rural high schools, while 18 of the 20 matched high schools from the 5-day week group were considered to be rural. The two high schools from the 5-day week group that were not considered to be rural were located in communities that were large enough to be considered a town; however, they were considered to be in remote locations (more than 35 miles from an urbanized area) (NCES, 2006). To see a complete listing of all data from the matching criteria, refer to Table A1 for Missouri high schools with a 4-day school week and Table A2 for Missouri high schools with a 5-day school week selected for this study.

Measurement

For this study, the relationship between the school week (4-day school week versus 5-day school week) and school performance was analyzed. The measurement of school performance was determined by MSIP 5 performance standards for K-12 school districts: academic achievement, subgroup achievement, college and career readiness, attendance rate, and graduation rate. Multiple instruments of measurement were used within each performance standard described in Table 1.

Table 1

Instruments of Measurement

	Performance Standard	Measurement	Instrument
RQ1	Academic achievement	MPI	2017-2018 EOC scores in Algebra I[a], English II, and Government
RQ2	Academic achievement	Percentage Proficient/Advanced	2017-2018 EOC scores in Algebra I[a], English II, and Government
RQ3	Subgroup achievement	MPI	2017-2018 EOC scores in Algebra I[a], English II, and Government
RQ4	Subgroup achievement	Percentage Proficient/Advanced	2017-2018 EOC scores in Algebra I[a], English II, and Government
RQ5	College and career readiness	Percent at or above the state standard	2018 graduating senior scores on CCR assessments[b], advanced placement courses[c], and postsecondary placement
RQ6	Attendance rate	Percent at or above 90% attendance	2017-2018 student attendance rate
RQ7	Graduation rate	Percent at or above the state standard	2017-2018 4-year graduation rate

Note. MPI = MAP Performance Index, EOC = End of Course, CCR = College and career readiness (CCR). [a]Algebra II EOC score is used if a student completed Algebra I before 9th grade. Geometry EOC score is used if a student completed both Algebra I and Algebra II before 9th grade. [b]CCR assessments include ACT, SAT, COMPASS, ASVAB, and WorkKeys. [c]Advanced placement includes AP, IBC, and dual credit. Adapted from *Comprehensive Guide to MSIP 5*, by MoDESE, 2018a. Retrieved from https://dese.mo.gov/quality-schools/mo-school-improvement-program/msip-5

The instruments of measurement are described in the following order: (a) description of EOC assessments and EOC assessment validity and reliability, (b) MPI calculation for academic achievement, (c) percentage proficient or advanced calculation for academic achievement, (d) description of the super subgroup, (e) MPI calculation for subgroup achievement, (f) percentage proficient or advanced calculation for subgroup achievement, (g) description of each CCR assessment, (h) percentage at or above the state standard

calculation for CCR assessments, (i) description of each advanced placement program, (j) percentage at or above the state standard calculation for advanced placement, (k) description of postsecondary placement, (l) percentage at or above the state standard calculation for postsecondary placement, (m) percentage at or above 90% attendance calculation for attendance rate, and (n) percentage at or above the state standard calculation for graduation rate.

EOC assessments. In MSIP 5, high school academic achievement and subgroup achievement is measured by the percentage of students meeting or exceeding the state standard on the required EOC assessments. The EOC assessments are criterion-referenced assessments designed to measure a student's understanding of the Missouri Learning Standards in each course upon completion of instruction regardless of grade level. While the EOC assessment scores are not a direct instrument of measurement for this study, it is necessary to review the EOC assessments and the validity and reliability for the intended use of the assessment scores to understand the instruments of measurement for this study.

All EOC assessment items were developed by a team of Missouri educators, Department of Elementary and Secondary Education (DESE) staff members, Regional Instructional Facilitators, and Riverside Publishing test development specialists, through an intricate item writing and review process (Questar Assessment, 2017). Items were field-tested and reviewed for bias before being placed in a bank of questions. In 2014, the process to review and align existing assessment items to the new Missouri Learning Standards and test blueprints began. English language arts (ELA) and mathematics were reviewed and aligned first, followed by science and social studies (Questar Assessment,

2017). Each new assessment form was field-tested before becoming operational according to the schedule shown in Table 2.

Table 2

EOC Assessment Implementation Schedule

Year	ELA	Mathematics	Science	Social Studies
Field Test	2016-2017	2016-2017	2017-2018	2018-2019
Operational	2017-2018	2017-2018	2018-2019	2019-2020

Note. ELA = English Language Arts. Adapted from *Online End-of-Course Assessments Guide to Interpreting Results 2017-2018,* by MoDESE, 2018f. Retrieved from https://dese.mo.gov/sites/default/files/asmt-eoc-gir-1718.pdf

Questar Assessment (2017) described each EOC assessment as having multiple types of items incorporated into the form. Item types include selected-response (SR) (multiple choice), performance events (PE), constructed-response (CR), and writing prompts (WP). For the 2017-2018 test administration, the English II EOC was comprised of 35 SR items and 3 WPs. The Algebra I EOC consisted of 40 SR items and 4 PEs. Both the Geometry EOC and Algebra II EOC consisted of 40 SR items. Both the Biology EOC and Government EOC consisted of 50 SR items (Questar Assessment, 2017). All EOC assessments are administered online, in one or two sessions depending on the subject area, during one of three testing windows: winter, spring, or summer. SR items are automatically scored by Questar against a fixed key immediately after a test is submitted by the student. PE and WP are scored by Questar's trained scorers (Questar Assessment, 2017). After the PE and WPs are graded, the score from the SR items is combined with the score from the PE or WP, resulting in a raw score for each student. This raw score is then converted into a scaled score, which is then categorized into an

achievement level, as shown in Table 3. Scale scores help to ensure "the consistency of EOC assessment scores over time and ensure achievement levels are applied consistently from year to year" (Questar Assessment, 2017, p. 69).

Table 3

EOC Scale Score Ranges by Achievement Level

Assessment	Below Basic	Basic	Proficient	Advanced
English II	325-383	384-399	400-419	≥ 420
Algebra I	325-388	389-399	400-408	≥ 409
Algebra II	325-387	388-399	400-410	≥ 411
Geometry	325-386	387-399	400-413	≥ 414
Government	100-178	179-199	200-224	225-250

Note. Adapted from *Online End-of-Course Assessments Guide to Interpreting Results 2017-2018,* by MoDESE, 2018f. Retrieved from https://dese.mo.gov/sites/default/files/asmt-eoc-gir-1718.pdf.

Lunenburg and Irby (2008) defined validity as "the degree to which an instrument measures what it purports to measure" (p. 181). According to *Standards for Educational and Psychological Testing*, the validity of test scores "relies on all the available evidence relevant to the technical quality of a testing system" (Questar Assessment, 2017, p. 134). Validity evidence includes test construction, score reliability, testing administration, scoring and scaling, standard setting, and fairness for all test takers. Questar Assessment (2017) summarizes the validity evidence for MO EOC assessments as it relates to testing content in terms of the adequacy and appropriateness to measure progress on Missouri Learning Standards, as well as the internal structure of the assessments "through correlation analysis of MO EOC Assessment content clusters" (p. 134). Because the limited number of items affect the correlation coefficients, Questar Assessment (2017)

used Spearman' formula to correct for any weakening and reported: "The corrected correlations between clusters within each assessment are strong (> 0.70), with many correlations approaching or exceeding 0.90" (Questar Assessment, 2017, p. 137).

Lunenburg and Irby (2008) defined reliability as "the degree to which an instrument consistently measures whatever it is measuring" (p. 182). Standard 2.0 of the *Standards for Educational and Psychological Testing* requires DESE "to ensure that the instruments used to measure student achievement for school accountability provide reliable results" (Questar Assessment, 2017, p. 88). Referring to the *Standards for Educational and Psychological Testing*, Questar (2017) defined reliability coefficients.

> First, the term has been used to refer to the reliability coefficients of classical test theory, defined as the correlation between scores on two equivalent forms of the test, presuming that taking one form has no effect on performance on the second form. Second, the term has been used in a more general sense, to refer to the consistency of scores across replications of a testing procedure, regardless of how this consistency is estimated or reported. (Questar, 2017, p. 88)

Questar Assessment (2017) used Classical Test Theory (CTT) to quantify reliability into a reliability coefficient, ranging from 0.0 to 1.0. Reliability coefficients closest to 0.0 are considered weak and indicate a less reliable assessment while coefficients closest to 1.0 are strong and suggest a more reliable assessment. Reliability cannot be directly estimated from CTT; therefore, Questar (2017) specifically utilized a coefficient alpha, which "indicates the internal consistency of the responses over a set of items measuring an underlying trait, in this case, academic achievement in the MO EOC content tests" (p. 89). All EOC assessments administered during the 2017-2018 school year have a

reliability coefficient alpha between 0.85 and 0.88, indicating the EOC assessments are highly reliable and show a consistency of student test scores (Questar Assessment, 2017).

Academic achievement (MPI). For RQ1, the instrument of measurement to determine if there is a difference in school academic achievement between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the MAP Performance Index (MPI) on EOC assessments in mathematics, English, and social studies during the 2017-2018 school year. Student performance on EOC assessments is reported in terms of four achievement levels (Below Basic, Basic, Proficient, and Advanced). MPI is a specific composite number that represents the performance of every student by awarding points to each student based on the MAP achievement level (MoDESE, 2018a).

