Evaluating the Impact of Block Scheduling Mathematics at the Palmerton Area Junior High School

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Abstract

This study evaluates the effectiveness of block scheduling in mathematics at Palmerton Area Junior High School (PJHS). Implemented in 2018-2019 to address poor student performance, the modified Block Schedule provides students with 90 minutes of daily mathematics instruction. Despite this significant change, no formal evaluation has been conducted until now.

The study aims to answer the following questions: How did the Block Schedule affect student grades during marking periods and at the end of the year? Did it influence the number of students scoring Advanced or Proficient on the Mathematics PSSA? How did math grades compare to other subjects taught traditionally? What was the impact on student discipline and attendance?

Data from PJHS's student information system, including grades, PSSA scores, attendance, and discipline records, were analyzed. The comparison covers three years of the Traditional Schedule and four years of the Block Schedule, using statistical methods to evaluate the data.

Results indicated improvements in mathematics achievement under the Block Schedule, with higher marking period and year-end grades, and an increased number of students scoring Advanced or Proficient on the Mathematics PSSA. However, no significant changes were observed in discipline referrals or attendance rates.

The study provides insights into the academic benefits of block scheduling in mathematics and offers recommendations for further research.

CHAPTER I

The purpose of this study is to evaluate the effectiveness of block scheduling mathematics at the Palmerton Area Junior High School (PJHS).

In response to poor performance in mathematics at the junior high level, the Palmerton Area Junior High School (PJHS) implemented a modified Block Schedule in the 2018-2019 school year. Since then, students in grades 7 and 8 have received 90 minutes of mathematics instruction per day for the full length of the school year. PJHS has recently completed the fourth year using this schedule, and as of this proposal, there has been no formal evaluation of its overall effectiveness.

Background

In my role as the Director of Curriculum, Instruction, and Technology, I played a significant role in the development and implementation of this plan. The planning process required a team of stakeholders to assist in its development, all of whom have a vested interest in the results. The team had planned to review the data to measure the implementation's effectiveness, but COVID-19 and administrative restructuring created a disconnect, and the evaluation has yet to be completed. Although curriculum and instruction no longer fall under my jurisdiction, I still work closely with that department and believe that evaluating the schedule's effectiveness is the responsible course of action for all the stakeholders involved. The purpose of this study is to evaluate the impact of block scheduling mathematics at the PJHS.

The research method used will be comparative using quantitative data. This study will compare student performance data from the past seven years, the last three years that PJHS used a Traditional Schedule, and the first four years using the modified Block

Schedule. The academic data used will include marking period and year-end grades, in addition to the percentage of students who scored Advanced or Proficient on the Mathematics PSSA. Nonacademic data will also be compared and that will be comprised of student discipline and absence information.

Capstone Research Questions

1. How did the Block Schedule affect student marking period and year end grades?
2. How did the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How did the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?
4. How did the Block Schedule affect student discipline and attendance?

Data Collection

Raw data will be gathered from the PJHS student information system (SIS). PJHS's Block Schedule differs from the typical block in that students receive instruction for the entire year rather than a semester. The data collected for use in this study will include all four quarters as well as the final grade. (Q1, Q2, Q3, Q4 and Y1). The data will be sorted and categorized by academic and nonacademic indicators as well as the grading period and school year.

Data Analysis

The data analysis will compare student achievement data and other performance indicators from the first four years of using the modified Block Schedule against the last three years of using the Traditional Schedule. The data will be analyzed to determine if there are any significant changes as a result of the implementation of the modified Block Schedule.

Academic Data Analysis

The academic data will be sorted and categorized by grading period and year. The analysis will compare each grading period (Q1, Q2, Q3, Q4 and Y1), across the seven-year span, to determine if there are any significant changes in number of student's earning failing or high achieving grades. In addition, mathematics data from the four years using the modified Block Schedule will also be compared to science and social studies data, which were taught using a Traditional Schedule, to determine if the increases in instructional minutes resulted in improved student performance.

Seven years of Mathematics PSSA data will also be compared to identify if there are any significant changes in the number of students scoring Advanced and Proficient as a result of the schedule change.

Nonacademic Data Analysis

Attendance and student discipline data will also be compared, across the seven-year time frame, to determine if the modified Block Schedule can be attributed to any changes in those areas.

Expected Outcomes

Proponents of block scheduling often highlight its advantages, attributing increased student achievement, decreased discipline referrals, and improved attendance to the adoption of this schedule. As no formal evaluation of its overall effectiveness at the PJHS has been conducted, I can only rely on informal observations to predict the outcomes of the study. I anticipate the results will show an increase in student achievement in mathematics during the years associated with the Block Schedule compared to those on a Traditional Schedule. However, I do not expect any significant difference in discipline referrals or student attendance.

Fiscal Implications

The fiscal implications associated with implementing a Block Schedule are substantial. When considering the move to a Block Schedule, one of the largest hurdles for our school board was the costs associated with it. The change required the hiring of additional teaching staff, classroom space, and curriculum materials, in addition to professional development directed at preparing staff for teaching in the block. The implementation was estimated to come at an annual cost of approximately three hundred thousand dollars. To date, the total cost is in excess of 1.5 million dollars, further demonstrating the need for a formal evaluation of its overall effectiveness.

Summary

Due to unsatisfactory performance in mathematics in grades seven and eight, the school implemented a modified Block Schedule in 2018-2019. This provided students with an additional fifty minutes of mathematics instruction per day for the entirety of the school year. It has been four years since the launch of implementation, and thus far, there has been no formal evaluation of its impact. This research will utilize a comparative approach using quantitative data, comparing the last four years of the modified Block Schedule with the preceding three years of a Traditional Schedule. Academic data, including marking period and year-end grades, as well as the percentage of students achieving Advanced or Proficient in Mathematics PSSA will be examined. Nonacademic data, specifically student discipline and attendance information, will also be analyzed.

The goal of the study is to measure the effectiveness of the block scheduling implementation for mathematics at Palmerton Area Junior High School.

CHAPTER II

Literature Review

Introduction

As a result of poor performance in mathematics at the junior high level, the Palmerton Area Junior High School (PJHS) implemented a modified block schedule in the 2018-2019 school year. As part of this new scheduling approach, students in these grades were provided with ninety minutes of daily mathematics instruction throughout the entire school year. This change marked a significant departure from the Traditional Schedule previously in place at the school in which students received only forty minutes of mathematic instruction per day.

PJHS has recently completed the fourth year of implementing the modified Block Schedule for mathematics instruction, and despite the passage of time and the considerable investment in this new approach, no formal assessment has been conducted to determine its overall effectiveness. The purpose of this study is to comprehensively evaluate the impact and outcomes of block scheduling mathematics instruction at the PJHS.

This review of the literature begins with a brief history of schedule designs in the United States, followed by the most commonly used scheduling models and the leading theories on their effectiveness. It also includes what current research shows to be the advantages and disadvantages of each, in addition to their impact on student achievement, discipline, and attendance.

History of Scheduling

In the early 19th century, educators of varying backgrounds and with minimal or even no formal academic training undertook the challenging task of imparting knowledge to students. Educators provided instruction in any subject, at any moment, to students of all levels (Schroth, n.d.). This educational frontier, however, lacked the structured rigor we commonly associate with contemporary schooling. Formal schedules were noticeably absent from the field of education, which led to variability in the way instruction was delivered and introducing a degree of inconsistency into the teaching process. It was during this period of academic inconsistency that a pressing need arose in the field of education. High school principals began to voice their concerns about the lack of standardized prerequisites for college admission. This call for uniformity in college entrance requirements gave birth to what has since become widely recognized as the "Committee of Ten" (Kliebard, 2004). The Committee of Ten, also known as the Committee on Secondary School Studies, was an educational committee convened by National Education Association, with the primary purpose to examine and reform the secondary education system, specifically the high school curriculum.

In 1892, the Committee of Ten was officially convened and tasked with evaluating the curriculum in American high schools. Their mandate was significant, as it carried the responsibility of shaping the future of American education (National Education Association of the United States. Committee of Ten on Secondary School Studies, 1894).

In 1893, the committee published an innovative report, presenting an outline for the subjects that should comprise the high school curriculum as well as their sequence length (Adrian, 2009). This report “determined the course of American secondary education for a generation following its publication" (Butts & Cremin, 1953).

By the end of the 19th century, as efforts were being made to standardize education, the Carnegie Unit was introduced to standardize the awarding of academic credit and to establish a consistent measure for course completion. It was developed in 1906 by the Carnegie Foundation for the Advancement of Teaching and is the basis of the Traditional Schedule used by many schools today (Williams, 2011).

The Carnegie Unit is the measure of time a student must study a subject in order to receive one “unit” of high school credit. It operates on the principle that a student must dedicate a specific amount of time to studying a particular subject to earn a "unit" of high school credit. The Carnegie Unit is equal to 120 hours of study (Carnegie Foundation, 2014).

The traditional school schedule, which most students and educators are familiar with, finds its origins closely connected with the Carnegie Unit. In the Traditional Schedule, a typical class period generally spans 40 to 50 minutes. The reason for this is so that students can attain the required 120 hours needed within a twenty-six-week school year. In essence, the very length of each class period is strategically designed to ensure students reach the required hours of study needed to earn a Carnegie Unit (Carnegie Foundation, 2014).

During the late 1960s and early 1970s, the individualized instruction movement gained momentum, leading educators to look for ways to provide students with customized learning experiences (Berg & Others, 1970). As a result, a notable increase in the adoption of a new flexible modular schedule emerged.

Flexible modular scheduling, often referred to as Flex-Mod, represents a scheduling methodology that divides the school day into classes of varying length. With this model, the school day is broken down into many 10-20 minutes modules or "Mods." Classes can then convene for one or more modules to accommodate the students' and/or courses' time requirements (Canady & Rettig, 1995).

This scheduling approach allows students to access diverse modes of instruction, offering a range of time patterns, period lengths, and meeting frequencies within the school curriculum for both students and teachers (Valencia, 1969). At its peak, an estimated 15% of American high schools were implementing this approach (Canady & Rettig, 1995).

Nevertheless, since the 1970s, the utilization of Flexible-Modular scheduling has experienced a decline, primarily attributed to concerns about discipline that arose from the increased unscheduled and unsupervised time afforded to students throughout the day (Hackmann, 2004). In addition, an article titled "FlexMod scheduling redux" noted that some believe alternative scheduling methods, such as block scheduling, have also contributed to the declining popularity of Flex-Mod scheduling (Murray, 2008).

By the late 80's and into the early 90's many schools began to re-examine their scheduling practice. The primary goal was to move away from the conventional "lock-step, daily, single-period schedule" that had long been the norm (Canady & Rettig, 1995). According to Canady and Rettig (1995), scheduling emerged as a critical factor in the broader efforts being made to restructure American schools. This shift subsequently led to an increase in the popularity of block scheduling.

Throughout the 1990s, the Block Schedule was one of only a handful of designs in the landscape of school scheduling. In fact, according to Canady and Rettig (1995), during this period, it stood as one of the few scheduling designs that were actively being implemented or even considered for implementation in American schools.

Scheduling Models

In 1994, the National Education Commission on Time and Learning released a report which outlined five key obstacles defining the time-related challenges confronting American schools. According to the report, these issues are considered "insurmountable barriers" to efforts directed at enhancing learning:

- The fixed clock and calendar, seen as a fundamental design flaw, needs reevaluation and change.
- Academic time has been diverted to accommodate numerous nonacademic activities.
- Today's school schedules must adapt to the significant societal changes that have transformed American life outside the classroom.
- Educators often lack the necessary time to perform their duties effectively.
- Achieving world-class standards demands additional time for nearly all students.

(National Education Commission on Time and Learning, 1994)

The report highlights that efforts to improve schools have faced considerable challenges, largely attributed to the inherent design flaw associated with a fixed clock and calendar. For many, the Traditional Schedule embodies this flaw. During this period, schools started re-examining their scheduling practices with the goal of departing from the Traditional Schedule. The report suggests that Block scheduling, which provides students with additional time to explore more complex subjects, is one approach to address this perceived design flaw that has been hampering both students and teachers (Underwood, 2014).

Traditional Schedule

The Traditional Schedule, which can be traced back to the early 20th century, continues to be the predominant schedule design used in American secondary schools. (Canady & Rettig, 1995). The Traditional Schedule's popularity grew out of the apparent need to standardize education. The need for standardization coupled with the challenge of efficiently educating a large number of students led to the design currently used by many schools.

The application of the scientific management theory and the development of the Carnegie Unit are thought to have been the motivation for the development of the traditional 7-period schedule (Adrian, 2009). Despite its popularity, the Traditional Schedule is often criticized for being guided by time rather than the needs of the students (DeMarrais & LeCompte, 1999). Remarkably, this schedule design has remained largely unchanged since its inception.

Below are examples of two common variations of the Traditional Schedule.

Standard Traditional Schedule

The Standard Traditional Schedule is a long-standing model commonly used in American secondary schools. This design typically features six, seven, or eight classes each day, with each class period ranging from forty to sixty minutes (Canady & Rettig, 1995). Under this schedule, students attend each of their classes daily, following the same sequence and spending the same amount of time in each class throughout the entire school year. This structure aims to provide a balanced and comprehensive education by exposing students to a variety of subjects on a daily basis.

According to data from the National Center for Education Statistics, approximately 63.3% of public schools in Pennsylvania adhere to a Traditional schedule (National Center for Education Statistics, n.d.). This statistic underscores the continued prevalence and acceptance of this scheduling format within the American education system.

Table 1 illustrates an example of a Standard Traditional Schedule; it offers a clear visual representation of how students' days are organized in this widely adopted format.

Table 1

Sample Traditional Seven-Period Schedule

Period	Monday	Tuesday	Wednesday	Thursday	Friday
1	Math	Math	Math	Math	Math
2	English	English	English	English	English
3	Art	Art	Art	Art	Art
4	Science	Science	Science	Science	Science
5	Music	Music	Music	Music	Music
6	History	History	History	History	History
7	Computers	Computers	Computers	Computers	Computers

Rotating Traditional Schedule

In addition to the Standard Traditional Schedule, another commonly adopted variation is the Rotating Traditional Schedule, also known as the Slide Schedule (Canady & Rettig, 1995). This schedule closely resembles the Standard Traditional Schedule in that students attend all their classes daily, spending the same amount of time on each subject throughout the school year. However, the distinction lies in the daily sequence, which rotates or "slides."

For example, if a particular course is scheduled for the first period on Monday, it will shift to the second period on Tuesday, and then to the third period on Wednesday, continuing to rotate through a 7-day cycle. This rotation provides students with a schedule where the order of their classes change regularly, potentially offering benefits such as minimizing the impact of early morning or late afternoon classes on their overall learning experience.

Table 2 offers an example of a Rotating Traditional Schedule on a seven-day cycle. This illustrates how this schedule operates and further highlights its distinctive features.

Table 2

Sample Rotating Traditional Seven-Day Schedule

Period	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Math	Tech ed.	History	Music	Science	Art	English
2	English	Math	Tech ed.	History	Music	Science	Art
3	Art	English	Math	Tech ed.	History	Music	Science
4	Science	Art	English	Math	Tech ed.	History	Music
5	Music	Science	Art	English	Math	Tech ed.	History
6	History	Music	Science	Art	English	Math	Tech ed.
7	Tech ed.	History	Music	Science	Art	English	Math

Block Schedule

The Block Schedule emerged as a prominent schedule design in American high schools during the 1990s. Since then, it has gained substantial popularity. As reported by the Texas Education Agency in 1995, approximately 40% of American high schools had adopted some form of Block Scheduling (Byers, 2011). This adoption rate underscores the appeal and potential benefits of this scheduling approach for both educators and students alike.

Since its inception, Block Scheduling has continued to maintain its popularity in American secondary education. Approximately 30% of the nation's secondary schools still utilize some form of Block Scheduling, indicating its sustained relevance and widespread usage (Rettig & Canady, 1999). Notably, as of 2008, there were a remarkable 52 variations of Block Scheduling in use across secondary schools. Amid this diversity, the 4x4 Block and Alternating Block models have emerged as the two most common designs, showcasing their effectiveness and adaptability in meeting the evolving needs of modern education (Hackmann, 2004).

4x4 Block

In a 4x4 Block Schedule, students are enrolled in four classes per semester, amounting to a total of eight classes over the course of a school year. This format allows students to concentrate more on each subject, as they have longer class periods ranging from 80 to 110 minutes. The extended class periods in a 4x4 Block Schedule provide students and teachers with the opportunity to spend more time on each subject, engage in hands-on activities or labs, and explore complicated subjects in greater depth. This format is valued for its potential to promote more in-depth learning experiences.

Table 3 offers an example of a 4x4 Block Schedule, illustrating how students' semesters are structured under this model. It provides a visual representation of the way subjects are sequenced.

Table 3

Sample 4x4 Block Schedule

Block	Monday	Tuesday	Wednesday	Thursday	Friday
			Semester 1		
1	Math	Math	Math	Math	Math
2	English	English	English	English	English
3	Art	Art	Art	Art	Art
4	Science	Science	Science	Science	Science
			Semester 2		
1	Music	Music	Music	Music	Music
2	History	History	History	History	History
3	Tech ed.	Tech ed.	Tech ed.	Tech ed.	Tech ed.
4	PE/Health	PE/Health	PE/Health	PE/Health	PE/Health

Alternating Block Schedule

In the Alternating Block design, students follow a scheduling pattern where they are enrolled in a total of eight courses that span a 2-day cycle. This means that their class schedule alternates between two different day schedules, typically referred to as Day A and Day B.

On Day A, students attend four of their scheduled classes, while the other four classes are scheduled for Day B (Underwood, 2014).

Table 4 offers an example of an Alternating Block Schedule, demonstrating how students' classes are arranged across the two-day cycle. This visual representation illustrates how subjects are distributed and rotated.

Table 4

Sample Alternating Block Schedule

Block	Day A	Day B
1	Math	Music
2	English	History
3	Art	Tech ed.
4	Science	PE/Health

Hybrid Block

Differing from the previously discussed variations of the Block Schedule, the Hybrid Block, also commonly referred to as the 'Modified Block,' combines elements of both Traditional and Block Scheduling. In a Traditional Schedule, students attend multiple classes every day, typically between 40-60 minutes per class. Conversely, Block Scheduling typically involves longer class periods, lasting 80 minutes or more, with students taking fewer classes each day but for a longer duration. In a Modified or Hybrid Block, students will attend classes of various lengths, representative of both a traditional class period and a block period.

Schools commonly adapt a Block Schedule in two fundamental ways: (1) a weekly Modified Block, wherein four days a week follow the Alternating Block format, while the fifth day adheres to the Traditional Standard period, or (2) a daily blend of block and standard traditional periods (Unlocking Time, 2018a).