MoDESE (2018a) explained, to calculate MPI, index point values are assigned to each of the achievement levels: 1 point for Below Basic, 3 points for Basic, 4 points for Proficient, and 5 points for Advanced. Achievement levels are provided by the testing companies for the total number of reportable students in each subject area. The total number of students scoring in each achievement level is multiplied by the corresponding index point value. The products are then summed, divided by the total number of reportable students, multiplied by 100, and rounded to the nearest tenth producing the MPI that ranges from 100 to 500 (MoDESE, 2018a).

Academic achievement (percentage proficient or advanced). For RQ2, the instrument of measurement used to determine if there was a difference in school academic achievement between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of students

who scored proficient or advanced on EOC assessments in mathematics, English, and social studies during the 2017-2018 school year. According to MoDESE (2018a), the Missouri expectation for academic achievement is that all students be on track for proficiency. Unlike the MPI that takes into account the achievement level of all students, the expectation of proficiency only accounts for students that score proficient or advanced. MoDESE (2018a) explained to calculate the percentage of students proficient or advanced, achievement levels are obtained from the testing company, and the total number of students that scored proficient is added to the total number of students that scored advanced, divided by the total number of reportable students, multiplied by 100, and rounded to the nearest tenth.

Super subgroup. In MSIP 5, the second school performance standard is demonstrating improvement in student performance for student subgroups. In the *Comprehensive Guide to MSIP 5*, MoDESE (2018a) indicated a need to discern among the needs of schools and to "ensure broader inclusion of students whose subgroups have historically performed below the state total" (p. 24). MoDESE (2018a) reported data indicating a significant difference in the academic performance of five subgroups: Black, Hispanic, low-income students, students with disabilities, and English language learners. To hold schools accountable for the academic performance of these subgroups, a super subgroup was formed comprised of all five underachieving subgroups. A student is included in the super subgroup as a single count if the student is identified in one or more of the five identified subgroups (MoDESE, 2018a).

Subgroup (MPI). For RQ3, the instrument of measurement used to determine if there is a difference in school subgroup achievement between Missouri high schools with

a 4-day school week and matched Missouri high schools with a 5-day school week was the subgroup MPI on EOC assessments in mathematics, English, and social studies during the 2017-2018 school year. MoDESE (2018a) explained the process to calculate subgroup MPI is the same as calculating the academic achievement performance standard; however, it excludes test scores of students who do not identify in the super subgroup. Index point values are assigned to each of the achievement levels: 1 point for Below Basic, 3 points for Basic, 4 points for Proficient, and 5 points for Advanced. Achievement levels are provided by the testing companies for the total number of reportable students identified in the super subgroup in each subject area (MoDESE, 2018a). The total number of subgroup students scoring at each achievement level is multiplied by the corresponding index point value. The products are then summed, divided by the total number of reportable students identified in the super subgroup, multiplied by 100, and rounded to the nearest tenth producing the MPI that ranges from 100 to 500 (MoDESE, 2018a).

Subgroup (percentage proficient or advanced). For RQ4, the instrument of measurement used to determine if there is a difference in school subgroup achievement between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of subgroup students who scored proficient or advanced on EOC assessments in mathematics, English, and social studies during the 2017-2018 school year. The Missouri expectation for subgroup achievement is that all students identified in a subgroup be on track for proficiency (MoDESE, 2018a). Unlike the MPI that takes into account the achievement level of all students, the expectation of proficiency only accounts for students who score proficient or advanced.

To calculate the percentage of subgroup students proficient or advanced, achievement levels are obtained from the testing company and the total number of subgroup students who scored proficient is added to the total number of subgroup students that scored advanced, divided by the total number of reportable students in the super subgroup, multiplied by 100, and rounded to the nearest tenth (MoDESE, 2018a).

CCR assessments. In the *Comprehensive Guide to MSIP 5*, MoDESE (2018a) indicated the college and career readiness performance standard requires high schools to provide postsecondary preparation for all students. One measurement is the percentage of graduates meeting or exceeding the state standard on CCR assessments, which include ACT, SAT, COMPASS, ASVAB, ACCUPLACER, or ACT WorkKeys (MoDESE, 2018a). While the CCR assessment scores are not direct instruments of measurement for this study, it is necessary to review the CCR assessments for the intended use of the assessment scores to understand the instruments of measurement for this study.

In *The ACT Technical Manual,* ACT (2018b) delineated the ACT as a series of four multiple-choice tests measuring student academic readiness in English, mathematics, reading, and science with an optional writing test. The ACT is aligned to college and career readiness standards and is meant to give educators a tool to measure educational achievement and assess college readiness for the high school student (ACT, 2018b). Each series of the ACT includes a different number of multiple-choice items; however, the raw scores (total number of multiple-choice items answered correctly) are converted to a scaled score ranging from 1 to 36 (ACT, 2018b). The writing score is reported on a scale from 2 to 12 (ACT, 2018b). A composite score is calculated by finding the sum of the scaled scores from the four multiple-choice tests, dividing by four, and then rounding

to the nearest whole number. The writing score is calculated by combining the English multiple-choice score with the writing score for an overall ELA score; however, the writing score does not affect the student's composite score (ACT, 2018b).

The College Board (2017) described the SAT as an assessment comprised of two sections, Evidence-Based Reading and Writing and Math, with an optional Essay section, measuring a student's knowledge, skills, and understanding of the essential concepts for college and career readiness. Each section of the SAT includes a different number of multiple-choice items; however, the raw scores (total number of multiple-choice items answered correctly) are converted to a scaled score ranging from 200 to 800. The overall SAT score is calculated by adding the two section scores together, resulting in an SAT scale score ranging from 400 to 1600 (CollegeBoard, 2017). The optional Essay section includes three essay questions scored on a scale ranging from 2 to 8. The scores from the optional essay have no impact on the overall SAT scale score (CollegeBoard, 2017).

The COMPASS was created by ACT to serve as a computer-adaptive college placement assessment; however, data analysis showed that the COMPASS was not effectively contributing to correct placement and student success; therefore, it was phased out in December 2016 (Fain, 2015). Even though the COMPASS was phased out, scores for students that had already taken the COMPASS prior to 2017 continued to count toward college placement until no graduating seniors have COMPASS scores. The ACCUPLACER was created by the College Board "to determine students' college and career readiness and inform college placement" (CollegeBoard, 2018a). In the *ACCUPLACER Program Manuel*, CollegeBoard (2018a) described the assessment as five computer-adaptive tests (Reading, Writing, Arithmetic, Quantitative Reasoning

Algebra and Statistics, Advanced Algebra and Functions) in which each assessment is tailored directly to the test taker where each assessment item is chosen based on how the test taker answered the previous question. The length of each assessment is dependent on how the test taker is answering questions; however, overall, the assessment is scored on a scale from 200 to 300 (CollegeBoard, 2018a).

The Personnel Testing Division Defense Manpower Data Center (2012) described the Armed Services Vocational Aptitude Battery (ASVAB) as an aptitude test administered to all applicants for military enlistment and as part of career exploration to high school students. The ASVAB is made up of nine subtests measuring a student's abilities in four domains: "verbal ability, mathematical ability, science and technical knowledge and skills, and spatial ability" (Personnel Testing Division Defense Manpower Data Center, 2012, p. vii). Each of the subtests consists of a different number of multiple-choice items that must be completed in varying time lengths (Personnel Testing Division Defense Manpower Data Center, 2012, p. vii). The subset scores are used to calculate three composite scores, the Armed Forces Qualification Test (AFQT) score used to determine acceptance into the Armed Forces, Service composite scores used to help assign applicants to military jobs, and a Career Exploration Program (CEP) score to aid students in a career search fitting to their abilities (Personnel Testing Division Defense Manpower Data Center, 2012). Each of the subtest scores is standardized based on a fixed mean and standard deviation from the population of examinees and then reported as a percentile between 1 and 99 (Personnel Testing Division Defense Manpower Data Center, 2012).

In the *WorkKeys Workplace Documents Technical Manual*, ACT (2018a) described the ACT WorkKeys as a job skills assessment used to identify an individual's foundational skill strengths one might need in the workforce (p. 1.1). The assessment is one section of multiple-choice questions aligned to skills one might need when using a written document to do a job. A raw score is calculated for the assessment as the total number of correct responses (ACT, 2018a, p. 8.2). Raw scores are then converted into a scaled score ranging from 65 to 90 and a level score ranging from 3 to 7 (ACT, 2018, p. 8.2).

CCR assessments (percentage at or above the state standard). For RQ5, the first instrument of measurement used to determine if there is a difference in school college and career readiness between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of graduates who scored at or above the state standard on CCR assessments throughout high school. MoDESE (2018a) explained the Missouri expectation is for all high school graduates to be adequately prepared for postsecondary plans, whether it be further education, military, or the workforce. The CCR assessments described above each measure a student's preparedness for college or a career. Because each of the CCR assessment scores are reported on different scales, equivalent scores were established as a point of comparability on the various assessments, as shown in Table 4. An index point value is assigned to each of the equivalent score ranges (MoDESE, 2018a).

Table 4

CCR Assessment Score Matrix

Assessment	0.25	0.75	1	1.25
ACT	≤ 17	18 – 21	22 – 25	26 – 36
SAT	≤ 939	940 – 1090	1100 – 1230	1240 – 1600
COMPASS	Algebra < 66 AND Reading < 81	Algebra ≥ 66 OR Reading ≥ 81	Algebra ≥ 66 AND Reading ≥ 81	n/a[a]
ACCUPLACER	Reading < 250 AND Math < 230	Reading ≥ 250 OR Math ≥ 230	Reading ≥ 250 AND Math ≥ 230	n/a[a]
ASVAB	≤ 29	30 – 62	63 – 87	88 – 99
ACT WorkKeys	3 or below	4	5	6 or 7

Note. A student with no record of participation in any of the CCR assessments receives a score of 0. [a]n/a indicates it is not possible to obtain the given index points on this assessment. Adapted from *Comprehensive Guide to MSIP 5*, by MoDESE, 2018a, p. 74. Retrieved from https://dese.mo.gov/quality-schools/mo-school-improvement-program/msip-5

According to MoDESE (2018a), score data for all high school graduates are collected from official testing companies, ACT, SAT, COMPASS, ASVAB, ACCUPLACER, and WorkKeys while ASVAB data is obtained from each district's Management of Student Information System (MOSIS) file for each graduate. Additionally, MoDESE (2018a) reported that the COMPASS test was phased out in 2016; however, scores were included if a graduating senior had taken the assessment. To calculate the total number of graduates scoring at or above the state standard, the total number of students scoring in each score range is multiplied by the corresponding index point value. Graduates without a score receive an index point value of zero (MoDESE, 2018a). When a student has taken multiple types of assessments or a single assessment numerous times, only the highest score is used for the calculation (MoDESE, 2018a).

Once the total number of graduates in each score range has been multiplied by the corresponding index value, the sum is calculated, then divided by the total number of graduates, multiplied by 100, and then rounded to the nearest tenth (MoDESE, 2018a).

Advanced placement courses. The second portion of measurement for college and career readiness is the percentage of graduates that "earn a qualifying score on an AP, IB, or TSA assessment or receive college credit through early college, dual enrollment, or an approved dual credit course" (MoDESE, 2018a, p. 33). While the AP, IB, and TSA assessment scores and dual credit grades are not direct instruments of measurement for this study, it is necessary to review each of these assessments for the intended use of the assessment scores and grades to understand the instruments of measurement for this study.

The CollegeBoard (2018b) described AP courses as rigorous, college-level courses in a variety of contents that allow students to earn college credit by earning a qualifying score on a comprehensive assessment. There are over 30 AP courses approved by the CollegeBoard; however, course offerings may differ from high school to high school (CollegeBoard, 2018b). AP courses are recognized by colleges to require greater course depth than a typical high school course and better prepare students for college-level work. The CollegeBoard (2018b) explained students enrolled in AP courses might choose to take the AP test, a course comprehensive final that measures the students' understanding of the course content as well as the students' achievement in the course. The majority of AP tests are composed of a multiple-choice section and a free-response section, although, some AP tests are performance-based throughout the course (CollegeBoard, 2018b). All AP tests are scored and reported on a scale from 1 to 5 with

1 meaning no recommendation for college credit and 5 meaning the student is exceptionally well qualified for college credit (CollegeBoard, 2018b).

IB is a program meant to provide a balanced education and provide geographic and cultural mobility to promote international understanding (IB, 2018). IB courses are made up of three required core elements: theory of knowledge, an extended essay, and creativity, activity, and service. IB (2018) explained that students enrolled in IB courses choose courses from one of each subject area: language and literature, language acquisition, individuals and societies, sciences, mathematics, and the arts. Students are required to take three or four of the courses at a higher level, receiving more instruction hours, and two or three classes at a standard level, receiving 150 hours of instruction (IB, 2018). Students enrolled in IB courses take assessments to measure whether they have mastered the advanced academic skills needed to analyze information, evaluate arguments, and solve problems creatively. Scores are reported on a scale ranging from 1 to 7, with 7 being the highest (IB, 2018). Students scoring high enough on IB assessments can earn college credit or even college scholarships with partnering colleges (IB, 2018). The IB program is not a required offering at all Missouri high schools and is offered on a school by school basis.

To support and measure student achievement in career and technical education, MoDESE (2015) indicated the state of Missouri administers Technical Skills Attainment (TSA) and Industry Recognized Credential (IRC) assessments. MoDESE (2015) explained a TSA assessment is meant to measure a student's knowledge and skills gained in a specific program of study and is given to a student if the student completes three or more courses in a sequence that leads to a career path. MoDESE (2015) described IRC

assessments as a means to measure a student's knowledge and skills gained in a specific course or toward a particular skill set and can be given to a student at the end of a course. The TSA assessment is a multiple-choice exam concentrated on a specific career path while the format of an IRC assessment differs from test to test from performance-based to multiple-choice and is focused on a particular set of skills (MoDESE, 2015). The scoring on both the TSA and IRC assessments is based on pass or fail cut scores, which are predetermined by the industry or through a national norm (MoDESE, 2015). Students who score above the cut score or the national norm are considered as passing. If the industry does not provide a cut score or a national norm, the cut score is 65% (MoDESE, 2015).

Missouri has helped support technology and engineering education through Project Lead The Way (PLTW). PLTW is a career education program designed to give students real-world, hands-on learning experiences in engineering, biomedical science, or computer science that uses an activity, project, and problem-based learning approach to learning to help students become problem solvers (PLTW, 2018). At the completion of a PLTW course, students are required to take the PLTW End of Course (EoC) exam. Each PLTW EoC is comprised of multiple-choice questions aligned to the specific course content (PLTW, 2018). Students are scored on the total number of questions answered correctly, and scores are then scaled on a stanine "standard nine" scale resulting in scale scores from 1 to 9 (PLTW, 2018). PLTW has been recognized by colleges and universities awarding students with scholarships, admission preference, or course credit, depending on how the student scores on each PLTW EoC (PLTW, 2018).

An additional way Missouri high schools provide postsecondary preparation for students is through dual enrollment or dual credit courses. Students enrolled in dual credit and dual enrollment courses earn both high school and college credit through course enrollment. MoDESE (2018e) describes dual credit courses as high school courses, taught by a high school teacher who has been approved by a college or university to teach as an adjunct professor. Dual enrollment courses are college or university courses, taught by a professor on the college or university campus, in which the high school has arranged high school credit for the college course (MoDESE, 2018e).

Advanced placement (percentage at or above the state standard). For RQ5, the second instrument of measurement used to determine if there is a difference in college and career readiness between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of graduates at or above the state standard for advanced placement. MoDESE (2018a) explained the Missouri expectation is for all high school graduates to be adequately prepared for postsecondary plans, whether it be further education, military, or the workforce. With a high enough AP, IB, or PLTW assessment score, or through dual credit courses, students can earn college credit while in high school classes, exhibiting a student's preparedness for postsecondary education. Students with a high enough score on a TSA or IRC assessment receive credentials or a certificate demonstrating proficiency for use in the workforce. While each of the assessment scores is reported on a different scale, equivalent scores were established as a point of comparability on the various assessments, as shown in Table 5 (MoDESE, 2018a). An index point value was

computed by MoDESE and assigned to each of the equivalent score ranges according to the information found in Table 5.

Table 5

Advanced Course Type Score Matrix

Course Type	0	1	1.25
AP	No record of participation or earn < B	Earn "B" or better[a] in approved AP Course	Exam Score of ≥ 3
IB	No record of participation or earn < B	Earn "B" or better[a] in approved IB Course	Exam Score of ≥ 4
PLTW	No record of participation or score < 6	Exam score of ≥ 6 on approved PLTW	n/a[b]
TSA/IRC	No record of participation or score < proficient	Earn an IRC	n/a[b]
Dual Credit / Dual Enrollment	No record of participation or earn < B	Earn "B" or better[a] in approved dual credit / dual enrollment course	n/a[b]

Note. AP = Advanced Placement, IB = International Baccalaureate, PLTW = Project Lead The Way, TSA = Technical Skills Attainment, IRC = Industry Recognized Credential. [a]Earning a "B" is determined by the average grade over the entire duration of the course. [b]n/a indicates it is not possible to receive the given index points on this advanced course type. Adapted from *Comprehensive Guide to MSIP 5*, by MoDESE, 2018a, p. 75. Retrieved from https://dese.mo.gov/quality-schools/mo-school-improvement-program/msip-5

MoDESE (2018a) explained score data for all high school graduates are collected from official testing companies, AP, IB, PLTW, TSA/IRC, while dual credit courses completed and grades earned data are obtained from each districts MOSIS file for each graduate. To calculate the total number of graduates scoring at or above the state standard, the total number of students scoring in each score range is multiplied by the corresponding index point value. Graduates without a score receive an index point value of zero (MoDESE, 2018a). When a student has taken multiple types of assessments or

earns dual credit, only the highest score is used for the calculation. Once the total number of graduates in each score range has been multiplied by the corresponding index value, the sum is calculated, then divided by the total number of graduates, multiplied by 100, and then rounded to the nearest tenth (MoDESE, 2018a).

Postsecondary placement (percentage at or above the state standard). For RQ5, the last instrument of measurement used to determine if there was a difference in college and career readiness between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of graduates at or above the state standard for postsecondary placement. MoDESE (2018a) defined the postsecondary placement percentage as the percentage of graduates who continue with postsecondary education or who enroll in the military within six months of graduation and graduates who completed career education programs in high school that are placed in occupations directly related to their training within six months of graduation. Placement data is collected by high schools through the February Student Graduate Follow-up in which each graduating senior from the prior school year is contacted and surveyed (MoDESE, 2018a). The follow-up data is then submitted in the MOSIS file from the high school and is compared to the National Student Clearinghouse (NSC) enrollment data to verify postsecondary education enrollment. Any high school with a 15% variance from NSC enrollment data in postsecondary placement will receive a warning, and a 25% variance will receive an error and be required to provide additional documentation (MoDESE, 2018a).