Table 5 illustrates examples of a Modified A/B Block with a standard period day. Days 1/4 and 2/5 are representative of a typical alternating A/B Block Schedule, while Day 3 is representative of a Standard Traditional Schedule.

Table 5

Modified A/B Block with Standard Period Day

Block/Period	Day 1	Day 2	Day 3	Day 4	Day 5
1 2	Math	Music	Math English	Math	Music
3 4	English	History	Art Science	English	History
5 6	Art	Elective	Music History	Art	Elective
7 8	Science	Tech ed.	Elective Tech ed.	Science	Tech ed.

Table 6 is representative of a Hybrid Block schedule featuring standard periods modified with two blocks. In this schedule, students start their day with a block of mathematics, then move to more traditional periods for periods 3 through 6, and then conclude their day with a block of English.

Table 6

Standard Periods Modified with Block

Period	Monday	Tuesday	Wednesday	Thursday	Friday
1 2	Math	Math	Math	Math	Math
3	Art	Art	Art	Art	Art
4	Science	Science	Science	Science	Science
5	History	History	History	History	History
6	PE	PE	PE	PE	PE
7 8	English	English	English	English	English

Traditional Schedule vs Block Schedule

In recent years, educational discussions have increasingly centered on the effectiveness of scheduling models used in schools. There are both advantages and disadvantages to the use of Traditional and Block Schedules. However, most of the recent literature focusing on scheduling practice seems to advocate for the use of Block Scheduling. As expected, many of the advantages and disadvantages for each design contradict those of the other. Conversely, it is worth noting that contradictory statements can be seen within a single scheduling design model as well. This section will detail both the advantages and disadvantages of the most commonly used models of the traditional and Block Scheduling designs.

Standard Traditional Schedule

Much of the recent literature on school schedule designs seems to be concentrated on promoting a shift from the Standard Traditional Schedule to some form of Block Scheduling. Despite the rise in popularity of Block Scheduling in the 90s, American high schools still predominantly use the Traditional Schedule (Canady & Rettig, 1995).

As with any schedule design, there are both advantages and disadvantages associated with its use. Some of the advantages of the Standard Traditional Schedule include familiarity with it; most people have at least some experience with a schedule consisting of six, seven, or eight classes daily. Another frequently cited advantage is the reduced costs associated with staffing when using the Standard Traditional Schedule, especially when compared to 4x4 or Alternating Block design (Williams, 2011).

In addition, proponents believe students on this schedule have increased student/teacher contact, greater opportunity to make up missed assignments, and increased instructional minutes (Spence, 2020). According to Ford (2015), operating on a 7-period day provides students with nine-thousand minutes of instructional time, while schools on the 4x4 block only have eight-thousand one-hundred minutes of instruction.

Furthermore, Cromwell (1997) states that the Traditional Schedule offers students the opportunity to acquire experience in time management, balancing schedules, transitioning from class to class, which are valuable skills in life after high school.

While the Standard Traditional Schedule is the most widely used model in American schools, it is not without criticism. One of the primary points cited for opposing its use lies in the schedule's historical origins and the fundamental motivation for its development. Critics contend that the Traditional Schedule was conceived to serve the need for efficiency rather than considering the educational needs of students (Adrian, 2009).

The scientific management theory, which was popular at the time, emphasized the efficient use of time and resources in an effort to increase productivity (DeMarrais & LeCompte, 1999). This is believed to have had a major influence on the Traditional Schedule as we know it.

The consequence of this approach is that students find themselves in a rigid daily routine. Their schedules are carefully planned down to the minute, leaving little room for flexibility to accommodate the diverse needs of individual students. This one-size-fits-all approach fails to acknowledge that some students require more time and support, while others may perform well at a faster pace.

Other frequently referenced faults of the Traditional Schedule include shorter class periods, a faster instructional pace, more classroom transitions, and increased costs associated with instructional materials (Williamson, 2010).

Shorter periods create a time crunch for instructors and make completing labs and/or long projects a challenge for students. The increase in class changes has been attributed to an increase in discipline referrals. There are often increased costs associated with instructional materials as more materials are needed, and there are fewer opportunities to share textbooks, calculators, etc.

Rotating Traditional Schedule

In addition to the aforementioned advantages of the Standard Traditional Schedule, the Rotating Traditional Schedule has been shown to offer additional benefits. In the rotating schedule, the student's course sequence rotates, allowing those students who perform better at different times of the day to have each course during those preferred windows at some point during the cycle.

For instance, some students may perform better in math during the afternoon. In a Standard Traditional Schedule, students who have math in the morning are locked into having math class at that time for the entirety of the school year, never having the opportunity to have that class during their more productive hours. A student on a rotating schedule will have math in the morning on Days 1, 2, and 3 and will then have it in the afternoon on the remaining days of the cycle. This arrangement allows them the opportunity to attend class during their higher achieving time.

Furthermore, students on a rotating schedule are not repeatedly impacted by late starts, early dismissals, athletics, etc. (Unlocking Time, 2018b).

Much like the advantages of the Rotating Traditional Schedule, the disadvantages are also similar to those associated with the standard version of the design. However, there are additional disadvantages related directly to the rotation of the courses. Like the Standard Traditional Schedule, students on a rotating schedule attend each class daily for the same length of time, with the exception that the daily course sequence slides through a 7-day cycle. This 7-day cycle is an increase from the 5-day Monday through Friday cycle common to the standard schedule. Critics believe that the additional two days in the cycle create a hardship for students and parents, as they now must track which day of the cycle students are on in order to know the correct daily course sequence. This complexity makes it more challenging, disrupting the establishment of a regular routine and potentially hindering students' ability to manage their time effectively.

4x4 Block Schedule

As an alternative to a Traditional Schedule, many districts have moved to the Block Schedule to help alleviate some of the shortcomings often associated with it. The most widely used form of Block Scheduling is the 4x4 Block, where students attend four 90-minute classes each day and complete courses in a single semester rather than a full school year (Comer, 2012).

Proponents of Block Scheduling cite a variety of benefits in support of its use. Unlocking Time (2018c), a national project aimed at helping K12 school leaders implement innovative time strategies, highlights several advantages of the 4x4 Block Schedule. Advantages include increased instructional time, reduced preparation demands for both students and teachers, stronger connections between staff and students, and fewer disruptions associated with class changes.

The prolonged instructional periods on the Block Schedule offer greater flexibility in teaching practices, as noted by Canady and Rettig. Moreover, unlike Traditional Schedules, the Block Schedule allows students extended class periods of up to 90 minutes, providing them with the additional time necessary to complete experiments, labs, or more time-intensive projects.

As with all the schedule designs included in this literature review, the 4x4 Block also has its limitations. On the 4x4 Block, students take four classes every day for the full length of the semester. This creates a challenge for students who complete classwork that requires end-of-course exams offered only at the end of the year. For example, AP course exams are traditionally given in May; students scheduled for these courses in the first semester will be tested on content long after the conclusion of the course. These students will have a semester-long hiatus between the course close and the exams (Canady & Rettig, 1995).

Furthermore, students on the 4x4 Block could also receive uneven schedules, resulting in an overload of challenging courses in either semester. It can also lead to potential gaps in content, allowing some students to go an entire year without taking coursework in a content area. Table 7 provides an example of the potential gap.

Table 7

Example: Math Gap

School Year	Semester 1	Semester 2
Year 1	Algebra 1	No Math Course
Year 2	No Math Course	Algebra 1

Alternating Block Schedule

Like the 4x4 Block Schedule, on the Alternating Block, also known as the A/B Block Schedule, students attend four classes per day for up to 90 minutes each. However, on the Alternating Block, students will have a courseload of eight classes, with four per day, taught on alternating days for the full length of the school year (Underwood, 2014). The advantages of this schedule are much like those of the 4x4 block. Nevertheless, there are additional benefits that address some of the limitations often associated with the standard 4x4 Block Schedule. However, with these additional advantages also come some added disadvantages. Much like the Traditional Schedules mentioned above, several of the benefits and limitations associated with both the 4x4 and Alternating Block are contradictory.

In addition to the aforementioned advantages of the 4x4 schedule, the Alternating Block also offers additional benefits targeted directly at addressing the inadequacies of the former. One significant advantage of the Alternating Block is that students are enrolled in courses for the entire length of the year, thus alleviating the potential content gaps associated with its semester-based counterpart. The yearlong enrollment of the Alternating Block also addresses the potential hiatus between the end of Semester 1 courses and the end-of-year exams. In the 4x4 schedule, students may experience a disconnect between the conclusion of Semester 1 courses and the end-of-year exams, but the Alternating Block negates this issue.

Furthermore, enrolling students in eight courses for the entirety of the school year also lessens the potential of receiving an unbalanced schedule. Canady and Rettig (1995) also state that students on an alternate-day schedule have fewer classes, tests, and homework assignments on any one day.

While the Alternating Block Schedule addresses some of the limitations of the 4x4 Block, it does have several drawbacks of its own to consider. Many of the criticisms that are commonly associated with the Traditional Schedule reemerge as concerns for the alternating block.

The Standard Traditional Schedule is often criticized for the high number of students teachers work with. Comparably, teachers in schools utilizing the Alternating Block Schedule find themselves working with similar numbers of students, which only adds to the demands of the high-class sizes many teachers are already faced with. Additionally, students also continue to be responsible for the workload associated with eight courses (Great Schools Partnership, 2013).

Critics also contend that the alternating day cycle disrupts the continuity of education, particularly in subjects like mathematics, instrumental music, and foreign languages (Underwood, 2014).

Impact on Student Achievement

Since the beginning of school in America, teachers and administrators have been investigating ways to improve student achievement. During the early 19th century, education was inconsistent and unreliable. Students attended schools that were often overcrowded and had limited resources (US History Scene, 2024). In response to the need for a uniform way to document and evaluate student achievement, the late 1800s saw the development of the Carnegie Unit, which is the basis of the Standard Traditional Schedule still in use today.

Despite its long history, the Traditional Schedule has remained largely unchanged, drawing criticism for its emphasis on the efficient use of time and not the needs of the students (Adrian, 2009). Opponents of the Traditional Schedule often cite the shorter class periods and faster pace as the primary barriers to student achievement (Williamson, 2010). Alternatives to the Traditional Schedule, like Block Scheduling, have gained in popularity throughout the years in an attempt to address these obstacles and increase student achievement. In fact, many schools cited student achievement as the primary reason they converted from the Traditional Schedule (Childers, 2018).

In 2002, the No Child Left Behind (NCLB) Act was signed into law and focused on accountability. Since then, states have been required to test students annually in both reading and math in grades 3 through 8 and once in high school (Klein, 2015). The results of these standardized tests are used to measure how well schools were progressing toward the goal of the legislation, which was to have all students reach proficiency, as defined by their state, by 2014. The results of these high-stakes tests are reported to the public and also used to hold schools accountable for the quality of the education they provide (Great Schools Partnership, 2014). This, along with findings in reports like the National Commission on Time and Learning’s "Prisoners of Time," has compelled educators to pursue alternative schedules as a means of increasing student achievement.

The National Commission on Time and Learning's report titled "Prisoners of Time," published in 1994, had a considerable influence on school schedules due it its focus on time as a resource. The report highlighted several key concerns related to scheduling, in addition to offering recommendations aimed at improving student achievement.

In the report, the primary recommendation was to increase student learning time. It highlighted that the current 6-hour, 180-day school year was insufficient to meet the needs of students. The results of the report prompted educators to start reevaluating their current scheduling practices. Block Scheduling was an alternative presented in the report due to the longer periods employed with this schedule. The report recognized that longer class periods allow for more in-depth exploration of content and enhance student engagement and achievement by providing extended periods for focused instruction. It also noted that it adds instructional time as a result of the reduced number of transitions between class periods (National Education Commission on Time and Learning, 1994).

Traditional Schedule vs Block Schedule

Throughout this literature review, numerous studies have been cited, comparing the impact of scheduling on measures of student achievement, with the most common comparisons being between Block and Traditional Schedules. However, it should be noted that most of the available studies are directed at either measuring the impact of Block Scheduling on student achievement or determining whether the bell schedule itself has any impact on student achievement. A search for "Traditional Schedule impact on student achievement" was conducted and yielded limited results directly measuring the impact of the Traditional Schedule. Conversely, a similar search for "Block Schedule impact on student achievement" produced a much greater number of results. However, the literature reviewed has presented varying results when it comes to the impact of Block Scheduling on academic achievement.

While many researchers have demonstrated the efficacy of Block Scheduling, there are others whose studies have shown little or no positive impact in measures of student achievement. Overall, the research presents mixed findings on the relationship between Block Scheduling and academic achievement. Arnold (2002) found no significant increase in test scores associated with Block Scheduling. However, Lewis et al. (2005) found that students on a 4x4 Block Scheduling had greater gain scores in reading and mathematics compared to traditional and A/B Block Scheduling. Veal and Schreiber, (1999) found no significant difference in test results for reading and language but did note a statistical difference in mathematics-computation in favor of the Traditional Schedule, suggesting that Block Scheduling may be beneficial for obtaining more credits in mathematics but may not improve achievement and conceptual understanding. Howard (1998), highlights concerns about decreased mathematics achievement associated with Block Scheduling. Overall, the findings suggest that the impact of Block Scheduling on academic achievement may vary depending on the specific scheduling type and subject area.

Impact on Student Discipline

For as long as schools have been in session, student discipline has been an issue for teachers and administrators. From the early days of the one-room classrooms when paddling was a common practice, through to today, teachers and administrators have been searching for ways to improve student discipline. Discipline problems occur in classrooms, often creating a distraction from learning for both the students and their peers. When teachers and administrators are required to address these concerns, it takes additional time away from instruction, ultimately leading to poor academic performance.

One analysis of 160,480 students found that students with one or more discipline referrals are 2.4 times more likely to score below proficiency in math as opposed to their peers with no referrals (Whisman & Hammer, 2014). They also found that as the number of referrals per student increases, as do the odds that they would perform at a level below proficiency.

Advocates for Block Scheduling frequently cite the lower number of transitions and improved teacher-student relationships as advantages of the Block Schedule that result in decreased numbers of discipline referrals.

Traditional Schedule vs Block Schedule

Research related to the impact that scheduling has on student discipline is limited. Very few studies directly address the impact scheduling has on discipline. In reviewing the literature, it seems that in most instances student discipline is included as a component of a larger study investigating the overall effectiveness of the Block Schedule. Like the results regarding student achievement, the data on student discipline is also mixed.

In "Effects of Block Scheduling on Academic Achievement Among High School Students", studies by Carroll (1989) and Matarazzo (1999) are cited, indicating that student satisfaction, as measured by attendance, dropout rate, discipline referrals, and suspensions, increased while on the Block Schedule. They conclude that the Block Schedule positively influences student attitudes toward school, which results in a decreased number of discipline referrals (Gruber & Onwuegbuzie, 2001, as cited in Carroll, 1989; Matarazzo, 1999).

Proponents of Block Scheduling frequently cite a decrease in discipline concerns as one of the advantages of this schedule. Rettig and Canady (1999) state that many case studies have shown discipline referrals to be reduced by as much as 25 to 50 percent. Khazzaka (1998) analyzed the data of six secondary schools that transitioned from a Traditional Schedule to block and found that infractions related to violent behavior decreased by 45.5%, and referrals for class disruption or insubordination dropped by 57%.

However, much like the findings associated with student achievement, the research on student discipline offers varied results. Williams (2011) compared discipline data from two high schools within the same suburban district. One used an A/B Block schedule, while the other followed a Traditional Schedule, from 2005-2010. The findings show that the school employing the A/B schedule consistently had a higher average number of referrals per student, with a 5-year average of 2.23 while the school utilizing the Traditional Schedule averaged only 1.9 referrals per student during that same 5-year period. It's also worth noting that discipline referrals overall decreased for both schools during that time. The school with the Traditional Schedule experienced a greater overall decrease, reducing by 10.9% compared to a 9.9% decrease for the A/B Block Schedule school.

Balsimo (2005) conducted a nine-year longitudinal study that compared the average number of discipline referrals per student, for the last two years on a Traditional Schedule versus the first seven on a block and found no significant difference in the in the average number per student.

Impact on Student Attendance

In the United States, compulsory education laws began to emerge in the 19th century. The first state to enact such a law was Massachusetts in 1852, and by 1918, every state had some form of attendance law (Yeban, 2024). Along with the adoption of these new laws came the responsibility of implementing them. This, coupled with the pressure of increasing student achievement, left administrators with the challenge of identifying ways to increase attendance rates and reduce truancy.

Research has consistently demonstrated the negative impact attendance has on measures of student achievement. Absenteeism is often associated with an increase in at-risk behaviors as well as negative academic and life outcomes; those who are absent for three days a month are missing 15% of their instructional time, leading to poor school performance and increased dropout rates (Maynard et al., 2017).

In addition, many state funding formulas consider attendance when allocating resources to schools. Schools with consistently low attendance rates may receive less funding compared to those with higher attendance rates. Absenteeism not only affects the immediate learning experience of the absent students but also has broader implications for administration to consider. As a result, many schools have taken a closer look at all aspects of the educational experience, including the bell schedule, as a possible means of improving student attendance.

Traditional Schedule vs Block Schedule

Much like the research associated with the impact scheduling has on student discipline, research dedicated solely to its impact on student attendance is also limited. A search for studies associated with Block Scheduling's impact on student attendance yielded very limited results. It appears that, in many cases, student attendance is considered as a factor within a broader examination assessing the overall efficacy of the Block Schedule.

Proponents of Block Scheduling often cite improved attendance as one of its advantages. They contend that reduced transitions, deeper engagement, fewer classes per day, and flexibility in planning all contribute to a more engaging and motivating school environment, which, in turn, encourages students to attend school consistently.

However, a range of studies have explored the impact Block Scheduling has on various outcomes, including attendance rates, and the results appear to be inconclusive.

Most of the literature reviewed found no significant difference in the attendance rates for students on the Traditional Schedule compared to those on the Block Schedule.

A study conducted in 2011 comparing the attendance rates for students under the A/B Block Schedule and students under the Traditional Schedule from 2005 to 2010, found that the attendance rates did not differ significantly (Williams, 2011). In fact, Traditional Schedule students saw an increase from 80.76% to 83.70%, indicating a rise of 2.94%. By contrast, A/B block-scheduled students experienced a decrease from 84.53% to 82.04%, representing a decline of 2.49% over that same time (Williams, 2011).

Another study conducted by Clark (2021) analyzed the mean attendance rates for each of the three schools before block implementation, during block implementation, and post block implementation and found there was no significant statistical difference in attendance rates between students on Block Schedules versus their counterparts on the Traditional Schedule at any of the three schools.

Those studies that did indicate positive outcomes for attendance seem to infer this as a result of increases in other metrics measured, such as school climate, student achievement, or dropout rates. "Block Scheduling: A Catalyst for Change in High Schools," credits characteristics commonly associated with Block Scheduling, such as reduced transitions, increased engagement, fewer classes per day, flexibility in instruction, and personalized learning opportunities, with contributing positively to school climate (Canady & Rettig, 1995). This, in turn, positively influences student attendance.

Deuel (1999) reported that students in Block Scheduling schools had higher grades and fewer absences. However, it is worth noting that the data used were gathered by administering surveys to a sample of teachers and counselors. Thirty-three percent of the teachers and thirty-seven percent of counselors surveyed saw improvements in student attendance.

The current data on Block Scheduling and student attendance presents mixed results. The overall findings of this literature review suggest that additional research is needed to truly determine the impact, if any, the Block Schedule has on student attendance. Many of the variables used to measure the efficacy of Block Scheduling with regard to student attendance are subjective and may be influenced by factors such as the type of Block Schedule, how well the Block Schedule is received by the school community, implementation quality, data interpretations, etc.

Summary

In response to poor mathematics performance at the junior high school level, Palmerton Area Junior High School (PJHS) implemented a modified Block Schedule, offering students in those grades ninety minutes of daily mathematics instruction, a departure from the previous forty-minute periods. This study aims to assess the impact of the schedule change in subsequent years. The literature review covers a brief history of scheduling in the United States, an overview of commonly used scheduling models, and leading theories on their effectiveness. It also investigates the impact of Block Scheduling on measures of student achievement, discipline, and attendance.

From the early 19th century, when education lacked consistency and structure, through to the present day, schools have consistently faced new challenges. Whether it's the call of high school principals voicing concerns about the lack of standardized prerequisites for college admission or the passage of legislation like the No Child Left Behind (NCLB) Act, administrators have been forced to seek ways to make their schools more successful. Oftentimes, they re-examine their scheduling practices as a means of improvement.

The Traditional Schedule, whose roots can be traced back to the Carnegie Unit, is the most popular model used in schools today. Most people have experience with this schedule; students attend anywhere from six to eight classes every day, typically lasting between 40-60 minutes per class. Despite its popularity, it does draw criticism, as critics argue that its purpose is to serve the need for efficiency rather than considering the educational needs of students.

Proponents of the Block Schedule often cite it as an alternative to the Traditional Schedule, asserting that the advantages of the Block Schedule outweigh the shortcomings associated with the traditional model. The longer class periods, typically lasting from 80 to 110 minutes, provide students and teachers with the opportunity to spend more time on each subject, engage in hands-on activities or labs, and explore complicated subjects in greater depth. This approach is believed to increase student focus and minimize the loss of instructional time due to the decrease in transitions needed when compared with the Traditional Schedule.

Since the early days of education, enhancing student achievement has been the goal of educators. Alternative schedules gained popularity throughout its history, with many schools making changes in an effort to improve student achievement. The No Child Left Behind (NCLB) Act in 2002 stressed the need for accountability by mandating annual standardized tests, whose results are used as a measure of student achievement and to assess the school's progress toward the goals of the legislation. This, along with reports such as the National Commission on Time and Learning's "Prisoners of Time" in 1994, influenced the scheduling landscape. The report argued that the standard 6-hour, 180-day school year was insufficient to meet the diverse needs of students, making the recommendation to increase student learning time. The emphasis on the deficiencies of the Traditional Schedule prompted educators to reevaluate their current scheduling practices.

Student discipline has long been a concern for both teachers and administrators, creating challenges that disrupt the classroom environment. Since the early days of one-room classrooms through to the present, educators have searched for effective strategies to address discipline concerns and the loss of instructional time associated with it. Advocates of the Block Schedule contend that advantages like fewer transitions and improved teacher-student relationships result in decreased discipline referrals. However, research studying the impact of scheduling on discipline presents mixed results.

Much like student discipline, student attendance has also posed challenges for school administrators. Students with attendance concerns underperform academically and have a higher likelihood of exhibiting at-risk behaviors. Research consistently shows negative consequences for those students with high rates of absenteeism. In addition, high rates of absenteeism can impact funding as well. Some schools have looked to the schedule to help alleviate these concerns due to potential positive outcomes associated with Block Scheduling. Despite the assertions of advocates that Block Scheduling improves attendance rates, limited research corroborates these claims, and the overall conclusion indicates the need for additional research.

CHAPTER III

Methodology

As a result of poor performance in mathematics at the Palmerton Area Junior High School, the decision was made to implement a modified Block Schedule. The schedule added an additional forty-five minutes of mathematics instruction per day for the full length of the school year for all students. Since the implementation in the 2018-2019 school year there has been no formal evaluation to determine the effectiveness of the schedule on measures of student achievement, discipline, and attendance. A team of stakeholders, consisting of administrators and professional staff, all of whom have a personal stake in the results, had planned to review the data at the conclusion of year three to measure the implementation's efficacy; however, COVID-19 and administrative restructuring created a disconnect, and the evaluation has yet to be completed.

The decision to move forward with the modified Block Schedule at Palmerton Area Junior High School (PJHS) was largely influenced by the success of Palmerton Area Senior High School’s 4x4 Block Schedule. Historically, Palmerton Area Senior High School has scored at or above the state average on the Algebra I Keystone Exam. In the three years preceding Palmerton Area Junior High's Block Schedule implementation, the senior high school scored an average of 12.5% higher than the state average in the number of students reaching Advanced or Proficient. This, in addition to the advantages associated with Block Scheduling commonly believed to improve student achievement, such as increased instructional time, reduced preparation demands for both students and teachers, stronger connections between staff and students, and fewer disruptions associated with class changes, served as the primary drivers for the transition away from the Traditional Schedule.

This Comparative Research study aims to address four key questions concerning the impact of the Block Schedule implementation. First, it aims to understand the effect the Block Schedule has on student achievement, including both marking period and year-end grades. Second, the study seeks to investigate the relationship between the Block Schedule and the performance levels on the Mathematics PSSA. Third, it aims to examine the effect of the Block Schedule on students' mathematics grades in comparison to those courses still taught using a Traditional Schedule. Lastly, the study will explore the influence of the Block Schedule on nonacademic indicators such as student discipline and attendance, aiming to identify any discernible impact on students' discipline and attendance rates.

Purpose

The purpose of this study is to compare student performance data from the past seven years: the last three years when Palmerton Area Junior High School used a Traditional Schedule and the first four years using the modified Block Schedule. The goal is to determine if there are any significant changes evident as a result of the schedule change.

In the four years leading into the implementation of the modified Block Schedule at Palmerton Area Junior High School, the number of students who scored at or above the level needed to be considered proficient on the Mathematics PSSA consistently fell below the state average. During that time, the four-year average for the number of students who scored proficient or above at the Palmerton Area School District was only

27.9%. During that same four-year period, the state average for 7th and 8th grade was 33.9%, placing them, on average, 6% below the state average during that four-year span. Additionally, in 2015, only 17.9% of 7th grade students reached Advanced or Proficient, placing them 15.1% below the state average that year. Students in the 8th grade fared slightly better during that span; however, in 2016, only 25.5% of students reached Advanced or Proficient, placing them 5.7% below the state average.

The following Capstone Research Questions will guide this study:

1. How did the Block Schedule affect student marking period and year end grades?
2. How did the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How did the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?
4. How did the Block Schedule affect student discipline and attendance?

Setting and Participants

This comparative research study was conducted at Palmerton Area Junior High School, the only school of its grade span within the Palmerton Area School District. It consists of two grade levels, 7th and 8th, and is situated in the southernmost part of Carbon County in Northeast Pennsylvania.

The average school enrollment from 2016 through 2022, the years used to conduct the study, was 296 students, with an average of 149 in the 8th grade and 147 in 7th. The students who attend Palmerton Area Junior High School were brought together here for the first time from the district's two elementary buildings to attend 7th grade. Towamensing Elementary, which is similar in size to the junior high school, sent an average of 50 sixth-grade students to the junior high school, while S.S. Palmer, the district's largest elementary, sent an average of 94.

The student demographic data for the school has remained largely unchanged from the start of the study until present; however, it is still worth noting that the data included in this section is taken from the school's most recent Future Ready Index (Pennsylvania Department of Education, 2024). The percentage of enrollment by gender is 53.2% male and 46.8% female. Furthermore, 41.6% of students are classified as economically disadvantaged, and 23.6% qualify for special education. In addition, the school qualifies for Title I services; however, it does not participate in the program. The percentage of enrollment by races is 91% White, 7.5% Hispanic, 0.4% Black, and 1.1% two or more races.

The participants chosen for this study consist of the entire student population of Palmerton Area Junior High School for each of the seven years under consideration. The students included in the first three years, 2016 through 2018, represent the group that participated in 45 minutes of mathematics instruction on the Traditional Schedule, while the students included for the 2019 through 2022 school years represent the group that participated in 90 minutes of Block Scheduling mathematics instruction. All students for each of the years are included to have the largest sample possible.

Research Plan

The goal of this study is to compare student performance data over the past seven years, with a focus on analyzing the impact of a modified Block Schedule at Palmerton Area Junior High School. The transition to the modified Block Schedule was motivated by concerns about the low number of students scoring proficient or above on the Mathematics PSSA, particularly in the three years leading up to the implementation.

The modified Block Schedule, which had been successful at exceeding the state average in the number of Advanced and Proficient students on the Keystone Exams at the senior high school level, was considered as a potential solution. In addition, the review of the literature also identified various advantages associated with the use of Block Scheduling. For instance, Canady and Rettig (1995) cite increased instructional time, decreased preparation requirements for both students and teachers, enhanced relationships between staff and students, and minimized disruptions related to class transitions as advantages that the Block Scheduling offers. Additionally, Lewis (2005) found that students following a 4x4 Block Schedule demonstrated higher gain scores in reading and mathematics in comparison to those under traditional and A/B Block Scheduling formats.

This study aims to determine the effect of implementing the modified Block Schedule at Palmerton Area Junior High School, specifically assessing its impact on student performance. The primary focus is on investigating whether the schedule change has led to noteworthy improvements in academic outcomes, as well as non-academic areas such as attendance and discipline.

Research Methods & Data Collection

This research study aims to investigate and identify if any significant changes in student performance occurred as a result of the shift from a Traditional Schedule to a modified Block Schedule.

The objectives of this study are threefold: first, to compare and analyze student performance data over the past seven years, considering Mathematics PSSA scores, marking period grades, and year-end grades; second, to assess the impact of the modified Block Schedule on annual attendance rates; and third, to evaluate the number of discipline referrals issued each year. The ultimate goal is to comprehensively understand the academic outcomes and potential effects on student behavior resulting from the change in scheduling.

Quantitative methods form the foundation of this study, providing the framework for statistical analyses aimed at quantifying the academic impact of the modified Block Schedule. Specifically, the focus lies on examining Mathematics PSSA scores, marking period grades, year-end grades, as well as attendance and discipline records. This decision is supported by findings from Johnson and Onwuegbuzie (2004), who emphasize the inherent strengths of quantitative methods, particularly in their ability to uncover patterns and trends within large datasets

The selection of quantitative methods for this study is further justified by their effectiveness in analyzing large datasets and identifying significant patterns or trends in student performance. With a dataset spanning seven years and encompassing multiple performance metrics, quantitative analysis offers a systematic approach to assessing the impact of the modified Block Schedule at Palmerton Area Junior High School. Through the application of statistical measures, relationships between the scheduling change and student performance can be clarified, providing invaluable insights into the efficacy of the implementation. Furthermore, quantitative analysis furnishes objective measures and evidence to substantiate the findings.

The data for this study will come from a variety of sources. The raw data associated with student performance in mathematics, as well as science and social studies courses, will be gathered from the Palmerton Area School District's student information system (SIS). Palmerton Area Junior High School's Block Schedule differs from the typical block in that students receive instruction daily for the entire year rather than a semester. Therefore, the data collected for use in this study will include all four quarters as well as the final grade (Q1, Q2, Q3, Q4, and Y1) for all years included. The raw data associated with attendance and discipline will also be collected from the district's SIS, and the PSSA data will be gathered from test administration results downloaded from the DRC Insight website.

Only the raw data will be collected from the student information system and the DRC data files. No identifiable information will be collected or used for the study. The dataset will be stripped of all identifying information so there is no way it can be linked back to the subjects from whom it was collected.

No data was collected prior to receipt of the Institutional Review Board (IRB) approval. The effective date of the initial IRB approval is September 10, 2021, valid through September 9, 2022 (See Appendix A for IRB approval). However, an extension was requested and granted by the IRB to allow the collection window to remain open until September 15. 2024 (see Appendix B for IRB approval extension).

Seven years of student marking period and year-end mathematics grades will be collected. The first three years of data represent the last three years using the Traditional Schedule, and the remaining four represent the first four years using the modified Block Schedule. This data will be used to investigate Research Question number 1 "How did the Block Schedule affect student marking period and year-end grades? " The data analysis will examine if there are any significant changes in the number of student's earning failing or high achieving grades. Table 8 illustrates the collection timeline for student marking period and year-end mathematics grades.

Table 8

Collection Timeline for Student Mathematics Grades

Research Question	Type of Data and Data Sources	Timeline
Questions 1: How did the Block Schedule affect student marking period and year end grades?	Quantitative Data The data will be collected from the district's student information system and placed on the raw academic data collection form for analysis.	November 2023 – February 2024

Additionally, student marking period and year-end Science and Social Studies grades will also be collected for the same seven years period. These courses are still taught using the Traditional Schedule. This data will be used to investigate research question number 3 "How did the Block Schedule affect student's mathematics grades compared to courses still taught using a Traditional Schedule?" The data analysis will explore if the increased instructional minutes resulted in improved student performance. Table 9 illustrates the collection timeline for student marking period and year-end science and social studies grades.

Table 9

Collection Timeline for Student Science and Social Studies Grades

Research Question	Type of Data Sources	Timeline
Question 3: How did the Block Schedule affect student's mathematics grades compared to courses still taught using a Traditional Schedule?	Quantitative Data The data will be collected from the district's student information system and placed on the raw academic data collection form for analysis.	November 2023 – February 2024

The academic data retrieved from the school's student information system (SIS) will be recorded on the Raw Academic Data Collection Form. The data will be sorted and categorized into tables illustrating the number of A's, B's, C's, D's, and F's earned by students in each grading period as shown in Table 10.

The numeric data pulled from the SIS will be converted into letter grades using the Palmerton Area Junior High School's "Numeric Grade Scale", on this grade scale 90-100 corresponds to an A, 80-89 to a B, 70-79 to a C, 60-69 to a D, and 0-59 to an F.

Table 10

Raw Academic Data Collection Form

YEAR:					
Subject: Math					
Grade	Q1	Q2	Q3	Q4	Y1
A (90-100)					
B (80-89)					
C (70-79)					
D (60-69)					
F (0-59)					

To investigate these questions, descriptive statistics (mean) and inferential statistics (t-test) will be used to establish whether there is a statistically significant difference in grades before and after the implementation of the Block Schedule. The data will be categorized into two groups: Group A (Pre-Block Schedule), covering the three years prior to the block implementation (Years 1-3), and Group B (Post-Block Schedule), covering the years following the implementation (Years 4-7).

The mean marking period and year-end grades will be calculated for both Group A and Group B to gain an overview of the central tendency of grades before and after the schedule change. Additionally, a grade distribution analysis will be employed to analyze the distribution of letter grades (e.g., A, B, C, D, F) for both Group A (Pre-Block Schedule) and Group B (Post-Block Schedule).

To assess if there is a significant difference in mean grades between Group A (Pre-Block Schedule) and Group B (Post-Block Schedule), a t-test will be conducted.

1. Null Hypothesis (H0): There is no significant difference in the mean marking period grades before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean marking period grades before and after the schedule change.

Mean grades will be calculated for each marking period, including year-end scores, resulting in marking period grades for the three years before the schedule change (Group A) and the four years after (Group B). The differences in mean grades between Group A and Group B will be calculated, and the mean of these differences will be determined. Standard deviation and standard error of the mean difference will be calculated to assess variability and reliability. Utilizing the t-statistic formula, a t-statistic will be calculated to gauge the significance of the observed difference. With a predetermined significance level of 0.05, a critical value from the t-distribution table will be determined. The calculated t-statistic will then be compared to this critical value to assess if there is a statistically significant difference in mean grades between the two groups.

Like the academic data, seven years of Mathematics PSSA data will also be collected. Similarly, the initial three years will correspond to the last three years of the Traditional Schedule, while the subsequent four years will align with the first four years under the modified Block Schedule. The data will be recorded on the PSSA Raw Data Collection Form and organized into tables, identifying the number of students who scored at Advanced, Proficient, Basic, and Below Basic levels on the Mathematics PSSA as shown in Table 11.

Table 11

PSSA Raw Data Collection Form

Year:		
Subject: PSSA Mathematics		
Performance Level	# of Students	% of Students
Advanced		
Proficient		
Basic		
Below Basic		
No Score		

This data analysis aims to answer research question number 2: "How did the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?" The investigation will concentrate on determining if there are significant changes in the number of students scoring Advanced and Proficient, potentially influenced by the schedule change.

Descriptive and inferential statistics will be used to explore this question, in addition to a performance level distribution analysis. Similar to the marking period and year-end grades, the PSSA data will be divided into two groups: Group A, representing the three years before the introduction of Block Scheduling (Years 1-3), and Group B, covering the years following implementation (Years 4-7).

The data will be further broken down by year and how the students scored according to the PSSA scoring guidelines. For example, in 2017, ten students scored at the Advanced level, seven at Proficient, and so on. Table 12 illustrates the collection timeline for PSSA Mathematics data.

Table 12

Collection Timeline for PSSA Mathematics Data

Research Question	Type of Data Sources	Timeline
Question 2: How did the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?	Quantitative Data The data will be collected from the district's raw data files downloaded from the DRC Insight website for each test administration between the years 2016 and 2022.	November 2023 – February 2024

Descriptive statistics will be used to calculate the mean percentage of students scoring Advanced or Proficient each year. The results will be used to trend students scoring Advanced or Proficient over the seven years. The performance level distribution analysis will be employed to analyze the distribution of performance levels (Advanced, Proficient, Basic, Below Basic) for both Group A (Pre-Block Schedule) and Group B (Post-Block Schedule).

To evaluate whether there exists a significant difference in the mean percentage of students scoring Advanced or Proficient each year between Group A (Pre-Block Schedule) and Group B (Post-Block Schedule), a t-test will be conducted.

1. Null Hypothesis (H0): There is no significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change.

The mean percentage of students scoring Advanced or Proficient on the PSSA will be computed, including the three years pre-implementation and four years post-implementation. The differences in mean percentages between Group A and Group B will be calculated, along with the mean of these differences. Standard deviation and standard error of the mean difference will be computed to evaluate variability and reliability. Utilizing the t-statistic formula, a t-statistic will be derived to assess the significance of the observed difference. Using a predetermined significance level of 0.05, a critical value from the t-distribution table will be determined. The calculated t-statistic will be compared to this critical value to determine if there is a statistically significant difference in mean grades between the two groups leading to the rejection of the null hypothesis.