MoDESE (2018a) explained the calculation for the percentage of graduates at or above the state standard for postsecondary placement incorporates all graduates who fall

into one of four categories. The sum of the number of graduates who attend postsecondary education, the number of graduates who participate in postsecondary training, the number of graduates who are in the military, and the number of graduates who completed an approved Career Education course and are employed is calculated. That sum is then divided by the total number of graduates, multiplied by 100, and then rounded to the nearest tenth (MoDESE, 2018a).

Attendance rate. For RQ6, the instrument of measurement used to determine if there is a difference in school attendance rate between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the percentage of students at or above 90% attendance. MoDESE (2018a) explained the target goal is for 90% of the students enrolled to have a 90% or above attendance rate. Attendance data are obtained from the MOSIS file for every student who is reported any time at the high school throughout the year. MoDESE (2018a) explained that the high school attendance rate is calculated from two different percentages: an individual student's proportional enrollment rate and an individual student's attendance rate. The proportional enrollment rate is calculated by taking the total individual student enrollment hours and dividing by the total calendar hours on the school calendar and rounding to the thousandth (MoDESE, 2018a).

An individual attendance rate, the percentage of time a particular student attends school, is then calculated for each student based on the total number of hours the student was enrolled in the school (MoDESE, 2018a). MoDESE (2018a) explained to calculate the individual attendance rate, the total hours of attendance is divided by the total hours enrolled, multiplied by 100, and then rounded to the nearest tenth. The individual

attendance rate is then assigned a corresponding index point, as shown in Table 6, awarding each student a specified attendance point (MoDESE, 2018a).

Table 6

Attendance Rate Points

Index Point	0	0.25	0.5	1
Attendance Rate (r)	$r < 85\%$	$85\% \leq r < 87.5\%$	$87.5\% \leq r < 90\%$	$r \geq 90\%$

Note. Adapted from *Comprehensive Guide to MSIP 5*, by MoDESE, 2018a, p. 47. Retrieved from https://dese.mo.gov/quality-schools/mo-school-improvement-program/msip-5

MoDESE (2018a) explained to determine the final percentage of students at or above 90% attendance, an adjusted proportional attendance point is calculated. Each student's proportional enrollment rate is multiplied by the student's attendance points earned, resulting in an adjusted proportional attendance point. The sum of the adjusted proportional attendance points for all students in the building is then divided by the sum of the proportional enrollment rate for all students in the building, multiplied by 100, and then rounded to the nearest tenth (MoDESE, 2018a).

Graduation rate. For RQ7, the instrument of measurement to determine if there is a difference in school graduation rate between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week was the 4-year graduation percentage. In MSIP 5, the fifth performance standard is for high schools to ensure all students graduate high school (MoDESE, 2018a). High schools are required to meet a four-, five-, six- or seven-year graduation rate; however, for this study, only the 4-year graduation rate was used. MoDESE (2018a) explained to calculate the 4-year graduation rate, data are collected from MOSIS, identifying each student's first freshman

year. The first freshman year is utilized to calculate an expected graduation year, forming a 4-year graduation cohort (MoDESE, 2018a). The total number of students in this cohort is adjusted throughout the four years, adding any students who transfer into the high school and subtracting any students who transfer out, emigrate to another country, or die during the same period (MoDESE, 2018a). To calculate the 4-year graduation rate, the total number of students who graduate in four years is divided by the number of students in the adjusted cohort for the graduating class, multiplied by 100, and then rounded to the nearest tenth (MoDESE, 2018a).

Data Collection Procedures

To collect data and conduct a study using archival data, a request must be submitted and approval granted prior to data collection. A request to conduct the research was submitted to the Baker University Institutional Review Board on March 11, 2019. The Baker Institutional Review Board granted approval to conduct the study on March 11, 2019 (see Appendix B).

All data were obtained from the MoDESE, Missouri Comprehensive Data System. All enrollment and demographic data for the high schools selected for this study were merged into a single spreadsheet, described in the selection of participants. A new Excel document, named *Supporting Data*, was created in which all the selected high schools and corresponding enrollment and demographic data on a 4-day schedule were inserted into worksheet 1 and all the matched high schools and similar enrollment and demographic data on a 5-day school week were inserted into worksheet 2. When entering the data for the matched high schools into worksheet 2, it was necessary to ensure that each 5-day high school was in the corresponding row as its matched 4-day

high school in worksheet 1. Columns were then inserted into the *Supporting Data* document previously created for each of the instruments of measurement. Six columns were added for academic achievement: percentage proficient or advanced on the ELA EOC, MPI on the ELA EOC, percentage proficient or advanced on the math EOC, MPI on the math EOC, percentage proficient or advanced on the social studies EOC, and MPI on the social studies EOC. Six columns were inserted for subgroup achievement: percentage proficient or advanced on the ELA EOC, MPI on the ELA EOC, percentage proficient or advanced on the math EOC, MPI on the math EOC, percentage proficient or advanced on the social studies EOC, and MPI on the social studies EOC. Three columns were inserted for college and career readiness: CCR assessments, advanced placement courses, and postsecondary placement. A column was added for both attendance rate and graduation rate.

Measurement data for each selected high school was then collected from the Missouri Comprehensive Data System by selecting *MSIP5 School APR Supporting Data Report – Public*, from the School Performance & Accountability tab under Districts, Charters, & Schools drop-down menu on the website https://apps.dese.mo.gov/MCDS/home.aspx. The supporting measurement data for each school was then obtained by selecting 2018 as the APR Year, the district name as the LEA, and the high school name as the School and then selecting view report. Supporting data for each high school was then transcribed from the report to the corresponding column in the *Supporting Data* document.

Data Analysis and Hypothesis Testing

Each of the research questions below has corresponding hypotheses that explore the relationship between the length of a school week and school performance indicators. The statistical analysis for each hypothesis follows the hypotheses for each research question. An independent-samples *t* test was chosen for each of the hypothesis tests since it examines the mean difference between two mutually exclusive independent groups, and the means of the two groups are numerical variables.

RQ1. To what extent is there a difference in school academic achievement, as measured by the 2018 MPI, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H1*.** There is a difference in school academic achievement, as measured by 2018 MPI for the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H2*.** There is a difference in school academic achievement, as measured by 2018 MPI for the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H3*.** There is a difference in school academic achievement, as measured by 2018 MPI for the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Three independent samples *t* tests were conducted to test H1-H3. Academic achievement, as measured by the mean MPI for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When

appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ2. To what extent is there a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H4*.** There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H5*.** There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H6*.** There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Three independent samples *t* tests were conducted to test H4-H6. Academic achievement, as measured by the percentage proficient and advanced for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was

set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ3. To what extent is there a difference in school subgroup achievement, as measured by the 2018 MPI, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H7*.** There is a difference in school subgroup achievement, as measured by 2018 MPI for the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H8*.** There is a difference in school subgroup achievement, as measured by 2018 MPI for the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H9*.** There is a difference in school subgroup achievement, as measured by 2018 MPI for the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Three independent samples *t* tests were conducted to test H7-H9. Subgroup achievement, as measured by the mean MPI for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ4. To what extent is there a difference in school subgroup achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments,

between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H10*.** There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H11*.** There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H12*.** There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Three independent samples *t* tests were conducted to test H10-H12. Subgroup achievement, as measured by the percentage proficient and advanced for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ5. To what extent is there a difference in college and career readiness, as measured by the percentage of students at or above the state standards, between Missouri

high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H13*.** There is a difference in college and career readiness, as measured by the percentage at or above the state standard on the CCR assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H14*.** There is a difference in college and career readiness, as measured by the percentage at or above the state standard for advanced placement, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

***H15*.** There is a difference in college and career readiness, as measured by the percentage at or above the state standard for postsecondary placement, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Three independent samples *t* tests were conducted to test H13-H15. College and career readiness, as measured by the percentage at or above the state standards, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ6. To what extent is there a difference in school attendance rate, as measured by the percentage of students at or above 90% attendance, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

H16. There is a difference in school attendance rate, as measured by the percentage of students at or above 90% attendance, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

An independent samples *t* test was conducted to test H16. School attendance rate, as measured by the percentage of students at or above 90% attendance, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

RQ7. To what extent is there a difference in school graduation rate, as measured by the 4-year graduation percentage, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

H17. There is a difference in school graduation rate, as measured by the 4-year graduation percentage, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

An independent samples *t* test was conducted to test H17. School graduation rate, as measured by the 4-year graduation percentage, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

Limitations

Lunenburg and Irby (2008) defined limitations as "factors that may have an effect on the interpretation of the findings or on the generalizability of the results" (p. 133). The limitations of this study were:

1. The high schools selected were all Missouri high schools, and measurement was based on Missouri performance standards. Therefore the results may not be applied to all high schools across the country.
2. For the 2017-2018 school year, science EOC assessments were field tests, and no data were released. Therefore the results of this study may not be applied to performance on all EOC assessments.
3. Variables outside the control of the researcher may play a part in student performance on EOC assessments. These variables may include the curriculum of the high school, amount of content and time focused on the EOC assessment, and methods of preparation for the EOC assessments.
4. Variables outside the control of the researcher may play a part in student performance on CCR assessments. These variables may include the availability of advanced curriculum, amount of content and time focused on CCR assessments, and methods of preparation for the CCR assessments.
5. Variables outside the control of the researcher may play a part in student performance on advanced placement courses. These variables may include the availability of advanced curriculum, amount of content and time focused on advanced placement assessments, and methods of preparation for the advanced placement assessments.