In addition to the aforementioned, this study will also look to see if the schedule change had a noticeable impact on non-academic areas, particularly in regard to student attendance and discipline. Proponents of Block Scheduling, such as Rettig and Canady (1999), argue that by having longer class periods, students can delve deeper into the subject matter during each session. This, they believe, can lead to increased engagement, better understanding of the material, and a more meaningful learning experience. Consequently, students may be more motivated to attend class regularly, contributing to improved attendance rates.

Student discipline data will also be examined to identify if any meaningful change has occurred as a result of the schedule switch. Similarly to attendance, proponents of Block Scheduling frequently attributed a decrease in the number of discipline referrals to the Block Schedule. Rettig and Canady (1999) states that many case studies have shown discipline referrals to be reduced by as much as 25 to 50 percent.

This data collection and analysis will be used to answer Research Question number 4 “How did the Block Schedule affect student discipline and attendance?”. The primary objective is to gather data on student discipline incidents and attendance rates to analyze the potential impact of Block Scheduling on these metrics. As with the academic data, seven years of student daily attendance and discipline referral data will also be collected. This data will be categorized into two groups: Group A (Pre-Block Schedule), covering the three years prior to the block implementation (Years 1-3), and Group B (Post-Block Schedule), covering the years following the implementation (Years 4-7). Table 13 illustrates the collection timeline for student discipline and attendance data.

Table 13

Collection Timeline for Student Discipline and Attendance Data

Research Question	Type of Data Sources	Timeline
Question 4: How did the Block Schedule affect student discipline and attendance?	Quantitative Data. The data will be collected from the district's student information system and placed on the raw non-academic data collection form.	November 2023 – February 2024

The data will be sorted and categorized into tables illustrating the number of absence occurrences and discipline referrals earned by students in each grading period as well as the year end totals. The data will be collected from the district's student information system (SIS) and will be stripped of all identifying information. The attendance counts will include any absences from the following categories: excused, unlawful, out of school suspension, unexcused and vacation. The discipline data includes any referral recorded in the district SIS as a PA State Reportable Incident type coded as a behavior code. Raw non-academic data will be collected and recorded in tables on the Raw Nonacademic Data Collection Form as shown in Table 14.

Table 14

Raw Nonacademic Data Collection Form

YEAR:	Q1	Q2	Q3	Q4	Y1
Absences					
Discipline					

Descriptive statistics will be used to interpret the attendance data. The average number of absences, as well as the average annual attendance rates, will be calculated for each group to ascertain the typical level of attendance during each grading period. This aims to identify the patterns, central tendencies, and variability of student attendance before and after the implementation of the Block Schedule.

Moreover, the standard deviation of daily attendance within each group will be examined to assess the variability in attendance patterns. This investigation aims to determine whether attendance became more consistent or varied following the implementation of the Block Schedule.

Descriptive statistics will also be employed to analyze discipline data. Similar to attendance, the average number of discipline referrals and the average annual disciplinary incident rates will be computed for each group to understand the typical level of disciplinary issues during each grading period. This analysis intends to uncover patterns, central tendencies, and variability in student disciplinary incidents before and after the adoption of the Block Schedule.

Additionally, the standard deviation of daily disciplinary referrals within each group will be explored to evaluate the variability in disciplinary patterns. This examination seeks to determine whether disciplinary incidents became more consistent or varied following the implementation of the Block Schedule, providing insight into the effectiveness of the scheduling change on student behavior.

Validity

This study will employ an approach centered on content and criterion validity to assess the impact of the schedule change on student performance. The study will focus on statistical examinations and comparisons of numerical data pertaining to student marking period and year-end grades, as well as the results of the Pennsylvania System School

Assessments. By utilizing quantitative measures and standardized assessments, the study aims to provide a comprehensive understanding of student performance, thereby ensuring validity. Valid data ensures that conclusions drawn from analyses are accurate and reliable, leading to informed decision-making and effective educational practices.

The student grade data will be collected from before and after the implementation of the Block Schedule. The collected data will undergo statistical analysis, such as mean comparison and t-tests, to discern changes in average grades. The mean grades for each marking period and year-end for both before and after the implementation will be compared using a paired t-test to assess whether there exists a significant difference in average grades after the schedule change. Additionally, a grade distribution analysis will be used to compare the frequency of each letter grade both before and after the Block Schedule's implementation. Descriptive statistics will be used to summarize the distribution of grades within each period.

The sample will encompass all students. It should be noted that in the years preceding the schedule change, every student was instructed by the same teacher. However, after the schedule change, only half of the students continued with this teacher, while a new teacher was hired to accommodate the remaining students. By including all students in the sample, regardless of whether they experienced a change in teachers, we enhance the validity of our findings. This approach allows for a thorough examination of the effects of schedule change on student performance across the entire student population. Ultimately, valid data ensures that the conclusions drawn from our analyses are accurate and reliable, leading to informed decision-making and effective educational practices.

This study will enhance the validity of its findings by utilizing triangulation alongside content and criterion validity. Triangulation, a method involving the use of multiple quantitative methods and data sources, will be employed to bolster the overall reliability of the study's results. Methodological triangulation will specifically involve the application of various statistical techniques to analyze the quantitative data collected.

To organize the data effectively, it will be divided into groups representing the pre- Block Schedule (Years 1-3) and post- Block Schedule (Years 4-7). For each group, mean grades will be calculated, and a grade distribution analysis will be conducted to assess changes in the number of failing or high-achieving grades. Descriptive and inferential statistics, such as t-tests, will be utilized to compare mean grades and identify significant differences.

Furthermore, the study will examine Mathematics PSSA data to analyze changes in the number of students scoring at different performance levels. Similar to the grade data, this PSSA data will also be divided into pre-block and post- Block Schedule groups. Descriptive and inferential statistics will be applied to compare performance levels over the years.

Through the implementation of triangulation, integrating different quantitative methods and data sources, a comprehensive understanding of the impact of the schedule change on student performance and behavior is sought. This approach guarantees a thorough examination of the topic.

Fiscal Implications

The research plan outlined in the chapter presents several financial considerations. However, the actual cost of conducting this research study turned out to be minimal. This was primarily due to the researcher's decision to handle all necessary tasks internally, thereby eliminating the need for outsourcing or hiring external services. Furthermore, no new software licenses were required as the researcher made use of existing tools and technologies for data collection and analysis. By maximizing the available resources, the researcher effectively minimized costs ensuring the execution of the research plan while keeping unnecessary expenses to a minimum.

Summary

The implementation of a modified Block Schedule at Palmerton Area Junior High School (PJHS) aims to address concerns regarding student performance in mathematics. This comparative research study seeks to evaluate the impact of the modified Block Schedule on student achievement, discipline, and attendance over a seven-year period. The decision to transition from a Traditional Schedule to a modified Block Schedule is influenced by the success observed at Palmerton Area Senior High School, where the 4x4 Block Schedule has led to improved student performance on standardized assessments.

The purpose of this study is to compare student performance data from the last seven years, focusing on the transition from a Traditional Schedule to a modified Block Schedule at PJHS.

These four key Capstone Research Questions guide this investigation:

1. How does the Block Schedule affect student marking period and year-end grades?
2. How does the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How does the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?

4. How does the Block Schedule affect student discipline and attendance?

The research plan involves collecting and analyzing data from various sources, including student performance records, standardized test scores, attendance records, and discipline referrals. Quantitative methods are employed to analyze the data, including descriptive statistics, and inferential statistics such as mean comparison, t-tests.

The validity of the study is ensured through content, criterion, and methodological triangulation. By employing multiple quantitative methods and data sources, the study provides a comprehensive analysis of the impact of the modified Block Schedule on student outcomes.

CHAPTER IV

Data Analysis and Results

The objective of this Doctoral Capstone project was to evaluate the impact of the schedule change at Palmerton Area Junior High School (PJHS) on student performance data. The study analyzed student data over seven years: three years before the implementation and four years after. By comparing data from the three years prior to the schedule change with the four years following its implementation, this study aims to provide a thorough understanding of the academic and behavioral impact of the modified Block Schedule. The results presented in this chapter will offer valuable insights into the effectiveness of the schedule change, guiding future educational practices and program decisions at PJHS.

The study is guided by four key Capstone Research Questions:

1. How does the Block Schedule affect student marking period and year-end grades?
2. How does the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How does the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?
4. How does the Block Schedule affect student discipline and attendance?

To address these questions, the study employs quantitative methods, using statistical analyses to uncover patterns and trends within a comprehensive dataset spanning seven years. The dataset includes student marking period grades, year-end grades, PSSA results, attendance records, and discipline referrals, all obtained from the Palmerton Area School District's student information system (SIS) and the DRC Insight website.

Data Analysis

Capstone Research Question 1

The raw mathematics data collected to address research question number one was gathered from the Palmerton Area School District's PowerSchool student information system (SIS). Access to the reports requires administrative access to the Palmerton Area School District's student information system and membership in a user group that has access to the PCSB Custom Reports. To access the correct student data, administrative access to the Palmerton Area Junior High School building within the system is also needed.

Once the filters were corrected and the teacher was selected, the raw data was exported as a CSV file. Before beginning the data analysis, all identifiable student information was removed. Additionally, any data from courses not included in this research, taught by the teacher, was also removed.

After the student data was removed, the remaining data was sorted by marking period. Once organized by grading period, the data was sorted by numeric grade in ascending order. Then, the number of A's, B's, C's, D's, and F's were calculated and placed in a corresponding table, as seen in Table 15.

Table 15

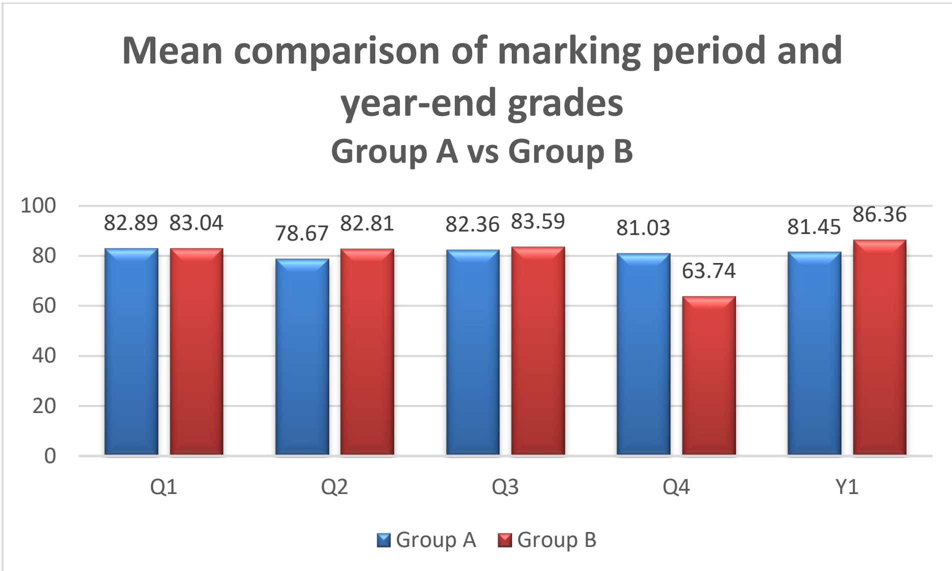
Raw Mathematics Data

YEAR: 2015-16					
Subject: Math					
Grade	Q1	Q2	Q3	Q4	Y1
A (90-100)	22	18	38	25	22
B (80-89)	66	35	33	49	49
C (70-79)	39	48	35	24	44
D (60-69)	10	30	23	23	19
F (0-59)	2	8	8	17	4

Once the data was collected and organized, it was categorized into two groups: Group A (Pre-Block Schedule), covering the three years prior to the block implementation (Years 1-3), and Group B (Post-Block Schedule), covering the years following the implementation (Years 4-7). From there, the means of the marking period and year-end grades were calculated and compared to gain an overview of the central tendency of grades before and after the schedule change. The bar graph seen in Figure 1 compares the mean grades for each marking period as well as year-end.

Figure 1

Mean comparison of marking period and year-end grades



As can be seen in Figure 1, Group B outperforms Group A in four out of five grading periods. In Quarter 1, Group A had a mean score of 82.89, while Group B had a slightly higher mean score of 83.04. In Quarter 2, Group B again outperformed Group A, with scores of 82.81 and 78.67, respectively. In Quarter 3, Group B again had a higher mean score of 83.59 compared to Group A's 82.36. However, in Quarter 4, Group A performed better with a mean score of 81.03, whereas Group B's mean score dropped to 63.74. It is worth noting that the COVID-19 closure occurred in Quarter 4 of 2019, and as a result, all students were awarded a passing grade, which for this research is equal to a 60. The COVID-19 pandemic caused widespread school closures during the 2019-2020 school year, disrupting education and prompting a rapid shift to remote learning.

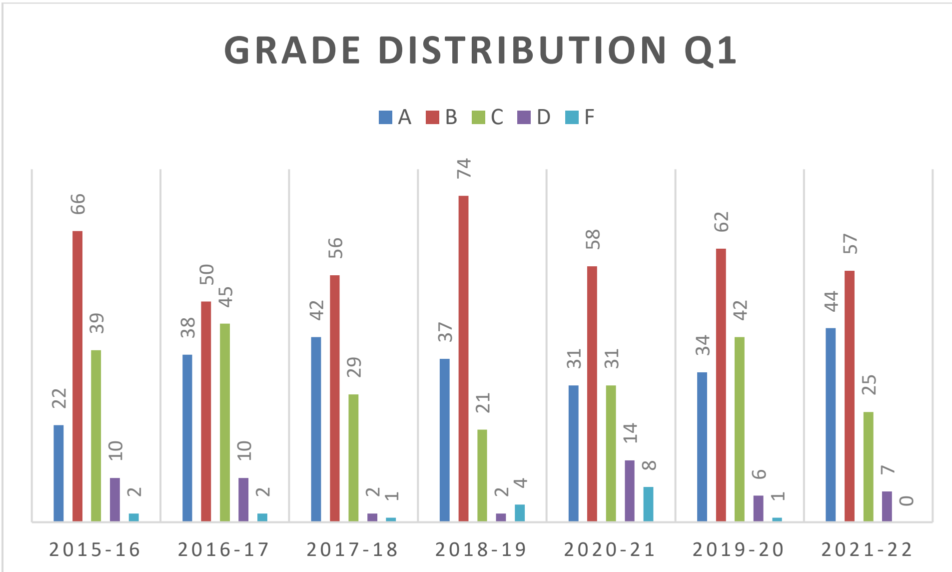
This had a significant impact on the 2019 Quarter 4 mean. Despite the drop in Quarter 4, Group B's yearly average was higher at 86.36 compared to Group A's 81.45.

Overall, the data indicates a trend of improvement in student performance from Group A to Group B. The drop in Q4 scores for Group B highlights the impact of the COVID-19 closure. Group B outperformed Group A in three out of the four quarters and in the yearly average. The data suggests that the modified Block Schedule results in higher mean grades compared to the Traditional Schedule, except for a the drop in Q4. The overall yearly average also seems to support the effectiveness of the modified Block Schedule in improving academic performance.

Additionally, a grade distribution analysis was used to examine the distribution of letter grades (e.g., A, B, C, D, F) for both Group A (Pre-Block Schedule) and Group B (Post-Block Schedule). The analysis of Q1 grades from 2015-16 to 2021-22, as shown in Figure 2, indicates that Group A (2015-16 to 2017-18) exhibited a gradual increase in the number of A grades earned, starting from 22 in 2015-16 and rising to 42 in 2017-18. This trend continues in Group B (2018-19 to 2021-22), although with greater variability, peaking at 44 in 2021-22.

Figure 2

Grade Distribution Q1



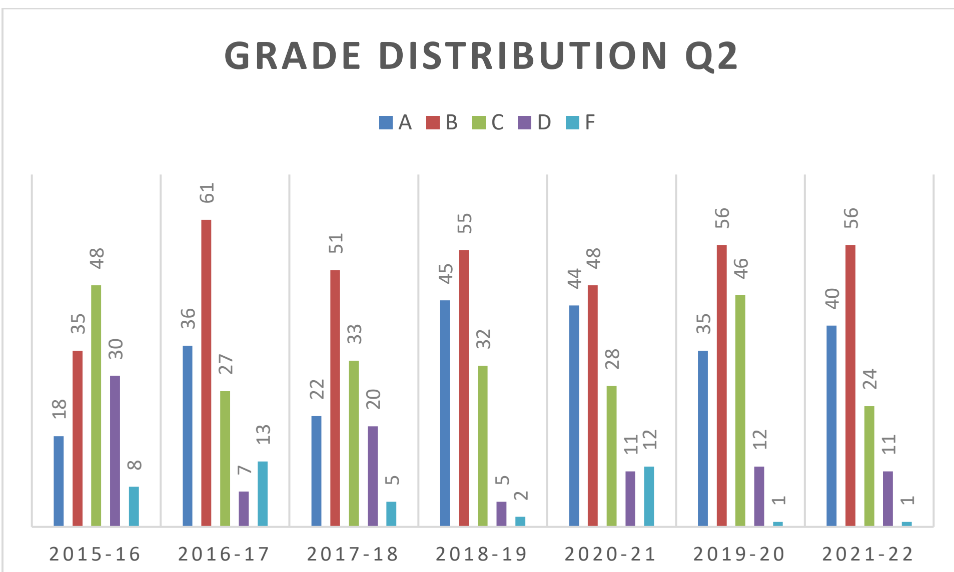
The analysis of Q1 grades over the years reveals several key differences and trends. Overall, there is a slight increase in the average number of A grades from Group A (34) to Group B (36.5). The average number of students earning B grades also increased, with Group A averaging 57.3 and Group B averaging 62.75. Furthermore, Group B saw a significant decrease in the average number of C grades, dropping to 29.75 from Group A's 37.7. Group B's D grades also saw a slight decrease, down to 7.25 from 7.3. Lastly, Group B saw an increase in the number of failing grades, with an average of 3.25 compared to Group A's 1.67.

These trends indicate an overall improvement in student performance in Group B, with more students achieving higher grades and fewer students receiving middle-range grades. However, the increase in failing grades in Group B suggests that there may still be challenges to address in supporting lower-performing students.

The results of the Q2 Grade Distribution analysis are similar to those seen for Q1, there is a notable increase in the average number of A grades from Group A (25.3) to Group B (41). The average number of students earning B grades also increased slightly, with Group A averaging 49 and Group B averaging 53.75. Furthermore, Group B saw a significant decrease in the average number of C grades, dropping to 32.5 from Group A's 36. Furthermore, Group B's D grades also saw a slight decrease, down to 9.75 from 19. Group B also experienced a significant decrease in the number of failing grades, dropping to an average of 4 from Group A's 8.67. Figure 3 illustrates the Q2 grade distribution.

Figure 3

Grade Distribution Q2



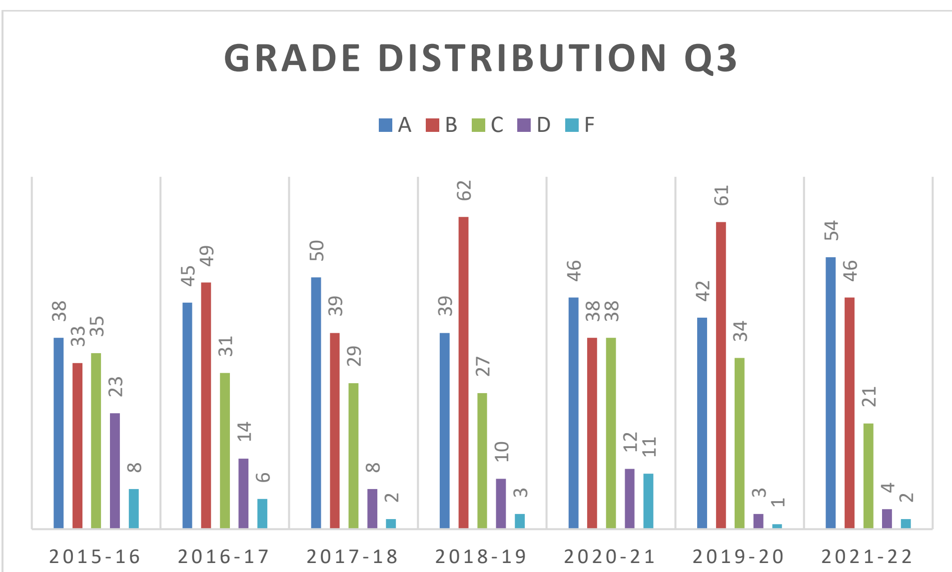
These trends also indicate an overall improvement in student performance for Group B, with more students achieving higher grades and fewer students receiving middle-range and failing grades. The improvement is particularly noticeable in the reduction of D and F grades, reflecting better academic outcomes in Group B compared to Group A. The improvement trends in student performance are consistent across both

Q1 and Q2, with more students achieving higher grades and fewer students receiving lower grades in Group B compared to Group A.

The results of the Q3 grade distribution are consistent with those seen in Q1 and Q2, showing overall improvement in student performance from Group A to Group B. As seen in Figure 4, there is a slight increase in the average number of A grades from Group A (44.3) to Group B (45.25). The average number of students earning B grades also increased, with Group A averaging 40.3 and Group B averaging 51.75. The average number of C grades remained relatively stable, with Group A averaging 31.7 and Group B averaging 30. However, Group B saw a significant decrease in the average number of D grades, dropping to 7.25 from Group A's 15. Lastly, Group B experienced a slight decrease in the average number of F grades, with 4.25 compared to Group A's 5.33.

Figure 4

Grade Distribution Q3

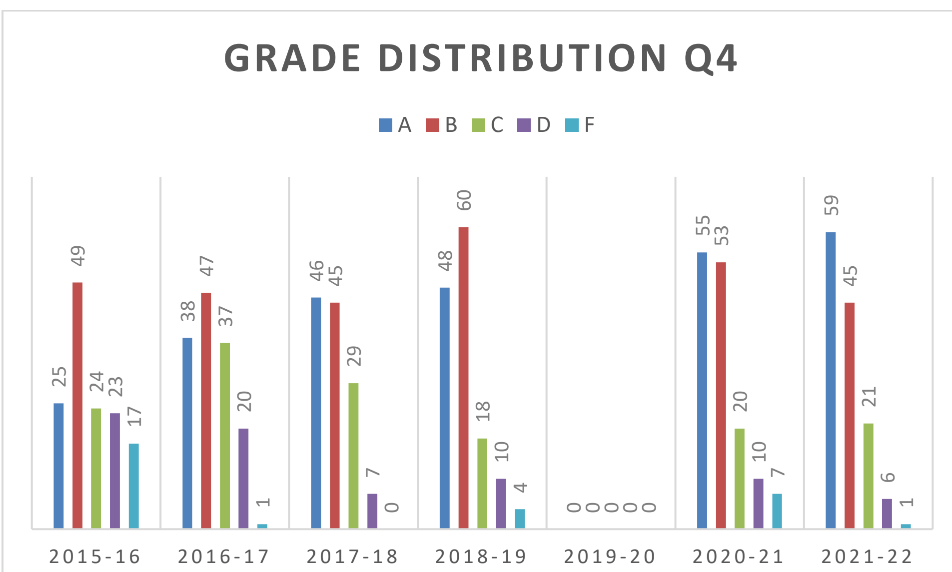


These trends indicate an overall improvement in student performance, with more students achieving higher grades and fewer students receiving lower grades in Group B compared to Group A. The reduction in D and F grades in Group B also suggests improved academic outcomes for students who previously struggled.

Lastly, the results of the Q4 grade distribution analysis are consistent with those of the previous three marking periods. As seen in Figure 5, there is an increase in the average number of A grades from Group A (36.3) to Group B (54, excluding 2019-20). The average number of students earning B grades also increased, with Group A averaging 47 and Group B averaging 52.6. Furthermore, Group B saw a significant decrease in the average number of C grades, dropping to 19.66 from Group A's 30. Group B's D grades also saw a substantial decrease, down to 8.6 from Group A's 16.7. Lastly, Group B experienced a decrease in the number of failing grades, with an average of 4 compared to Group A's 6.

Figure 5

Grade Distribution Q4



These trends also indicate an overall improvement in student performance, with more students achieving higher grades and fewer students receiving lower grades in

Group B compared to Group A. The reduction in D and F grades in Group B suggests improved academic performance for students. The absence of grades in 2019-20 (Q4) are a result of the COVIC-19 closure.

Across all quarters, there is improvement in student performance from Group A to Group B, with more students achieving higher grades (A and B) and fewer students receiving lower grades (C, D, and F). This consistency indicates that the implementation of a Block Schedule had a positive impact on student performance with regards to marking period and year-end grades.

In addition to the mean comparison and the grade distribution analysis, a t-test was performed to test the following hypothesis:

1. Null Hypothesis (H0): There is no significant difference in the mean marking period grades before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean marking period grades before and after the schedule change.

To perform the t-test, the marking period means were calculated and sorted into two groups: Group A, representing the years on the Traditional Schedule, and Group B, representing the years on the modified Block Schedule. The differences in mean grades between Group A and Group B were calculated, and the mean of these differences was determined. The standard deviation and standard error of the mean difference were also calculated, and an unpaired t-test was then used to analyze the data and determine if there was a statistically significant difference. Table 16 represents the data used to perform the t-test.

Table 16

Marking Period T-test Data

Group	Group A	Group B
Mean	81.2793	79.9060
SD	2.8025	18.9831
SEM	0.7236	4.2448
N	15	20

The results of the t-test produced a P value of 0.3369, indicating that the difference between the two groups is not statistically significant. This suggests that the observed difference in mean grades between Group A and Group B is likely due to random chance rather than the schedule change. The confidence interval for the difference in means ranges from -5.0226 to 1.7693. The calculated t-statistic is 0.9745, with 33 degrees of freedom, and the standard error of the difference is 1.669. These values were used to determine the statistical significance and confidence interval. Overall, the data does not provide sufficient evidence to conclude that there is a significant difference in mean grades between the traditional and modified Block Schedules.

Capstone Research Question 2

To address Capstone Research Question 2, "How did the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?" raw data files were downloaded from the DRC Insight website for each test administration included in the study. Once downloaded, all identifiable student data was removed, and the data was sorted by performance levels. Then, the number of students who scored at each performance level was calculated and placed in the appropriate table according to the test was administered, as seen in Table 17.

Table 17

PSSA Raw Data

Year: 2015		
Subject: PSSA Mathematics		
Performance Level	# of Students	% of Students
Advanced	6	3.92%
Proficient	21	13.73%
Basic	52	33.99%
Below Basic	74	48.37%
No Score	0	0%

Once the data was collected and organized, it was categorized into two groups: Group A (Pre-Block Schedule), covering the three years prior to the block implementation (Years 1-3), and Group B (Post-Block Schedule), covering the years following the implementation (Years 4-7). The mean number of students scoring at each performance level was then calculated for both groups to provide an overview of the central tendency of student performance on the PSSA before and after the schedule change.

Figure 6 compares the mean number of students who scored at each performance level for Group A and Group B, revealing several key insights about the impact of the Block Scheduling on student performance.

The data suggests that the Block Schedule implementation has led to an improvement in student performance at the Advanced level, with Group B showing a higher average number of students scoring Advanced at 10.3 compared to Group A's 7.6. Both groups performed similarly at the Proficient level, with Group B having a slightly higher average number of students at 31.3 compared to Group A's 30.6.

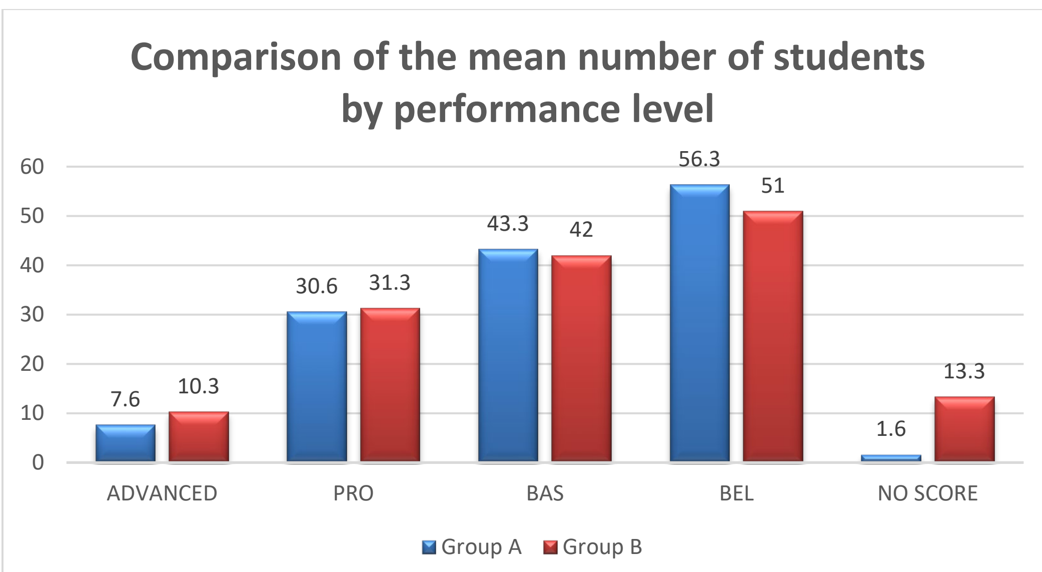
At the Basic level, Group B had a slightly lower average number of students, with 42 compared to Group A's 43.3. Additionally, the number of students performing at the Below Basic level decreased in Group B to 51 from Group A's 56.3.

However, the average number of students with no scores increased significantly in Group B to 13.3 from Group A's 1.6. This increase is likely a result of the COVID-19 pandemic.

Overall, the implementation of the Block Schedule has resulted in improvements at the Advanced level and a reduction in the Below Basic level. However, the significant increase in the number of students with no scores after implementation is a concerning trend that requires further investigation.

Figure 6

Comparison of the mean number of students by performance level



To further investigate the impact of the schedule change on the PSSA results, the average percent of students scoring at each performance level was calculated to provide a clearer analysis of student performance and a more accurate assessment of the schedule change's effectiveness.

Figure 7, found below, compares the mean percentage of students scoring at each performance level for Group A (Pre-Block Schedule) and Group B (Post-Block Schedule).

An analysis of the mean percentage data offers a clearer picture of the distribution of performance levels relative to the group size. The results for students scoring Advanced and Proficient were consistent with the findings suggested by the mean number of students data.

In contrast, at the Basic level, Group B has a slightly lower average number of students (28.4%) compared to Group A (31.1%). This indicates that the difference in the percentage of students at this performance level is minimal. However, this slight variation might be attributed to overall class size differences rather than a significant change in student performance, suggesting that Group A's marginally higher percentage could reflect a larger overall class size.

For the Below Basic level, Group A has a higher mean number of students (56.3) compared to Group B (51). This is also reflected in the percentages, where Group A has a higher proportion (40.17%) compared to Group B (34.67%). This suggests that the Block Schedule implementation has helped reduce the number of students performing at the lowest level.

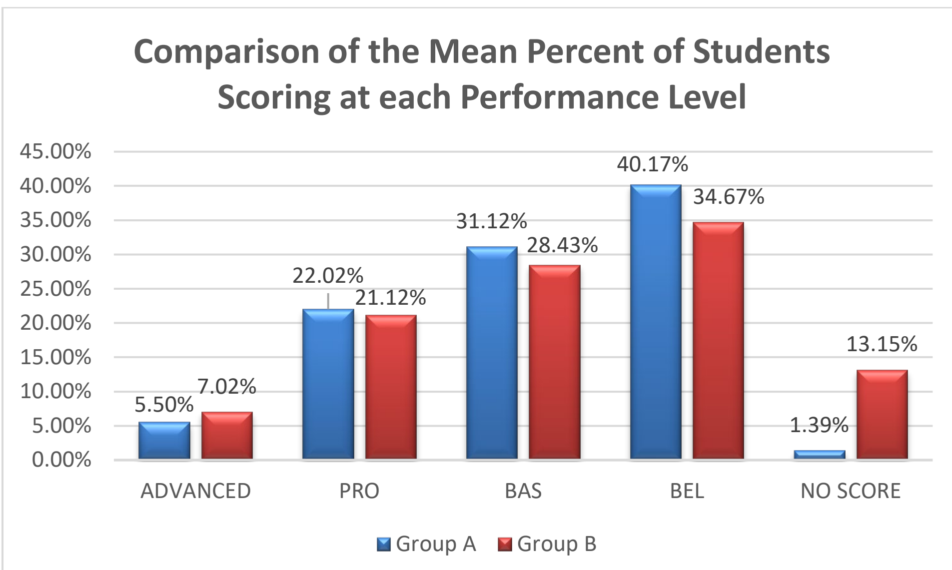
A notable concern is the No Score category, where Group B has a much higher mean number of students (13.3) compared to Group A (1.6), with percentages showing a similar trend (Group B: 13.15%, Group A: 1.39%). However, this is likely a result of

COVID-19. The data for both groups is fairly consistent with the exception of 2021, the year immediately preceding the COVID-19 closure, where 31 tests were not scored, significantly impacting the average.

Overall, the mean percent data provides a clearer picture of the distribution of performance levels relative to group size, highlighting that the Block Schedule implementation appears to have positively impacted student performance at the Advanced level and reduced the percentage of students scoring at the Below Basic level.

Figure 7

Mean Percent of Students Scoring at each Performance Level

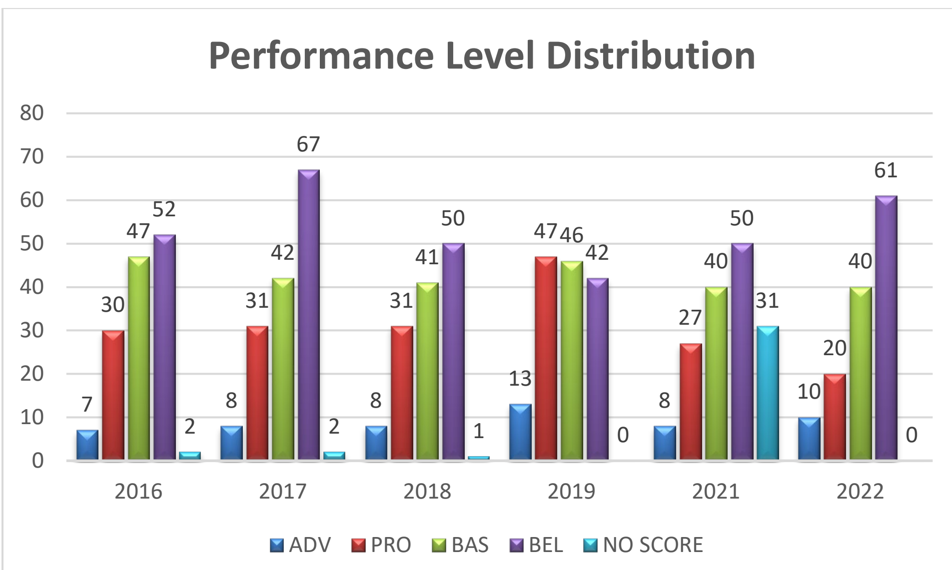


A performance level distribution analysis was conducted to examine the distribution of student scores across different performance levels from 2016 to 2022, specifically comparing the distribution before the schedule change with results after. The comparison of Group A (Pre-Block Schedule: 2016-2018) and Group B (Post-Block Schedule: 2019-2022) reveals several notable trends.

As seen in Figure 8, Group B demonstrated an improvement at the Advanced level, with higher numbers of students scoring in this category post-implementation. However, while there was an initial increase in Proficient level scores in 2019, subsequent years showed a decline, indicating variability in performance. The Basic level scores in both groups showed a trend towards stabilization, with Group B maintaining numbers similar to the lower end of Group A. The Below Basic level in Group B initially decreased but saw an increasing trend in the later years, highlighting a potential area of concern. Additionally, the No Score category saw a sharp increase in 2021 for Group B likely due to the COVID-19 pandemic.

Figure 8

Performance Level Distribution



Overall, while the Block Schedule implementation led to some positive outcomes, particularly at the Advanced level, there are areas that may require targeted interventions to ensure consistent improvement across all performance levels.

A t-test analysis was performed to determine if there was a statistically significant difference in the mean percentage of students scoring Advanced and Proficient between Group A (Pre-Block Schedule) and Group B (Post-Block Schedule) to test the following hypotheses:

1. Null Hypothesis (H0): There is no significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change.

Table 18 below highlights the data used to perform the t-test.

Table 18

PSSA T-test Data

Group	Group A	Group B
Mean	27.5267	28.1367
SD	1.9845	10.7535
SEM	1.1458	6.2085
N	3	3

The P value obtained from the analysis is 0.9277. This P value indicates that the difference in the mean percentages is not statistically significant, as it is well above the predetermined significance threshold of 0.05. The confidence interval for the mean difference between Group A and Group B is from -18.1387 to 16.9187, suggesting that the true difference in means could be anywhere within this range.

Additionally intermediate values used in the calculations include a t-value of 0.0966, with 4 degrees of freedom, and a standard error of the difference of 6.313. Group

A had a mean score of 27.5267 with a standard deviation (SD) of 1.9845 and a standard error of the mean (SEM) of 1.1458. Group B had a mean score of 28.1367 with a much higher standard deviation of 10.7535 and a SEM of 6.2085, also based on 3 observations.

In conclusion, the statistical analysis supports the null hypothesis (H0), indicating that there is no significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change. The confidence interval and high P value highlight variability within the data, further supporting the conclusion that the schedule change did not have a statistically significant impact on student performance at these levels.