6. Variables outside the control of the researcher may play a part in student performance on postsecondary placement. These variables may include the availability of advanced curriculum, amount of content and time focused on postsecondary placement, and availability of career placement resources.

Summary

This chapter contained the design of the study exploring the relationship between the length of a school week and school performance indicators, specifically if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. This chapter also included a description of how the participants were selected and matched, the different instruments of measurement, data collection procedures, an explanation of the data analysis process used to address the research questions, and the limitations of the study. Presented in Chapter 4 are the results of the study, along with a detailed data analysis of those results.

Chapter 4

Results

This study was designed to explore the relationship between the length of a school week and school performance indicators. More specifically, the focus of this study was to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Included in this chapter is a presentation of the results of the hypothesis testing conducted for this study.

Hypothesis Testing

This section contains the results from independent sample *t* tests conducted to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. An independent-samples *t* test was chosen for each of the hypothesis tests since it examines the mean difference between two mutually exclusive independent groups, and both means of the two groups are continuous variables. The first five research questions are followed by the analysis used to test each hypothesis related to the research question. Following this explanation is each hypothesis and the results for each hypothesis. The last two research questions posed in this study are listed along with the corresponding hypotheses. After each hypothesis, the analysis used to test the hypothesis and the results for each are presented.

RQ1. To what extent is there a difference in school academic achievement, as measured by the 2018 MPI, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Three independent samples *t* tests were conducted to test H1-H3. Academic achievement, as measured by the mean 2018 MPI for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

H1. There is a difference in school academic achievement, as measured by the 2018 MPI for the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -2.221$, $p = .032$, $d = 0.702$. The sample mean for Missouri high schools with a 4-day school week ($M = 331.820$, $SD = 12.338$, $n = 20$) was lower than the sample mean for Missouri high schools with a 5-day school week ($M = 342.245$, $SD = 16.982$, $n = 20$). The hypothesis was supported. A 95% confidence interval showed there is evidence to suggest the mean 2018 MPI for ELA EOC assessment in Missouri high schools with a 4-day school week is between 0.923 and 19.927 points lower than the 2018 MPI for ELA EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a medium to large effect.

***H2*.** There is a difference in school academic achievement, as measured by the 2018 MPI for the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -3.006$, $p = .005$, $d = 0.951$. The sample mean for Missouri high schools with a 4-day school week ($M = 292.800$, $SD = 19.900$, $n = 20$) was lower than the sample mean for Missouri high schools with a 5-day school week ($M = 315.660$, $SD = 27.578$, $n = 20$). The hypothesis was supported. A 95% confidence interval shows there is evidence to suggest the 2018 MPI for mathematics EOC assessments in Missouri high schools with a 4-day school week is between 7.466 and 38.255 points lower than the 2018 MPI for mathematics EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a large effect.

***H3*.** There is a difference in school academic achievement, as measured by the 2018 MPI for the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(17) = 0.7118$, $p = .4863$. The sample mean for Missouri high schools with a 4-day school week ($M = 375.400$, $SD = 25.756$, $n = 10$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 364.444$, $SD = 40.476$, $n = 9$). The hypothesis was not supported. There is no evidence to suggest the 2018 MPI for social studies EOC assessments in Missouri high schools with a 4-day school week is different than the 2018 MPI for social studies EOC assessments in Missouri high schools with a 5-day school week.

RQ2. To what extent is there a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Three independent samples t tests were conducted to test H4-H6. Academic achievement, as measured by the percentage proficient and advanced for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

H4. There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -2.364$, $p = .023$, $d = 0.748$. The sample mean for Missouri high schools with a 4-day school week ($M = 45.315$, $SD = 4.896$, $n = 20$) was lower than the sample mean for Missouri high schools with a 5-day school week ($M = 49.480$, $SD = 6.173$, $n = 20$). The hypothesis was supported. A 95% confidence interval shows there is evidence to suggest the percentage proficient or advanced on the 2018 ELA EOC assessments in Missouri high schools with a 4-day school week is between 2.598% and 9.732% lower than the percentage proficient or advanced on the

2018 ELA EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a large effect.

H5. There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -3.128$, $p = .003$, $d = 0.989$. The sample mean for Missouri high schools with a 4-day school week ($M = 35.505$, $SD = 6.750$, $n = 20$) was lower than the sample mean for Missouri high schools with a 5-day school week ($M = 43.085$, $SD = 8.479$, $n = 20$). The hypothesis was supported. A 95% confidence interval shows there is evidence to suggest the percentage proficient or advanced on the 2018 mathematics EOC assessments in Missouri high schools with a 4-day school week is between 2.674% and 12.486% lower than the percentage proficient or advanced on the 2018 mathematics EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a large effect.

H6. There is a difference in school academic achievement, as measured by the percentage proficient or advanced on the 2018 social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(17) = 0.824$, $p = .422$. The sample mean for Missouri high schools with a 4-day school week ($M = 67.710$, $SD = 10.501$, $n = 10$) was

not different from the sample mean for Missouri high schools with a 5-day school week (M = 62.100, SD = 18.517, n = 9). The hypothesis was not supported. There is no evidence to suggest the percentage proficient or advanced on the 2018 social studies EOC assessments in Missouri high schools with a 4-day school week is different than the percentage proficient or advanced on the 2018 social studies EOC assessments in Missouri high schools with a 5-day school week.

RQ3. To what extent is there a difference in school subgroup achievement, as measured by the 2018 MPI, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Three independent samples t tests were conducted to test H7-H9. Subgroup achievement, as measured by the mean MPI for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's d, is reported along with a 95% confidence interval to determine the true difference between the means.

H7. There is a difference in school subgroup achievement, as measured by the 2018 MPI for the ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples t test indicated no statistically significant difference between the two means, $t(38) = -1.931$, $p = .061$. The sample mean for Missouri high schools with a 4-day school week (M = 308.505, SD = 16.027, n = 20) was not different from the sample mean for Missouri high schools with a 5-day school week (M = 319.000, SD = 18.268, n = 20). The hypothesis was not supported. There is no

evidence to suggest the subgroup MPI for the 2018 ELA EOC assessments in Missouri high schools with a 4-day school week is different than the subgroup MPI for the 2018 ELA EOC assessments in Missouri high schools with a 5-day school week.

H8. There is a difference in school subgroup achievement, as measured by the 2018 MPI for the mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -2.864$, $p = .007$, $d = 0.906$. The sample mean for Missouri high schools with a 4-day school week ($M = 267.755$, $SD = 18.316$, $n = 20$) was lower than the sample mean for Missouri high schools with a 5-day school week ($M = 289.62$, $SD = 28.813$, $n = 20$). The hypothesis was supported. A 95% confidence interval shows there is evidence to suggest the subgroup MPI for the 2018 mathematics EOC assessments in Missouri high schools with a 4-day school week is between 6.410 and 37.32 points lower than the subgroup MPI for the 2018 mathematics EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a large effect.

H9. There is a difference in school subgroup achievement, as measured by the 2018 MPI for the social studies EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(5) = 1.638$, $p = .162$. The sample mean for Missouri high schools with a 4-day school week ($M = 357.233$, $SD = 32.654$, $n = 3$) was not different from than the sample mean for Missouri high schools with a 5-day school week

(M = 311.725, SD = 38.658, n = 4). The hypothesis was not supported. There is no evidence to suggest the subgroup MPI for the 2018 social studies EOC assessments in Missouri high schools with a 4-day school week is different from the subgroup MPI for the 2018 social studies EOC assessments in Missouri high schools with a 5-day school week.

RQ4. To what extent is there a difference in school subgroup achievement, as measured by the percentage proficient or advanced on the 2018 EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Three independent samples t tests were conducted to test H10-H12. Subgroup achievement, as measured by the percentage proficient and advanced for each EOC assessment, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

***H10*.** There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the 2018 ELA EOC assessment, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated a statistically significant difference between the two means, $t(38) = -2.123$, $p = .040$, $d = 0.671$. The sample mean for Missouri high schools with a 4-day school week (M = 36.165, SD = 5.657, n = 20) was lower than the sample mean for Missouri high schools with a 5-day school week

(M = 40.320, SD = 6.681, n = 20). The hypothesis was supported. The 95% confidence interval shows there is evidence to suggest the subgroup percentage proficient or advanced on the 2018 ELA EOC assessments in Missouri high schools with a 4-day school week is between 0.192% and 8.118% lower than the subgroup percentage proficient or advanced on the 2018 ELA EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a medium effect.

H11. There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the 2018 mathematics EOC assessments, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples t test indicated a statistically significant difference between the two means, $t(38) = -2.657$, $p = .011$, $d = 0.840$. The sample mean for Missouri high schools with a 4-day school week (M = 28.31, SD = 5.827, n = 20) was lower than the sample mean for Missouri high schools with a 5-day school week (M = 34.505, SD = 8.649, n = 20). The hypothesis was supported. The 95% confidence interval shows there is evidence to suggest the subgroup percentage proficient or advanced on the 2018 mathematics EOC assessments in Missouri high schools with a 4-day school week is between 1.474% and 10.916% lower than the subgroup percentage proficient or advanced on the 2018 mathematics EOC assessments in Missouri high schools with a 5-day school week. The effect size indicated a large effect.