Capstone Research Question 3

The raw science and social studies data collected to address research question number three was gathered from the Palmerton Area School District's student information system, (SIS) utilizing the same steps previously applied to collect the data to respond to Capstone Research Question #1

After the student data was removed, the remaining data was organized by grading period, and sorted by numeric grade in ascending order. Then, the number of A's, B's, C's, D's, and F's was calculated and placed in a corresponding table, as seen in Table 19.

Table 19

Raw Academic Data

YEAR: 2015-16					
Subject: Science					
Grade	Q1	Q2	Q3	Q4	Y1
A (90-100)	32	31	31	33	31
B (80-89)	58	43	43	41	40

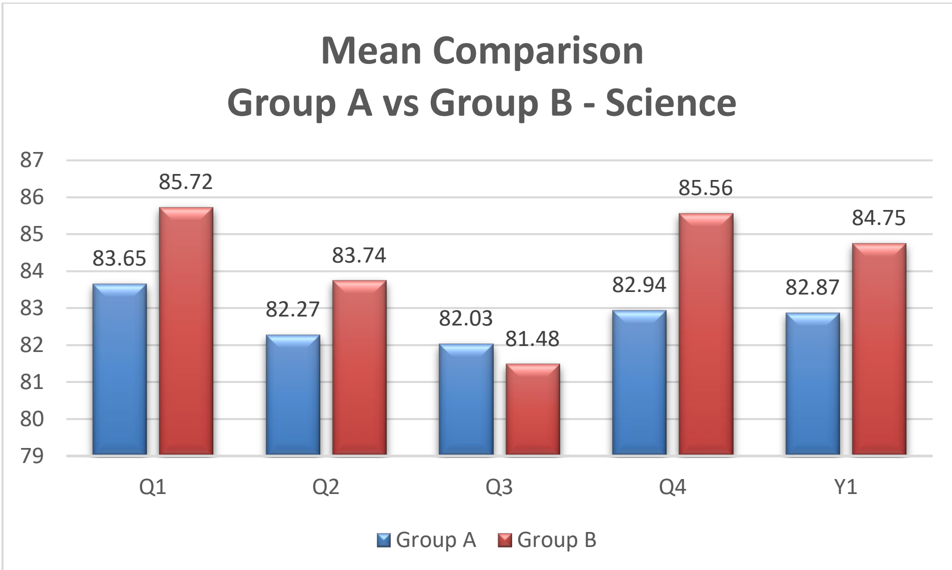
C (70-79)	39	51	48	39	53
D (60-69)	15	13	16	23	17
F (0-59)	1	7	5	7	2

As was done with mathematics, once the data was collected and organized, it was categorized into two groups: Group A (Pre-Block Schedule), covering the three years prior to the block implementation (Years 1-3), and Group B (Post-Block Schedule), covering the years following the implementation (Years 4-7). From there, the means of the marking period and year-end grades were calculated and compared to gain an overview of the central tendency of grades before and after the schedule change.

The bar graph in Figure 9, titled "Mean Comparison Group A vs. Group B - Science," compares the average science grades of both groups across each marking period and the year-end. Several trends are highlighted in this figure. Throughout the four quarters, Group B consistently outperformed Group A, with the exception of the third quarter. In the first quarter, Group B led with a mean score of 85.72 compared to Group A's 83.65. This trend continued into the second quarter, where Group B again scored higher (83.74) than Group A (82.27). The third quarter saw a slight shift, with Group A achieving a higher score (82.03) than Group B (81.48). However, in the fourth quarter, Group B demonstrated a considerable lead, averaging 85.56 while Group A's mean score was 82.94.

Figure 9

Mean Comparison Group A vs Group B - Science



Overall, the yearly average (Y1) underscores Group B's stronger performance, with an average score of 84.75 compared to Group A's 82.87. These trends highlight that while Group A's performance remained relatively stable across the quarters, Group B consistently scored higher, particularly in the first and fourth quarters.

Additionally, a grade distribution analysis was completed for both Science and Social Studies to assess the impact of the Block Schedule on student's grades in subjects still taught using the Traditional Schedule.

The distribution of Q1 Science grades, as seen in Figure 10, comparing Group A (2016-2018) with Group B (2019-2022) highlights several trends. Group B shows a significant increase in the number of students earning A grades, peaking at 96 in 2019, compared to Group A's steady rise to 60 in 2018. The number of students earning B grades remains fairly consistent in both groups, with Group B averaging slightly higher.

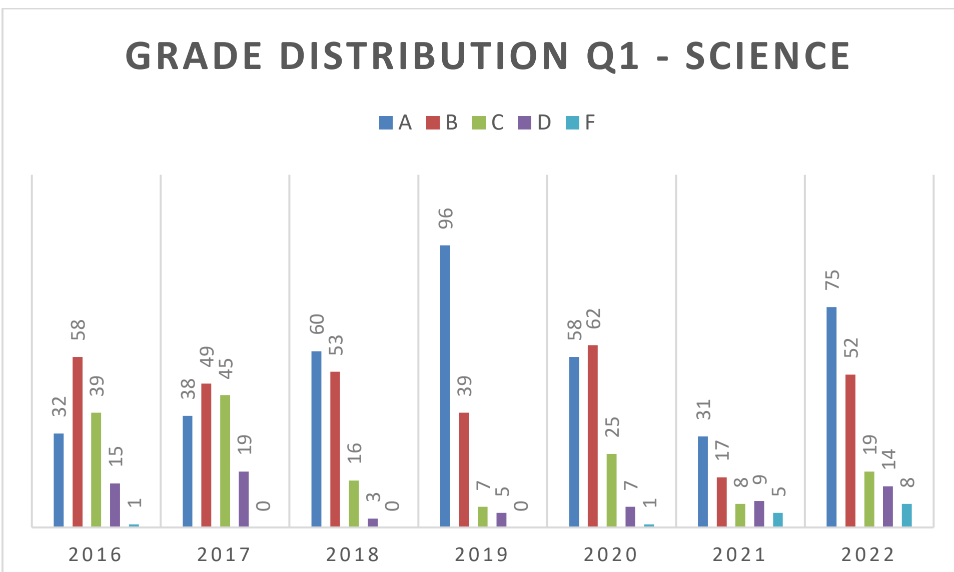
Notably, Group B has fewer C grades, averaging 18.5 compared to Group A's 31, indicating fewer middle-range performers.

The number of students earning D grades are low in both groups, with Group B averaging slightly less. However, Group B has a higher average of F grades (5) compared to Group A's minimal (0.33).

Overall, Group B exhibits improved performance with more A grades and fewer C grades, though the increase in failing grades suggests areas needing attention. This underscores the importance of continuing efforts to support all students, particularly those who are underperforming.

Figure 10

Grade Distribution Q1 – Science



As shown in Figure 11, titled "Grade Distribution Q2 – Science," the key trends in Q2 align with those observed in Q1, demonstrating similar patterns of improvement for both Group A (2016-2018) and Group B (2019-2022).

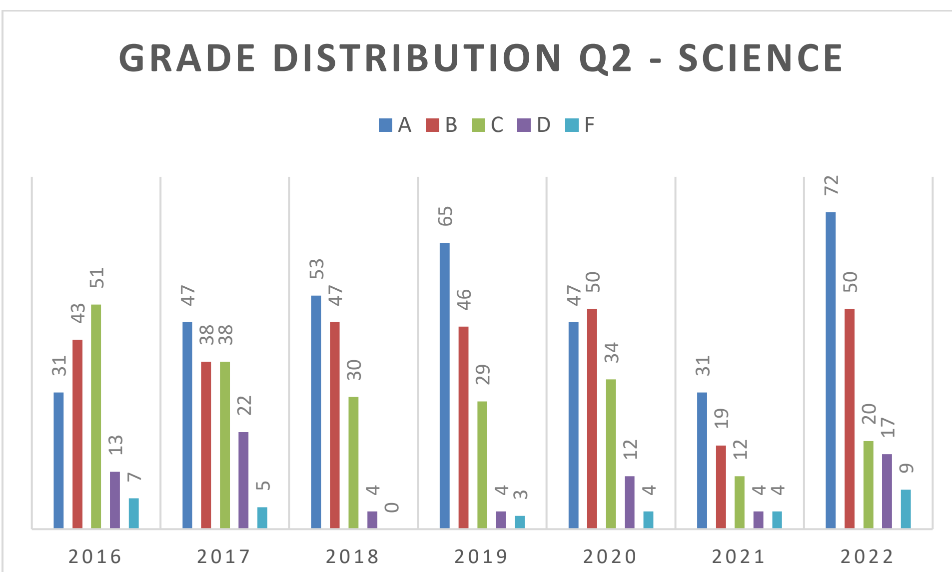
Group B shows a significant increase in the number of students earning A grades, peaking at 72 in 2022 compared to 53 in 2018 for Group A. Additionally, the number of students earning B grades remained consistently high in both groups, with Group B averaging slightly lower at 40.75 compared to Group A's 48.33.

The number of students earning C grades have decreased in Group B, averaging 13.75 compared to Group A's 37. D grades are also slightly lower in Group B, averaging 9 compared to Group A's 13. However, Group B has a slight increase in the number of students earning F grades, averaging 5 compared to Group A's 4.

Overall, Group B exhibits improved performance with more A grades and fewer C grades, though the slight increase in F grades suggests areas needing attention. These trends highlight an overall improvement in student performance.

Figure 11

Grade Distribution Q2 - Science



As seen in Figure 12, the analysis of Q3 Science grades for Group A (2016-2018) versus Group B (2019-2022) uncovers several trends consistent with the results of Q1 and Q2.

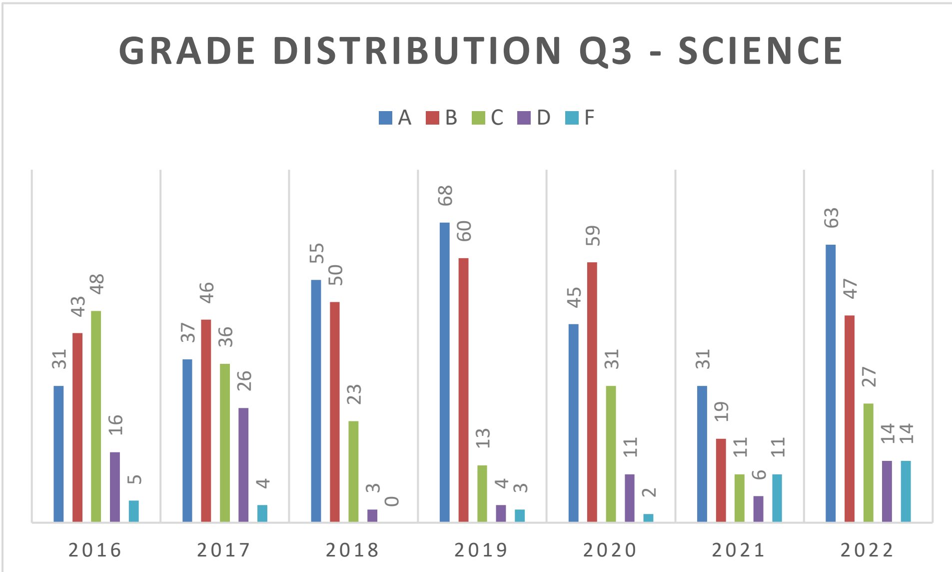
Group B again shows a significant increase in the number of students earning A grades, peaking at 68 in 2019 and averaging 55.25, compared to Group A's average of 41. B grades remain high and consistent in both groups, with Group B averaging 42.75 and Group A averaging 46.33.

There is a notable decrease in the number of students earning C grades for Group B, averaging 20.5 compared to Group A's 35.67. The number of students earning D grades is also lower in Group B, averaging 8.5 compared to Group A's 18.33. However, Group B again shows an increase in the number of students earning F grades, averaging 6.75 compared to Group A's 4.

These trends are consistent with those observed in Q1 and Q2, where Group B consistently demonstrates higher performance, with more students earning A grades and fewer earning C and D grades. Overall, the findings highlight an improvement in student performance in Group B.

Figure 12

Grade Distribution Q3 – Science



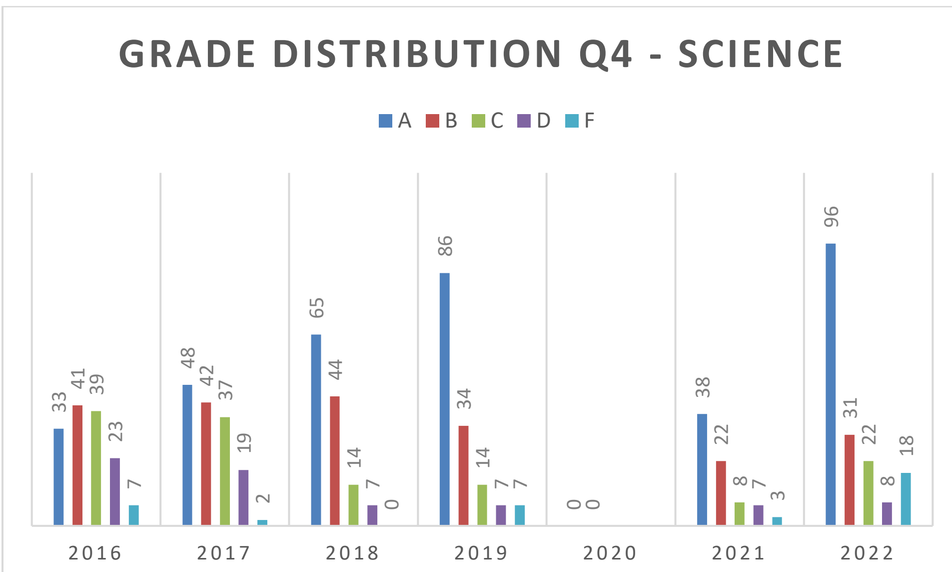
The analysis of Q4 Science grades, as seen in Figure 13, comparing Group A (2016-2018) with Group B (2019-2022) demonstrate trends consistent with the proceeding grading periods. Group B shows a significant increase in the number of students earning A grades, peaking at 96 in 2022, compared to Group A's peak of 65 in 2018. The number of students earning B grades remains fairly consistent in both groups, with Group B averaging lower at 29 compared to Group A's 44.33. additionally, Group B has fewer C grades, averaging 13.33 compared to Group A's 30, indicating fewer students earning C’s.

The number of students earning D grades is also lower in Group B, averaging 6 compared to Group A’s 18.67. However, Group B shows a slight increase in the number of students earning F grades, averaging 5.67 compared to Group A's 5.33.

These trends are consistent with those observed in Q1, Q2, and Q3, where Group B consistently demonstrates higher performance with more A grades and fewer C and D grades. However, the increase in the number of students earning F grades across all quarters indicates a need for targeted support for struggling students. Overall, the findings suggest an improvement in student performance in Group B.

Figure 13

Grade Distribution Q4 - Science



To assess if there is a significant difference in mean science grades between Group A (Pre-Block Schedule) and Group B (Post-Block Schedule), a t-test was also conducted to assess the following hypothesis.

1. Null Hypothesis (H0): There is no significant difference in the mean marking period grades before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean marking period grades before and after the schedule change.

To perform the t-test, the marking period means were calculated and sorted into two groups: Group A (2016-2018) and Group B (2019-2022). The differences in mean grades between Group A and Group B were calculated, and the mean of these differences was determined. The standard deviation and standard error of the mean differences were also calculated, and an unpaired t-test was then used to analyze the data to determine if there was a statistically significant difference. Table 20 represents the data used to perform the t-test.

Table 20

Marking Period T-test Science Data

Group	Group A	Group B
Mean	82.7540	83.1558
SD	3.0600	6.1252
SEM	0.7901	1.4052
N	15	19

The results of the t-test produced a P value of 0.805, indicating that the difference between the two groups is not statistically significant. This suggests that the observed difference in mean grades between Group A and Group B is likely due to random chance rather than the schedule change.

The calculated t-statistic is -0.249, with 32 degrees of freedom. These values were used to determine the statistical significance.

Given the p-value of 0.805, which is much greater than the predetermined significance level of 0.05, we fail to reject the null hypothesis. This means there is not enough evidence to conclude that there is a significant difference in mean grades between the traditional and modified Block Schedules.

In addition to science, social studies grades were also analyzed to see if the implementation of the Block Schedule had an effect on student performance in subjects still taught using the Traditional Schedule.

The bar graph titled "Mean Comparison Group A vs Group B - Social Studies," shown in Figure 14 below, compares the mean social studies grades for each marking period and the year-end. The graph reveals several noteworthy trends.

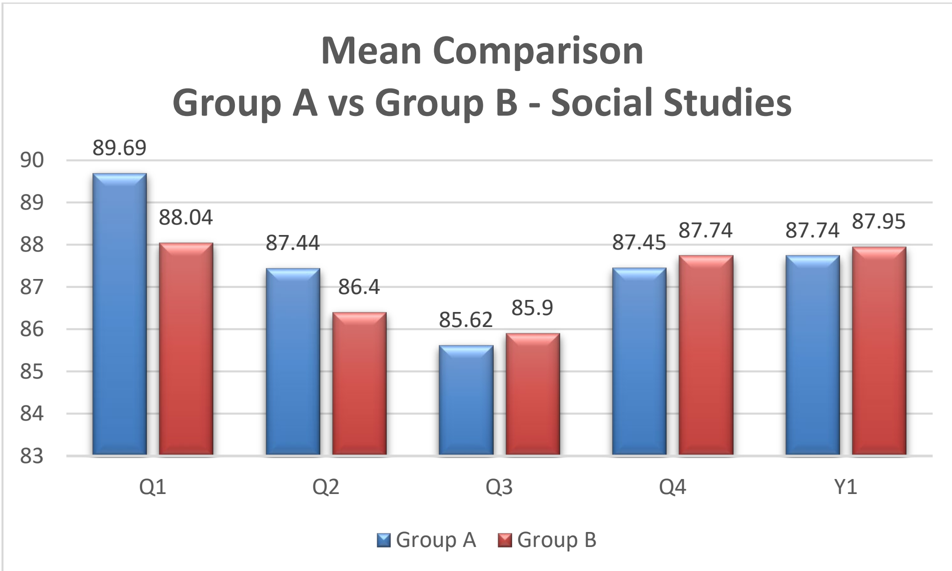
In the first quarter (Q1), Group A led with a mean score of 89.69, while Group B scored 88.04. This trend continued into the second quarter (Q2), where Group A again performed better, with a mean score of 87.44 compared to Group B's 86.4. In the third quarter (Q3), Group B slightly outperformed Group A with a mean score of 85.9 compared to Group A's 85.62.

In the fourth quarter (Q4), Group B outperformed Group A with a mean score of 87.74, while Group A scored 87.45. The yearly average (Y1) further underscores Group B's stronger overall performance, with a mean score of 87.95 compared to Group A's 87.74.

Overall, these trends highlight that while Group A generally performed better in the first two quarters, Group B showed a slightly better performance in the third and fourth quarters as well as in the overall yearly average.

Figure 14

Mean Comparison Group A vs Group B - Social Studies



The data suggests that the Block Scheduling of mathematics may have had a positive impact on social studies grades, as evidenced by Group B's improved performance in the latter part of the year and the higher yearly average compared to Group A.

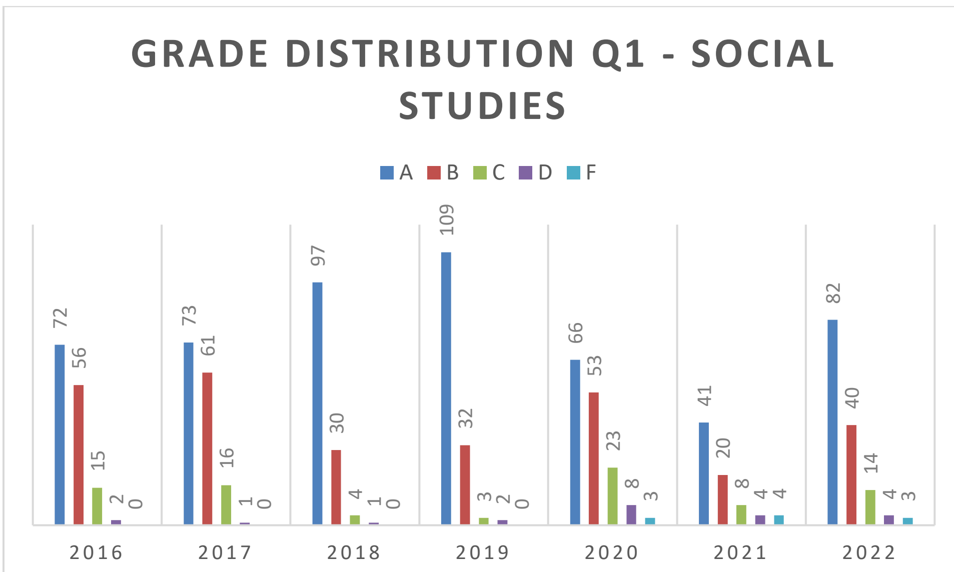
A grade distribution analysis of Social Studies was also conducted to compare Group A (2016-2018) with Group B (2019-2022) across the four quarters (Q1-Q4) to evaluate the impact of the schedule changes on student performance in courses still taught using the Traditional Schedule.

Figure 15, seen below, illustrates the Social Studies grade distribution for both groups during Q1. As shown in the bar graph, Group A (2016-2018) had a higher average number of students earning A and B grades, with averages of 80.67 and 49.00, respectively, indicating more consistent performance compared to Group B (2019-2022). Group B had an average of 74.50 students earning A grades and 36.25 earning B grades.

However, Group B had fewer students earning C grades, with an average of 12.00, but averaged more students earning D and F grades, with 4.50 and 2.50 respectively, suggesting an increase in the number of lower-performing students.

Figure 15

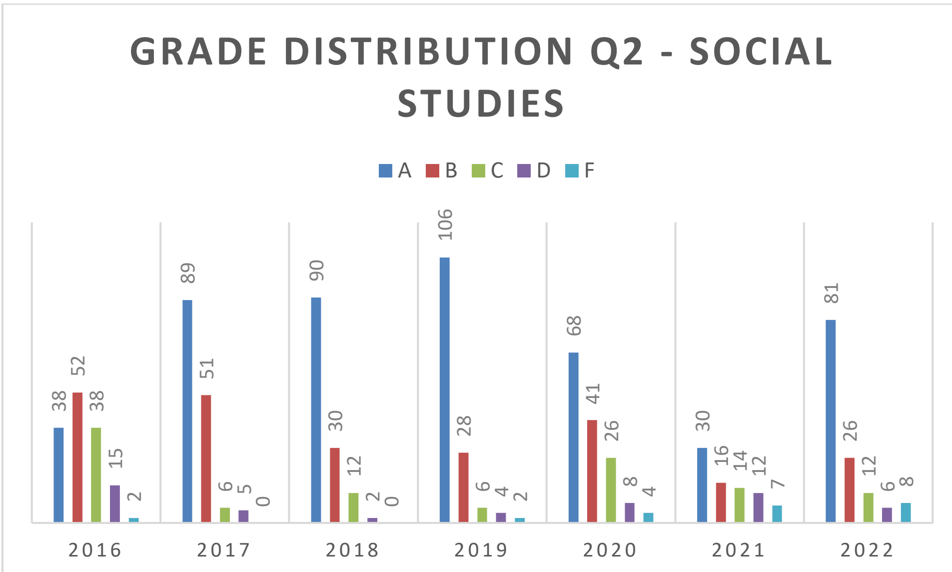
Grade Distribution Q1 - Social Studies



In Figure 16, titled “Grade Distribution Q2 - Social Studies,” seen below, Group A outperformed Group B in the number of students earning A grades, averaging 72.33 compared to 71.25. However, Group B had fewer students earning B grades (27.5 vs. 44.33) and higher averages for D and F grades, with 7.50 and 5.25 respectively, again indicating an increase in lower-performing students.

Figure 16

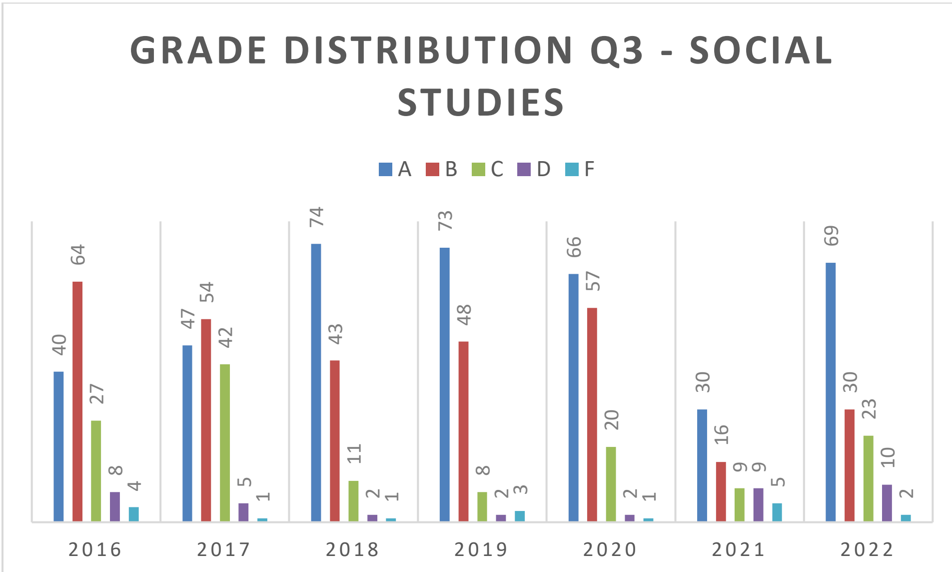
Grade Distribution Q2 - Social Studies



For Q3, Figure 17, Group B had an average number of students earning A grades (59.5), which is higher than Group A (53.67). However, Group B had a lower average number of students earning B grades (37.75 vs. 53.67) and fewer earning C grades (15 vs. 26.67). Group B also had higher D and F grades, at 5.75 and 2.75, respectively. Overall, while Group B outperformed Group A in the top-grade category, they also had more lower-performing students.

Figure 17

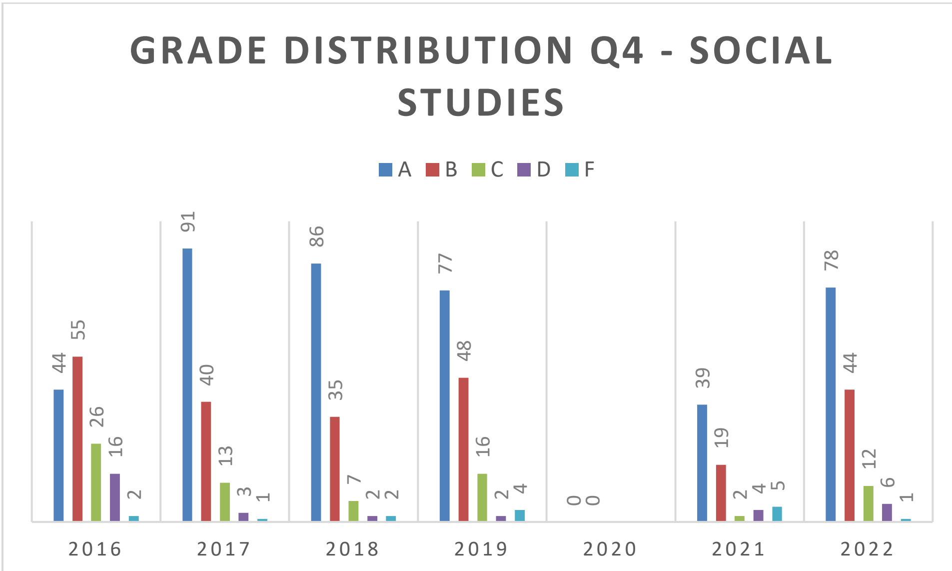
Grade Distribution Q3 - Social Studies



Lastly, in Q4, Figure 18, Group A (2016-2018) had an average of 73.67 students earning A grades, while Group B (2019-2022) had an average of 64.67 students earning A grades. The B grade averages were 43.33 for Group A and 37.00 for Group B. Group A had more C grades on average (15.33) compared to Group B (10.00). However, Group A had more students earning D grades, with an average of 7, compared to 4 for Group B. The average number of F grades differed, with Group A having 1.67 and Group B having 3.33, indicating a higher incidence of failing grades in Group B.

Figure 18

Grade Distribution Q4 - Social Studies



Overall, the data suggests that implementing the Block Schedule for mathematics had mixed effects on student performance in Social Studies. While there was an increase in top performers, there was also a rise in the number of lower-performing students. This indicates the need for further research.

As was done with both mathematics and science data, the same process was used to conduct a t-test and test the null hypothesis for Social Studies grades. The hypotheses tested were as follows:

1. Null Hypothesis (H0): There is no significant difference in the mean marking period grades before and after the schedule change.
2. Alternative Hypothesis (H1): There is a significant difference in the mean marking period grades before and after the schedule change.

To perform the t-test, the marking period means were calculated and sorted into two groups: Group A (2016-2018) and Group B (2019-2022). The differences in mean grades between Group A and Group B were calculated, and the mean of these differences was determined. The standard deviation and standard error of the mean difference were also calculated. An unpaired t-test was then used to analyze the data and determine if there was a statistically significant difference. Table 21 represents the data used to perform the t-test.

Table 21

Marking Period T-test Social Studies Data

Group	Group A	Group B
Mean	87.5593	85.7111
SD	3.4058	6.7394
SEM	0.8794	1.5461
N	15	19

The results of the t-test produced a p-value of 0.3408, indicating that the difference between the two groups is not statistically significant by conventional criteria. This suggests that the observed difference in mean grades between Group A and Group B is likely due to random chance rather than the schedule change.

The calculated t-statistic is 0.9670, with 32 degrees of freedom, and the standard error of the difference is 1.911. The mean difference between Group A and Group B is 1.8483, with a 95% confidence interval ranging from -2.0450 to 5.7416.

Given the p-value of 0.3408, which is much greater than the predetermined significance level of 0.05, we fail to reject the null hypothesis. This means there is not enough evidence to conclude that there is a significant difference in mean grades between the traditional and modified Block Schedules.

The analysis of science and social studies grades from the Palmerton Area School District before and after the implementation of the Block Schedule revealed that Group B (2019-2022) generally outperformed Group A (2016-2018) in terms of higher average grades, particularly in science.

However, the results of the t-tests for both subjects indicated that these differences were not statistically significant, with p-values much greater than the significance level of 0.05. This suggests that the observed improvements in mean grades are likely due to random chance rather than the schedule change.

While Group B showed positive trends in performance, the increase in lower-performing students in some areas underscores the need for targeted support. Overall, the findings do not provide sufficient evidence to conclude that the Block Schedule had a significant impact on student performance, highlighting the necessity for further research and intervention strategies to support all students.

Capstone Research Question 4

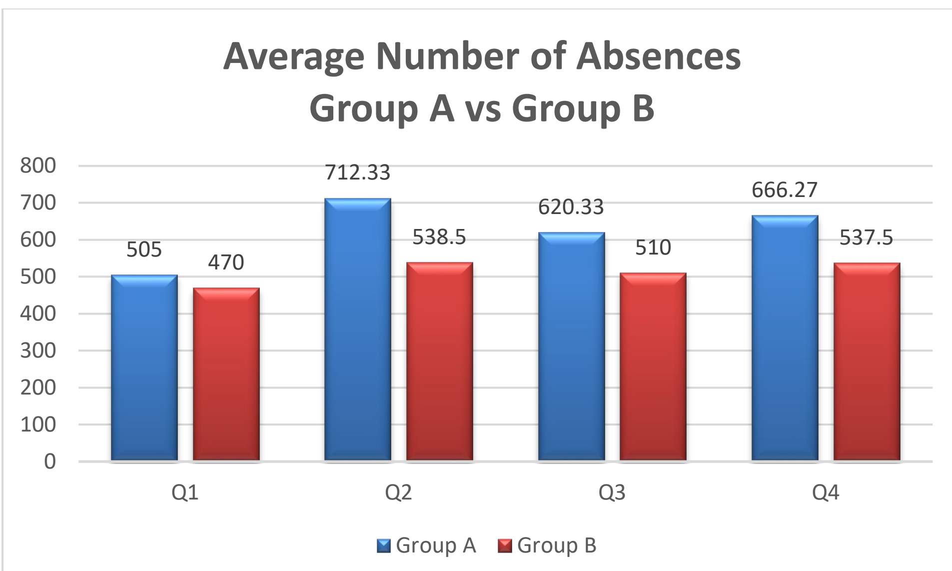
To answer Research Question 4, seven years of student discipline and attendance data was collected to investigate the impact, if any, Block Scheduling mathematics had on these metrics. As with all other data, student attendance and discipline data were collected and categorized into two groups: Group A (Pre-Block Schedule, Years 1-3) and Group B (Post-Block Schedule, Years 4-7).

The graph in Figure 19 illustrates the average number of absences per quarter for both groups. It shows that Group A consistently had higher absences across all quarters compared to Group B. In Q1, Group A had an average of 505 absences, while Group B had 470. The most significant difference is observed in Q2, where Group A's absences average 712.33 compared to Group B's 538.5. This trend continues in Q3 and Q4, with Group A having averages of 620.33 and 666.27 absences respectively, while Group B had 510 and 537.5.

These patterns suggest that the Block Schedule may have contributed to reduced absenteeism, highlighting the need for further investigation to understand and address these underlying causes.

Figure 19

Average Number of Absences Group A vs Group B



The standard deviation of daily attendance within each group was also calculated to provide a better understanding of the consistency of attendance rates before and after the Block Schedule implementation. For Group A (2016-2018), the standard deviation is 77.05, indicating greater variability in attendance. Conversely, Group B (2019-2022) has a standard deviation of 27.86, reflecting lower variability. This suggests that the Block Schedule implementation may have contributed to more consistent attendance rates. Therefore, the Block Schedule may have positively impacted student attendance.

Additionally, the annual attendance rates were calculated to identify the patterns, central tendencies, and variability of student attendance before and after the implementation of the Block Schedule.

The annual attendance rates were calculated by multiplying the student enrollment by the total number of days in the school year to determine the total number of student days. Then, the total number of absences was subtracted to find the total number of days present. Finally, the days present were divided by the total number of student days and multiplied by 100 to obtain the percentage.

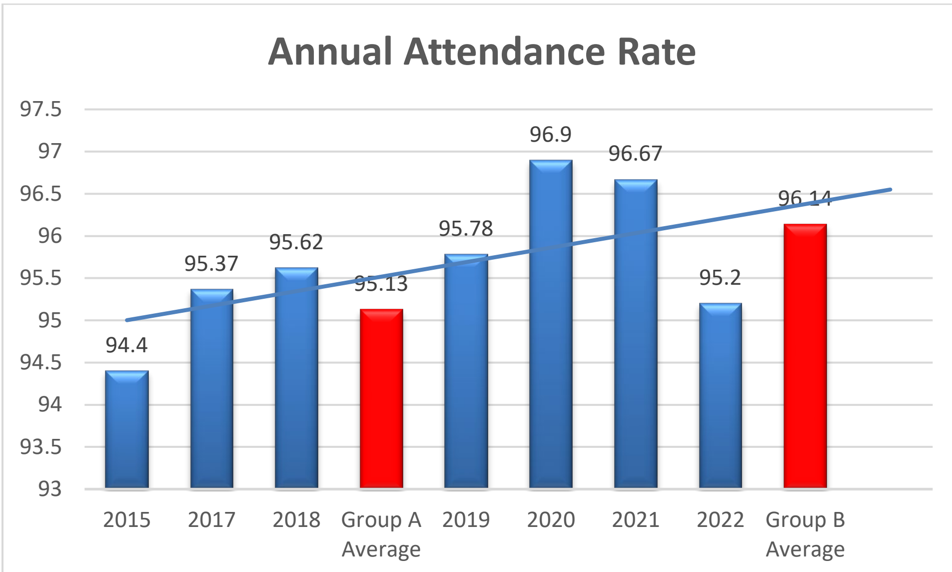
Figure 20 illustrates the average annual attendance rates from 2015 to 2022, showing changes before and after the implementation of the Block Schedule. Group A represents the pre- Block Schedule years (2015-2018) with attendance rates ranging from 94.4% to 95.62% and an average of 95.13%. Group B represents the post- Block Schedule years (2019-2022) with rates between 95.2% and 96.9% and an average of 96.14%. This indicates an improvement in attendance rates post-implementation, with an increase of 1.01%.

Group A exhibited less variability, with a range of 1.22%, whereas Group B showed more variability with a range of 1.7%. Despite this increased variability, the overall trend indicates higher attendance rates during the post- Block Schedule period. The higher average attendance rates and increased variability in Group B suggest that the

Block Schedule may have positively impacted student attendance, warranting further investigation into the specific factors influencing these changes.

Figure 20

Annual Attendance Rate



Student discipline data was also collected and analyzed to investigate the impact, if any, the Block Schedule had on student discipline incident rates. Figure 21 below shows average annual rates. The discipline data rates included are based on the data recorded in the district SIS as a PA State Reportable Incident type coded as a behavior code.

Based on the discipline data, Group B, exhibited higher discipline rates in Q1, Q2, and Q3 compared to Group A. Specifically, Group B's discipline rates were 5.5 in Q1, 7.75 in Q2, and 6.25 in Q3, compared to Group A's rates of 3.66, 5, and 5 respectively. However, in Q4, Group B showed a decrease in discipline rates to 4.25, while Group A had a rate of 5.66.