H12. There is a difference in subgroup achievement, as measured by the percentage proficient or advanced on the 2018 social studies EOC assessment, between

Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(5) = 2.124$, $p = .087$. The sample mean for Missouri high schools with a 4-day school week ($M = 62.133$, $SD = 12.648$, $n = 3$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 36.325$, $SD = 17.758$, $n = 4$). The hypothesis was not supported. There is no evidence to suggest the subgroup percentage proficient or advanced on the 2018 social studies EOC assessment in Missouri high schools with a 4-day school week is different than the subgroup percentage proficient or advanced on the 2018 social studies EOC assessment in Missouri high schools with a 5-day school week.

RQ5. To what extent is there a difference in college and career readiness, as measured by the percentage of students at or above the state standards, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

Three independent samples *t* tests were conducted to test H13-H15. College and career readiness, as measured by the percentage at or above the state standards, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

***H13*.** There is a difference in college and career readiness, as measured by the percentage at or above the state standard on the CCR assessments, between Missouri high

schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(38) = -0.117$, $p = .908$. The sample mean for Missouri high schools with a 4-day school week ($M = 69.040$, $SD = 8.952$, $n = 20$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 69.405$, $SD = 10.74$, $n = 20$). The hypothesis was not supported. There is no evidence to suggest the percentage at or above the state standard on the CCR assessments in Missouri high schools with a 4-day school week is different than the percentage at or above the state standard on the CCR assessments in Missouri high schools with a 5-day school week.

H14. There is a difference in college and career readiness, as measured by the percentage at or above the state standard for advanced placement, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(38) = -1.245$, $p = .221$. The sample mean for Missouri high schools with a 4-day school week ($M = 52.330$, $SD = 17.901$, $n = 20$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 59.17$, $SD = 16.841$, $n = 20$). The hypothesis was not supported. There is no evidence to suggest the percentage at or above the state standard for advanced placement in Missouri high schools with a 4-day school week is different than the percentage at or

above the state standard for advanced placement in Missouri high schools with a 5-day school week.

***H15*.** There is a difference in college and career readiness, as measured by the percentage at or above the state standard for postsecondary placement, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(38) = -0.041$, $p = .967$. The sample mean for Missouri high schools with a 4-day school week ($M = 90.430$, $SD = 10.695$, $n = 20$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 90.565$, $SD = 10.090$, $n = 20$). The hypothesis was not supported. There is no evidence to suggest the percentage at or above the state standard for postsecondary placement in Missouri high schools with a 4-day school week is different than the percentage at or above the state standard for postsecondary placement in Missouri high schools with a 5-day school week.

RQ6. To what extent is there a difference in school attendance rate, as measured by the percentage of students at or above 90% attendance, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

***H16*.** There is a difference in school attendance rate, as measured by the percentage of students at or above 90% attendance, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

An independent samples *t* test was conducted to test H16. School attendance rate, as measured by the percentage of students at or above 90% attendance, was compared

between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(38) = -1.824$, $p = .076$. The sample mean for Missouri high schools with a 4-day school week ($M = 92.350$, $SD = 2.126$, $n = 20$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 93.525$, $SD = 1.945$, $n = 20$). The hypothesis was not supported. There is no evidence to suggest the percentage of students at or above 90% attendance in Missouri high schools with a 4-day school week is different than the percentage of students at or above 90% attendance in Missouri high schools with a 5-day school week.

RQ7. To what extent is there a difference in school graduation rate, as measured by the 4-year graduation percentage, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week?

H17. There is a difference in school graduation rate, as measured by the 4-year graduation percentage, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

An independent samples *t* test was conducted to test H17. School graduation rate, as measured by the 4-year graduation percentage, was compared between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The level of significance was set at .05. When appropriate, an effect size, as

indexed by Cohen's *d*, is reported along with a 95% confidence interval to determine the true difference between the means.

The results of the independent samples *t* test indicated no statistically significant difference between the two means, $t(38) = -0.628$, $p = .534$. The sample mean for Missouri high schools with a 4-day school week ($M = 94.04$, $SD = 7.915$, $n = 20$) was not different from the sample mean for Missouri high schools with a 5-day school week ($M = 95.295$, $SD = 4.152$, $n = 20$). The hypothesis was not supported. There is no evidence to suggest the 4-year graduation percentage in Missouri high schools with a 4-day school week is different than the 4-year graduation percentage in Missouri high schools with a 5-day school week.

Summary

This chapter presented the results from independent sample *t* tests conducted to determine if there is a difference in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The results of the study were mixed, indicating a significant difference in academic achievement and subgroup achievement; however, no significant differences in college and career readiness, attendance rates, and graduation rates. Presented in Chapter 5 are a study summary, the findings related to the literature, and the conclusions.

Chapter 5

Interpretation and Recommendations

The first four chapters presented the background of the 4-day school week along with the purpose and significance of the study; a review of the literature relevant to the 4-day school week and the potential impact to school performance; an explanation of the research design and methodology utilized in the study; and quantitative analysis results of each hypothesis. Presented in this chapter is a study summary. Also, a discussion of the findings of the current study in relation to the research, with a specific focus on the comparison of school performance indicators between 4- and 5-day school weeks is included. This chapter ends with the conclusions of the study.

Study Summary

The study summary provides an overview of the problem as school districts face continued budget cuts and respond by implementing the 4-day school week without knowing the potential impact on school performance. The purpose statement and research questions are included. The review of the methodology describes the design of the study, the selection of participants, and instruments of measurement used to determine how the school week is related to school performance. Finally, the significant findings of the study are reviewed, specifically differences in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week.

Overview of the problem. Students across the United States have traditionally attended school 5 days a week for approximately 9 months out of the year. In the early

1970s, an oil embargo left many rural school districts looking for ways to save money on fuel expenses, hence the first movement in the 4-day school week (NCSL, 2018). With educational reform at the forefront of the nation's attention, the 4-day school week lost momentum as education professionals pushed for increased attendance days (National Commission on Excellence in Education, 1983). However, over time, schools across the country saw continued cuts to state and federal education budgets, causing schools to look for ways to save money, once again considering the 4-day school week (NCSL, 2018).

As the recession began to have a greater impact, the number of states allowing the 4-day school week continued to rise. In 2010, Missouri had its first school district to implement the 4-day school week. Since then, the number of 4-day schools in Missouri has continued to increase, growing to 25 school districts for the 2017-2018 school year (MoDESE, 2018d). As an increasing number of school districts across the nation implemented the 4-day school week, the possible impact on student academic performance and school performance needed to be considered.

Purpose statement and research questions. The purpose of this study was to determine if there is a difference in academic achievement and subgroup achievement as measured by student performance on MAP EOC assessments in Algebra I, English II, and Government, between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. Additionally, the purpose was to determine if there is a difference in college and career readiness as measured by student performance on CCR assessments; student performance on AP, IB, or TSA assessments, and student performance in earning college credit between Missouri high schools with a

4-day school week and matched Missouri high schools with a 5-day school week. Lastly, the purpose was to determine if there is a difference in attendance rate and graduation rate as measured by the percentage of students whose attendance rate meets or exceeds the state standard and percentage of students who meet the graduation requirements in 4 years between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. To address the purposes of the study, seven research questions were posed, and 17 hypotheses were tested.

Review of the methodology. This quantitative study used a causal-comparative design of matched pairs to examine the relationship between the length of a school week and school performance indicators. The independent variable, school week, was identified as Missouri high schools that attended a 4-day school week and matched Missouri high schools that operated on a 5-day school week. The dependent variable, school performance, was measured by MSIP 5 performance standards: academic achievement, subgroup achievement, college and career readiness, attendance rate, and graduation rate. The sample utilized in the study was a matched pair in which the first group was Missouri high schools that operated on a 4-day school week during the 2017-2018 school year matched to the second group of Missouri high schools that operated on a 5-day school week during the 2017-2018 school year. Schools were matched on Grades 9-12 enrollment, percentage of students receiving free and reduced lunch, percentage of white students, percentage of students with IEPs, and the locale of each district.

The measurement of school performance was determined by MSIP 5 performance standards for K-12 school districts: academic achievement, subgroup achievement,

college and career readiness, attendance rate, and graduation rate. Academic achievement was measured explicitly by MPI and the percentage of students scoring proficient or advanced on the Algebra I, English II, and Government EOC. Subgroup achievement was specifically measured by subgroup MPI and percentage of subgroup students scoring proficient or advanced on the Algebra I, English II, and Government EOC. College and career readiness was measured by the percentage of students scoring at or above the state standard on CCR assessments, advanced placement courses, and postsecondary placement. The attendance rate was measured by the percentage of students at or above 90% attendance, and the graduation rate was measured by the percentage of students at or above the state standard that graduated within 4 years. Archival data were collected from the Missouri Comprehensive Data System. An independent samples *t* test was chosen to test each of the hypotheses to examine the mean difference for each school performance indicator between Missouri high schools with a 4-day school week and the matched Missouri high schools with a 5-day school week.

Major findings. The researcher investigated to what extent the school week was related to school performance, specifically differences in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. The analysis of the data revealed mixed results. Missouri students attending a 4-day school week high school scored significantly lower on the ELA and mathematics EOC assessments for both MPI and percentage proficient or advanced than their peers at 5-day school week high schools. The subgroup of Missouri students attending school on a 4-day schedule also scored significantly lower on EOC

assessments in ELA for percentage proficient or advanced and mathematics for both MPI and percentage proficient or advanced than their peers attending school on a 5-day schedule.

While some of the findings of the study indicated students in Missouri high schools attending school on a 4-day school week were scoring significantly lower in academic achievement and subgroup achievement than Missouri students who attended school on a 5-day school week, not all the results showed significant differences. The findings of the study indicated there was not a significant difference for Missouri students attending a 4-day school week high school on the social studies EOC assessment for both MPI and percentage proficient or advanced, as well as subgroup performance on the social studies EOC assessment for both MPI and percentage proficient or advanced, and subgroup performance on the ELA EOC assessment MPI, compared to Missouri students attending a 5-day school week high school. The findings of the study also showed there was not a significant difference in CCR assessments, advanced placement courses, postsecondary placement, percentage of students at or above 90% attendance, and the 4-year graduation rate for Missouri students attending a 4-day schedule compared to Missouri students attending a 5-day school week high school.

Findings Related to the Literature

In this section, the current study's findings are compared with previous research related to the length of a school week and school performance. The results of the current study were both consistent with and in contrast to the research studies described in the literature review. The connections to the literature on the impact of the 4-day school week on academic achievement, subgroup achievement, college and career readiness,

attendance rates, and graduation rates are reviewed below, along with the findings from the current study.

The results of the current study showed mixed results regarding academic achievement. While students attending school on the 4-day schedule scored significantly lower on both ELA and mathematics state assessments than students attending school on the 5-day school week, no significant difference was found in academic performance on the social studies state assessment. These results were in contrast to the majority of the research, which indicated that the impact of the 4-day school week on academic performance (positive or negative) is so small that there is no way to determine if any of the differences are a cause of the schedule. Both Reeves (1999) and Yarbrough and Gilman (2006) found that while the scores on state assessments of students attending a 4-day school week did improve after switching to the 4-day schedule, the improvement was not significant, suggesting there was no difference in academic performance between when the school operated on the 4-day school week versus the 5-day school week.

The results of the current study were also in contrast to similarly designed studies by Domier (2009) and Anderson and Walker (2013) in which student academic achievement in 4-day schools was compared to student academic achievement in similarly matched 5-day schools. Domier (2009) found no significant difference in student academic achievement when comparing state assessment scores in 4-day schools to similar 5-day schools. Anderson and Walker (2013) reported students in the 4-day school week had slightly higher scores than students in the 5-day week; however, the difference in scores was not enough to say the 4-day week was the cause.

The mixed results of the current study on academic performance were partially consistent with Sagness and Salzman (1993) and Hewitt and Denny (2011). While the current study only included high school age students and both the Sagness and Salzman (1993) and Hewitt and Denny (2011) studies included all grade levels, the results were similar for high school age students. In the current study, high school students attending school on a 4-day schedule scored lower on state assessments than their peers attending school on a 5-day schedule, which was in agreement with both Sagness and Salzman (1993) and Hewitt and Denny (2011) who also reported high school students were more likely to see a decrease in student performance on state assessments in the first year of a 4-day school week implementation. In contrast to the results of the current study, Sagness and Salzman (1993) also found elementary-age students were more likely to see an increase in performance on state assessments while middle school age students were likely to see little change.

The findings of the current study showed students attending school on the 4-day schedule scored significantly lower on both ELA and mathematics state assessments than students attending school on the 5-day schedule. The results of the current study were partially consistent with Lefly and Penn (2011), who determined state assessment scores in reading were slightly higher for students attending 5-day schools than 4-day schools when the school enrollment was smaller than 600. Lefly and Penn (2011) also found for middle and high school students, 5-day school math scores were significantly higher than the 4-day schools of the same size. The results of the current study were also consistent with Hedtke (2014) and Tharp et al. (2016) who both found that when 4-day schools were compared to similar 5-day schools, the 5-day schools had a significantly higher

percentage of students scoring proficient and advanced than the 4-day counterparts in both math and reading.

The results of the current study showed mixed results regarding subgroup achievement. While the subgroup of students attending school on the 4-day school week scored significantly lower on both ELA and mathematics state assessments than the super subgroup of students attending school on the 5-day school week, no significant difference was found regarding academic performance on the social studies state assessments. These results were consistent with Thompson (2019), who determined low-income and special education students were more negatively impacted by the 4-day school week and were less likely to score proficient on math and reading assessments than their 5-day counterparts.

When looking at the impact of the 4-day school week on college and career readiness, the results of the current study indicated no significant difference between 4-day schools and 5-day schools on college entrance exams, advanced placement courses, or college placement, which was consistent with the majority of research. The results of the current study were consistent with Leiseth (2008), Knapp (2014), Lake (2015), and Gower (2017), who found no significant difference in ACT scores after schools made a change to the 4-day schedule. The results of the current study were consistent with Braun (2018), who reported no significant difference in ACT scores between 4-day schools and matched 5-day schools; however, Braun (2018) also reported that 4-day schools with higher minority rates scored significantly lower on the ACT than 5-day schools with similar minority rates. The results of the current study were in direct contrast to Richert (2015a) who not only found students attending school on a 4-day schedule were scoring

lower on college entrance exams than their 5-day counterpart but that a lower percentage of 4-day week students were going on to attend college than 5-day week students.

The results of the current study showed no significant difference in attendance rates between 4-day schools and matched 5-day schools. While most of the research on attendance rates and the 4-day school week was focused on how the attendance rate changed after the 4-day school week was implemented, two researchers conducted studies similar to the current study. The results of the present study were in agreement with Richert (2015c), who reported that the 4-day school week attendance was only slightly higher than the state average; therefore, the schedule could not be determined to have a significant impact on student attendance. The findings of the current study were in contrast to Gower (2017), who found a significant difference in attendance rates between 4-day and 5-day schools in which 4-day schools were significantly higher.

When looking at the impact of the 4-day school week on graduation rates, the results of the current study indicated no significant difference between 4-day schools and 5-day schools. Very little research has been done on the impact of the 4-day school week on graduation rates or drop-out rates and what research was found focused on how the graduation rate changed after the 4-day school week was implemented. None of the research found offered a comparison of graduation rates between 4-day schools and 5-day schools.

Conclusions

The last section of this chapter provides closure for the study. Implications for school districts currently utilizing or contemplating implementation of the 4-day school

week are presented. This section also offers recommendations for future research and concluding remarks.

Implications for action. The significant findings from this study regarding the potential impact the 4-day school week has on school performance have implications for the educational community and policymakers making decisions regarding education funding and the use of the 4-day school week. School districts that are currently utilizing the 4-day schedule should consider the results of this study to help determine the future of the 4-day school week within their communities. The potential impact of the shortened school week on student academic performance, specifically negative impacts on students that fall into the super subgroup, should be considered to make the best decisions for all students. School districts that choose to continue utilizing the 4-day school week should further investigate the anomalies (4-day schools outperforming their 5-day matched school) within the study to determine what is working well.

School districts that are considering the implementation of the 4-day schedule should utilize the results of this study to further plan for the potential impact it might have on student achievement. Because this study was a causal-comparative study, it is not possible to determine the 4-day school week caused student achievement to decrease after implementation; however, school districts need to be aware of the differences between the 4-day and 5-day schools. School districts should seek advice from 4-day schools that have seen success in student achievement on the schedule and plan additional professional development around their information to ensure decreases in student achievement do not occur. Those considering the change to a 4-day school week should also consider that there were no instances in which the sample of high schools

operating on the 4-day school week was outperforming the sample of matched 5-day week high schools on the school performance indicators. School districts considering the change need to weigh the cost savings against the potential impacts on students.

Policymakers should also consider the results of this study when making decisions about the future of the 4-day school week, requirements for school districts to continue using the 4-day school week, and educational funding. With an increasing number of school districts considering the 4-day school week due to additional cuts to funding, policymakers must consider the potential impact the 4-day week will have on students. If the 4-day week schools are not performing as well as 5-day week schools, policymakers must ensure adequate funding to keep schools in session 5-days a week. If politicians continue to allow the 4-day school week, it is imperative schools be held accountable for academic achievement. Policymakers should consider additional accountability standards for schools utilizing the 4-day schedule to ensure students attending those schools are offered the same educational opportunities as students attending 5-day schools.

Recommendations for future research. While the current study explored the relationship between a school week and school performance, specifically in academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week, additional research is needed to further determine the impact the 4-day week has on school performance. The subsequent recommendations are made for others interested in studying the effects of the 4-day

school week as well as those in the field of education that are currently utilizing a 4-day school week schedule.

There are multiple aspects of the current study that could be adjusted to better understand the impact of the 4-day school week on school performance. One piece of the current study that could be changed is the selection of participants. Some anomalies in the present study, 4-day schools with consistently higher scores than their matched 5-day school, stood out, causing the researcher to wonder why such large deviations from the sample occurred. It was recognized that some of the anomalies were schools that had been utilizing the 4-day schedule for much longer than the other schools in the sample. It is recommended to replicate the study but split the schools into two groups, schools that had been utilizing the 4-day school for 5 years or longer and schools that have operated on it for less than 5 years. Another way to adjust the selection of participants would be to eliminate schools that were in their first year of implementation of the 4-day school week as the first year could be a hard transition for students, teachers, and administration, which could affect overall school performance. It is also recommended the study be replicated to include all grade levels instead of just high schools. It is essential to know if different ages of students are affected differently by the 4-day school week.

Another recommendation for further research is to change the basis of comparison in the study. The current study compared school performance in 4-day schools to matched 5-day schools. While the results indicated the 4-day schools were scoring lower in some areas, it was not apparent whether those schools had made improvements since switching to the 4-day schedule. It is recommended to replicate the study utilizing the same instruments of measurement, however, compare the performance of the 4-day

schools 2 years before the change of schedule to the 2 years after implementation. The current study only examined one year of performance data in 4-day schools to 5-day schools, and it is recommended that three years of performance data be utilized in a future study to determine if the longevity of the schedule has an impact on school performance.

One aspect that was not considered in the current study is the cost savings 4-day schools are realizing through the change in schedule. Most school districts deciding to change to a 4-day school week have financial motivations, and further research needs to be conducted to determine if the shortened school week is obtaining the financial results the districts sought. One possible future study could replicate the current study, however, include per-pupil expenditures of the 4-day schools compared to the per-pupil expenditures of the 5-day schools to determine if 4-day schools were obtaining similar results in student performance at smaller costs. Another possible future study should include research on the cost savings of the 4-day school week and what districts are doing with the savings. In many states, funding is dependent on student enrollment and attendance rates. Some of the previous research indicated an increase in student attendance rates after the change to a 4-day school week. If there is a potential for state aid to increase due to increased student attendance, a future study should be conducted on student attendance rates and additional funding received to determine if the 4-day school week could potentially provide a district additional funds in addition to cost savings.

Many school districts that have made the change to the 4-day school week claim the schedule has a positive impact on teacher retention. A future study could explore the potential impact the 4-day school week has on employment factors important to the

educational community. Some smaller school districts have trouble recruiting highly qualified candidates for classroom openings, and research should be conducted to determine if the shortened workweek would entice more qualified candidates to accept positions in a 4-day school. Often, smaller school districts that are utilizing the 4-day school week have lower teacher salaries than larger school districts; therefore, it is necessary to study whether a teacher would choose a school utilizing the 4-day schedule over a school paying higher salaries. Another study could investigate the impact the 4-day schedule has on teacher retention rates, including whether the schedule helps to entice educators to stay in the profession longer rather than retire.

One thing that is apparent regarding the 4-day school week is that once a school district transitions to the schedule, very few districts revert to the traditional 5-day schedule. Another possible future study could include interviews of administrators, teachers, students, parents, and the communities surrounding 4-day schools. It is essential to determine the other potential impacts the 4-day schedule may have on a school and community that are not measurable by performance indicators.

Concluding remarks. Examined in this study was the relationship between a school week and school performance, specifically academic achievement, subgroup achievement, college and career readiness, attendance rates, and graduation rates between Missouri high schools with a 4-day school week and matched Missouri high schools with a 5-day school week. While the findings of the study indicated significantly lower academic achievement and subgroup achievement for schools with a 4-day school week, the study showed no significant differences in college and career readiness, attendance rates, or graduation rates between the two schedules. As school districts across the nation

continue to face cuts to budgets and seek alternative options for saving money, the 4-day school week could be a worthwhile consideration. Schools need to be aware of the potential impact the 4-day school week may have on academic performance and subgroup performance and make decisions based on the potential downfalls. Schools must determine what is best for all students and determine if the benefits of the 4-day schedule outweigh the risks to school performance.

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Appendices

Appendix A: Demographics for Matched 4-Day and 5-day Schools

Table A1

Demographics for 4-Day Schools

School	Enrollment[a]	FRL[b]	White[b]	IEP[b]	Location[c]	District Configuration[b]
Pair 1	113	39.0%	98.2%	9.5%	Rural: Distant	Elementary – 1 High School – 1
Pair 2	60	41.4%	83.9%	9.2%	Rural: Remote	Elementary – 1 High School – 1
Pair 3	168	32.1%	94.0%	10.7%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 4	386	38.1%	92.5%	6.2%	Rural: Distant	Elementary – 2 Middle School – 1 High School – 1
Pair 5	102	45.6%	96.6%	6.8%	Rural: Distant	Elementary – 1 High School – 1
Pair 6	317	44.0%	95.3%	10.7%	Rural: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 7	307	24.2%	94.1%	11.7%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 8	47	*	94.6%	*	Rural: Distant	Elementary – 1 High School – 1
Pair 9	107	58.7%	97.2%	12.2%	Rural: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 10	83	46.3%	94.4%	4.8%	Rural: Distant	Elementary – 1 High School – 1

School	Enrollment[a]	FRL[b]	White[b]	IEP[b]	Location[c]	District Configuration[b]
Pair 11	134	56.9%	90.2%	8.8%	Rural: Distant	Elementary – 1 High School – 1
Pair 12	175	57.9%	96.9%	14.1%	Rural: Distant	Elementary – 1 High School – 1
Pair 13	203	44.6%	97.0%	8.9%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 14	230	48.7%	99.1%	8.3%	Rural: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 15	95	47.2%	95.2%	11.5%	Rural: Distant	Elementary – 1 High School – 1
Pair 16	378	44.6%	92.3%	9.0%	Rural: Fringe	Elementary – 2 Middle School – 1 High School – 1
Pair 17	429	54.3%	84.9%	15.4%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 18	198	58.7%	96.9%	16.1%	Rural: Distant	Elementary – 1 High School – 1
Pair 19	106	79.6%	98.6%	17.9%	Rural: Distant	Elementary – 1 High School – 1
Pair 20	69	60%	93.9%	21.7%	Rural: Distant	Elementary – 1 High School – 1

Note. FRL = Free and Reduced Lunch, IEP = Individualized Education Plan. [a]Adapted from *Building Enrollment 1991-2017*, by MoDESE, 2018c. Retrieved from https://apps.dese.mo.gov/MCDS/home.aspx. [b]Adapted from *Building Demographic Data 2006-2017*, by MoDESE, 2018b. Retrieved from https://apps.dese.mo.gov/MCDS/home.aspx. [c]Adapted from *Rural Education in America*, by National Center for Education Statistics, 2006. Retrieved from https://nces.ed.gov/surveys/ruraled/definitions.asp

Table A2

Demographics for Matched 5-day Schools

School	Enrollment[a]	FRL[b]	White[b]	IEP[b]	Location[c]	District Configuration[b]
Pair 1	114	39.9%	95.3%	9.9%	Rural: Remote	Elementary – 1 High School – 1
Pair 2	60	39.8%	100%	9.2%	Rural: Distant	Elementary – 1 High School – 1
Pair 3	171	25.7%	95.3%	12.3%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 4	375	39.0%	90.7%	9.6%	Town: Remote	Elementary – 2 Middle School – 1 High School – 1
Pair 5	113	49.7%	97.0%	8.3%	Rural: Remote	Elementary – 1 High School – 1
Pair 6	323	43.2%	95%	13.0%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 7	315	34.9%	97.5%	9.2%	Rural: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 8	45	*	97.3%	27.4%	Rural: Remote	Elementary – 1 High School – 1
Pair 9	111	61.9%	98.7%	12.0%	Rural: Distant	Elementary – 1 High School – 1
Pair 10	85	44.1%	97.6%	8.9%	Rural: Distant	Elementary – 1 High School – 1
Pair 11	130	60.3%	94.4%	12.8%	Rural: Distant	Elementary – 1 High School – 1

School	Enrollment[a]	FRL[b]	White[b]	IEP[b]	Location[c]	District Configuration[b]
Pair 12	163	57.2%	96.2%	12.5%	Rural: Remote	Elementary – 1 High School – 1
Pair 13	200	46%	98%	9.5%	Rural: Distant	Elementary – 1 Middle School – 1 High School – 1
Pair 14	223	48.7%	96.4%	11.2%	Rural: Remote	Elementary – 2 Middle School – 1 High School – 1
Pair 15	91	46.9%	93.9%	9.2%	Rural: Distant	Elementary – 1 High School – 1
Pair 16	400	45.8%	93.0%	10.3%	Town: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 17	413	57.7%	96.1%	14.3%	Rural: Remote	Elementary – 1 Middle School – 1 High School – 1
Pair 18	195	59.3%	96.4%	11.4%	Rural: Fringe	Elementary – 1 High School – 1
Pair 19	115	70.8%	98.9%	12.4%	Rural: Remote	Elementary – 1 High School – 1
Pair 20	70	63.7%	94.9%	22.2%	Rural: Remote	Elementary – 1 High School – 1

Note. FRL = Free and Reduced Lunch, IEP = Individualized Education Plan. [a]Adapted from *Building Enrollment 1991-2017*, by MoDESE, 2018c. Retrieved from https://apps.dese.mo.gov/MCDS/home.aspx. [b]Adapted from *Building Demographic Data 2006-2017*, by MoDESE, 2018b. Retrieved from https://apps.dese.mo.gov/MCDS/home.aspx. [c]Adapted from *Rural Education in America*, by National Center for Education Statistics, 2006. Retrieved from https://nces.ed.gov/surveys/ruraled/definitions.asp

Appendix B: IRB Approval

BAKER UNIVERSITY

Baker University Institutional Review Board

March 11th, 2019

Dear Heidi Dailey and Susan Rogers,

The Baker University IRB has reviewed your project application and approved this project under Exempt Status Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.

Please inform this Committee or myself when this project is terminated or completed. As noted above, you must also provide IRB with an annual status report and receive approval for maintaining your status. If you have any questions, please contact me at npoell@bakeru.edu or 785.594.4582.

Sincerely,

Nathan Poell, MA
Chair, Baker University IRB

Baker University IRB Committee
Scott Crenshaw
Erin Morris, PhD
Jamin Perry, PhD
Susan Rogers, PhD