This data indicates that the Block Schedule had a mixed impact: although it led to a reduction in incidents in Q4, the overall increase in disciplinary actions in the first three quarters suggests a potential negative effect on discipline. The yearly averages further support this interpretation. Group B's average discipline rate was 23.75, higher than Group A's average of 19.33. Thus, the data suggests that the Block Schedule may have had an overall negative impact on discipline for Group B, despite the improvement seen in the final quarter.

Figure 21

Average Discipline Rates Group A vs Group B

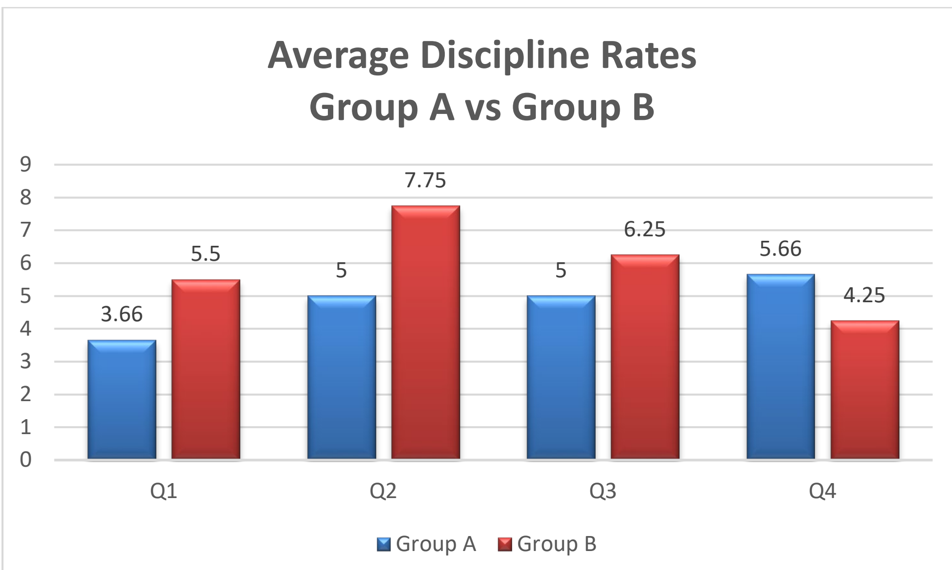


Figure 22 displays the annual incident count from 2016 to 2022, including the averages for Group A (2016-2018) and Group B (2019-2022). The counts are: 11 incidents in 2016, 24 in 2017, 23 in 2018, 30 in 2019, 30 in 2020, 3 in 2021, and 32 in 2022. Group A averaged 19.33 incidents, while Group B averaged 23.75 incidents.

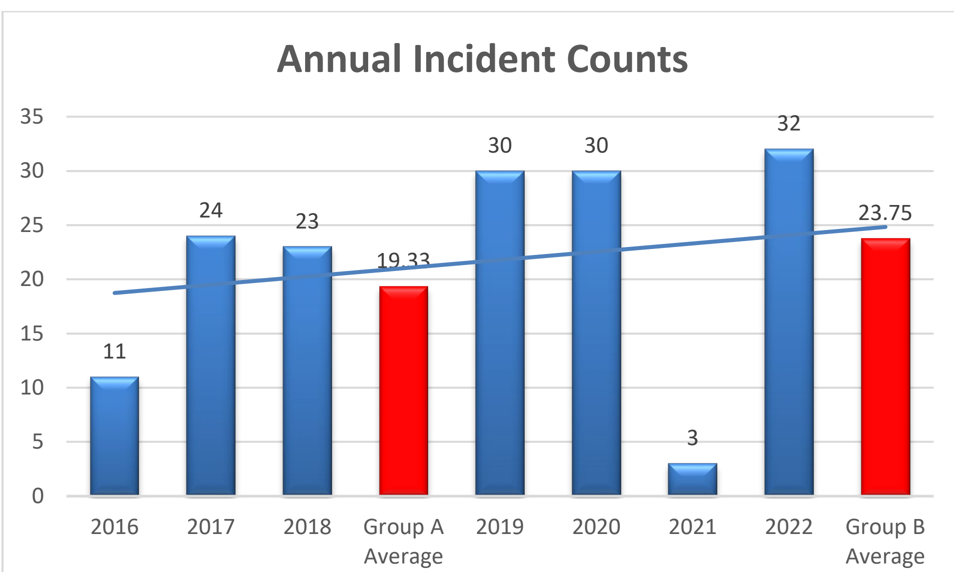
The standard deviation within each group was also calculated to provide a better understanding of the consistency of discipline rates before and after the Block Schedule implementation. For Group A (2016-2018), the standard deviation is 5.9, indicating lower variability in discipline rates. Conversely, Group B (2019-2022) has a standard deviation of 12, reflecting greater variability. This suggests that the Block Schedule implementation may have contributed to less consistent discipline rates. Therefore, the Block Schedule may have negatively impacted student discipline.

The most notable fluctuation is the sharp drop to 3 incidents in 2021, followed by a spike to 32 in 2022. These changes highlight the need to investigate specific events or reporting changes affecting these years.

Overall, this data suggests that the impact of the Block Schedule on incident counts is mixed and warrants further investigation.

Figure 22

Annual Incident Counts



The findings indicate that Block Scheduling may have contributed to reduced absenteeism and more consistent attendance rates, as evidenced by lower average absences and decreased variability in attendance post-implementation. However, the impact on student discipline is more complicated, with an increase in discipline incidents in three out of four quarters following the adoption of the Block Schedule. The mixed results in discipline data suggest that while Block Scheduling might positively influence attendance, its effect on student behavior needs further examination. Overall, these findings underscore the importance of continued investigation to better understand Block Scheduling 's impact on various student outcomes.

Summary

The primary objective of this Capstone project was to evaluate the impact of the schedule change at Palmerton Area Junior High School (PJHS) on student performance data. The study analyzed seven years of data, encompassing three years prior to the schedule implementation and four years following, to evaluate the impact of the modified Block Schedule. The research was guided by four key questions:

1. How does the Block Schedule affect student marking period and year-end grades?
2. How does the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How does the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?
4. How does the Block Schedule affect student discipline and attendance?

Employing quantitative methods, the study analyzed data from student marking period grades, year-end grades, PSSA results, attendance records, and discipline referrals sourced from the Palmerton Area School District's student information system (SIS) and the DRC Insight website. The results indicate that the modified Block Schedule led to improved academic performance. Group B (Post-Block Schedule) outperformed Group A (Pre-Block Schedule) in three out of four quarters and in the yearly average. Group B had higher mean grades in most marking periods, despite a significant drop in Quarter 4 of 2019 due to the COVID-19 closure. The grade distribution analysis showed an increase in A and B grades and a decrease in C and D grades in Group B, though there was also an increase in failing grades, indicating a need for targeted support for lower-performing students. However, a t-test comparing mean grades before and after the schedule change suggests that the improvements might be due to random chance, as the differences were not statistically significant.

In terms of PSSA Mathematics performance, the results again indicate that the modified Block Schedule led to improved academic performance. The analysis revealed an increase in the number of students scoring at the Advanced level in Group B, while performance at the Proficient level remained similar between the two groups. There was also a lower mean number of students scoring Basic in Group B and a reduction in students scoring Below Basic. However, a t-test again indicated no statistically significant difference in the mean percentage of students scoring Advanced or Proficient on the PSSA before and after the schedule change.

The study also analyzed science and social studies grades, subjects still taught using the Traditional Schedule, to assess any indirect effects of the Block Schedule. Again, Group B generally outperformed Group A in science grades, with consistent improvements across most grading periods except for a slight drop in Quarter 3. In social studies, however, Group B showed mixed results, with higher A grades but also an increase in lower-performing students (D and F grades). T-tests for both subjects indicated that the differences in mean grades were not statistically significant.

Regarding discipline and attendance, the study found that Group B had a reduction in absences and more consistent attendance rates, suggesting a positive impact of the Block Schedule on student attendance. However, there was an overall increase in discipline incidents in three out of four quarters for Group B, indicating a potential negative impact on student behavior. These mixed results highlight the need for further research to fully understand the implications of the Block Schedule on student discipline and to identify strategies to mitigate any negative effects.

In conclusion, the modified Block Schedule appears to have positively influenced academic performance and attendance at PJHS, while its impact on discipline is more complex and requires further investigation. These findings underscore the necessity for continued research and targeted interventions to support all students.

CHAPTER V

Conclusions and Recommendations

This chapter presents the conclusions and recommendations from evaluating the impact of the Block Schedule implementation on student performance at Palmerton Area Junior High School (PJHS). The goal of this Doctoral Capstone project was to assess how the schedule change affected students' academic and nonacademic performance over seven years, including three years before and four years after implementation. By comparing data from before and after the schedule change, this study aims to provide insights into the effectiveness of the schedule and offer recommendations for future decisions at PJHS.

The research was guided by four key questions:

1. How does the Block Schedule affect student marking period and year-end grades?
2. How does the Block Schedule affect the number of students receiving Advanced or Proficient on the Mathematics PSSA?
3. How does the Block Schedule affect students' mathematics grades compared to courses still taught using a Traditional Schedule?
4. How does the Block Schedule affect student discipline and attendance?

To address these questions, the study employed quantitative methods, analyzing a collection of data that included student grades, PSSA results, attendance records, and discipline referrals. This data was sourced from the Palmerton Area School District's student information system (SIS) and the DRC Insight website. The subsequent analysis provided an examination of the academic and nonacademic impact of the schedule change, offering insight into its effectiveness.

The conclusions drawn from this study underline key trends observed in the data, providing a basis for informed recommendations. The following sections will explore the specific conclusions for each research question, followed by recommendations to support ongoing improvements at PJHS.

Conclusions

Capstone Research Question 1

The implementation of the Block Schedule appears to have positively impacted student performance at the PJHS. The data analysis reveals that Group B, representing the post- Block Schedule period, outperformed Group A, the pre- Block Schedule period, in three out of four quarters and in the overall yearly average. Despite the negative impact of the COVID-19 pandemic on Quarter 4, Group B's overall yearly average was higher than Group A's, suggesting that the Block Schedule contributed to better student performance.

Additionally, the grade distribution analysis for Quarters 1 and 2 shows significant increases in the number of students earning A and B grades and decreases in the number of students earning C, D, and F grades for Group B. Similar trends were observed in Quarters 3 and 4, indicating more students achieving higher grades and fewer receiving lower grades post- Block Schedule. These consistent trends across different quarters support the conclusion that Block Scheduling positively affected student performance. However, the results of the t-test indicate that the differences in mean grades between Group A and Group B were not statistically significant, suggesting that the improvements might be due to random variation rather than the intervention itself.

Capstone Research Question 2

The implementation of the Block Schedule has shown varying effects on student performance on the Mathematics PSSA. Data indicates a notable improvement at the Advanced level, with an increase in the average number of students scoring Advanced in Group B (Post-Block Schedule) compared to Group A (Pre-Block Schedule). This suggests that the Block Schedule has positively impacted higher-performing students. The Proficient level scores remained relatively consistent, with Group B showing a slight increase, indicating that student performance at this level was maintained after the schedule change. Additionally, there was a slight reduction in the number of students scoring at the Basic level and a significant decrease in those scoring Below Basic in Group B, highlighting a positive trend for lower-performing students. However, the number of students with no scores increased significantly in Group B, likely due to the COVID-19 pandemic, which introduces variability that requires further investigation.

These conclusions are well-supported by the data analysis. The comparison of the mean number and percentage of students at each performance level before and after the Block Schedule implementation reveals clear trends. The increase in Advanced scores and the slight rise in Proficient scores suggest that the Block Schedule has either maintained or improved performance levels. The reduction in Basic and Below Basic scores further supports the effectiveness of the intervention in assisting lower-performing students. The increase in no scores, primarily attributed to the pandemic, aligns with external disruptions impacting the data.

Capstone Research Question 3

The analysis of the academic data in science and social studies reveals mixed outcomes regarding the impact of the Block Schedule on those subjects still taught using the Traditional Schedule. In science, students in Group B (Post-Block Schedule) generally outperformed those in Group A (Pre-Block Schedule) across most quarters, except for the third quarter, with significant improvement in year-end averages. However, the t-test results indicated that these differences were not statistically significant, with a p-value of 0.805, suggesting that the improvements are likely due to random chance rather than the Block Scheduling intervention. Similarly, in social studies, Group B showed slightly better performance in the latter quarters and year-end averages. Despite these positive trends, the t-test results for social studies also produced a p-value of 0.3408, indicating no statistically significant difference between the two groups. These findings imply that while Block Scheduling may have some positive effects, the overall impact on student performance is not statistically significant.

Capstone Research Question 4

The analysis of attendance data reveals that Block Scheduling has had a positive impact on student attendance. The data shows that the average number of absences per quarter was consistently lower for Group B (Post-Block Schedule) compared to Group A (Pre-Block Schedule). For instance, in Q2, Group A had an average of 712.33 absences, whereas Group B had 538.5. Additionally, the standard deviation of daily attendance within each group demonstrated that Group B experienced more consistent attendance rates, with a standard deviation of 27.86 compared to Group A's 77.05. The annual attendance rates further validate these findings, with Group B showing an improved average attendance rate of 96.14%, an increase from Group A's 95.13%. These results support the conclusion that Block Scheduling positively influences student attendance, as evidenced by reduced absences and more consistent attendance patterns.

In contrast, the impact of Block Scheduling on student discipline appears to be mixed. While there was a notable reduction in disciplinary incidents in Q4 for Group B, with an average of 4.25 incidents compared to Group A's 5.66, the overall discipline rates in Q1, Q2, and Q3 were higher for Group B. The annual averages also reflect this trend, with Group B averaging 23.75 incidents compared to Group A's 19.33. The standard deviation indicates greater variability in discipline rates post- Block Scheduling, with Group B having a standard deviation of 12 compared to Group A's 5.9. These results suggest that while Block Scheduling may reduce disciplinary incidents in the later part of the school year, it could potentially lead to an increase in incidents during the earlier quarters.

Limitations

In conducting this study on the impact of implementing a Block Schedule for mathematics at Palmerton Area Junior High School, several aspects of the research design and methodology, as well as external factors, influenced the interpretation of findings.

Firstly, the use of quantitative methods provided a structured approach to analyzing large datasets of student performance, attendance, and discipline records over a seven-year period. This methodology enabled statistical analysis, including descriptive statistics and inferential tests like t-tests, to evaluate changes in student performance before and after the schedule change. By focusing on numerical trends and statistical significance, the study objectively quantified the impact of the Block Schedule on both academic performance and non-academic indicators.

However, the reliance on quantitative data alone also posed limitations. The emphasis on numerical outcomes through standardized assessments and organizational records meant that qualitative dimensions, such as the detailed experiences of students and teachers with the Block Schedule, were not fully captured. This bias towards numerical data may have concealed potential qualitative insights into how the schedule change influenced teaching practices, student engagement, or school climate.

External factors also played a role in influencing the interpretation of findings. After the implementation of the Block Schedule, two teachers taught Mathematics, introducing variability in teaching practices that could influence student outcomes. Additionally, the COVID-19 closure occurred during the post-implementation period, followed by a hybrid schedule in the subsequent year. These significant disruptions likely impacted student performance and behavior independently of the Block Schedule change. These external variables, while not directly controlled in the study, needed acknowledgment as they could affect the observed outcomes.

In summary, while using numbers and statistics helped analyze data trends effectively, the study's design and outside factors also influenced how the results were interpreted. Recognizing these research methods and outside influences is essential for fully understanding how the modified Block Schedule affected student outcomes at Palmerton Area Junior High School.

Recommendations for Future Research

Based on the results and conclusions of this study, several areas stand out as needing additional research to address unanswered questions. Future research should aim to provide a more comprehensive understanding of the effects of Block Schedule implementation on student performance.

To better understand the long-term effects of Block Scheduling, future research should track groups of students over several years. This approach would help identify trends and patterns that might not be visible in shorter studies. The focus should be on long-term academic performance in different subjects, graduation rates, and the ongoing effects on student discipline and attendance.

Along with analyzing numbers, methods like interviews, focus groups, and case studies should be used to understand the detailed experiences of students, teachers, and administrators. This approach would provide a deeper understanding of the data and help explain the reasons behind the observed trends. It would be especially useful for understanding how students and teachers feel about the Block Schedule, its effect on classroom interactions, and the challenges and benefits perceived by different stakeholders.

The success of any scheduling model depends on how prepared and supported the teachers are. Future studies should evaluate professional development programs that help teachers adapt to Block Scheduling. This includes looking at teacher training and support programs, the needs and effectiveness of professional development, and how teachers plan their instruction.

While this study focused on academic performance, future research should also look at broader non-academic outcomes of Block Scheduling, such as student well-being, mental health, and social-emotional development.

The modified Block Schedule at PJHS has shown promising results in improving academic performance and attendance, with mixed outcomes on student discipline. Future research should build on these findings by exploring long-term impacts, qualitative experiences, and effects on specific student populations. Addressing these areas can help educators make better decisions to improve the effectiveness of Block Scheduling and support overall student success.

Summary

This Doctoral Capstone project aimed to evaluate the impact of the Block Schedule implementation on student performance at Palmerton Area Junior High School (PJHS) by analyzing academic and non-academic data over a seven-year period, including three years before and four years after the schedule change. The study explored four key areas, including the impact of Block Scheduling on student grades, Mathematics PSSA performance, a comparison of mathematics grades to Traditional Schedules, and the influence on student discipline and attendance.

The findings indicate that the Block Schedule positively impacted student performance, with improved overall grades and increased numbers of students earning A and B grades. However, the t-test results suggested that these improvements were not statistically significant, possibly due to random variation. Performance on the Mathematics PSSA showed a notable increase in Advanced scores, slight improvement in Proficient scores, and a decrease in Basic and Below Basic scores, despite a rise in the number of students with no scores due to the COVID-19 pandemic. In science and social studies, subjects still taught traditionally, Group B (post- Block Schedule) showed improved performance, but these results were also not statistically significant. Attendance improved significantly under the Block Schedule, with fewer absences and more consistent attendance rates. However, the impact on student discipline was mixed, with reduced incidents in the later part of the school year but increased incidents in the earlier quarters.

The study's reliance on quantitative methods provided a structured approach to data analysis but limited the understanding of qualitative aspects such as student and teacher experiences with the Block Schedule. External factors like the COVID-19 pandemic and variations in teaching practices also influenced the findings.

In conclusion, the modified Block Schedule at PJHS has shown promising results in enhancing academic performance and attendance, with mixed effects on discipline. Future research should focus on long-term impacts, incorporating qualitative methods to capture detailed experiences, and evaluating teacher training and support programs. By addressing these areas, educators can make more informed decisions to enhance the effectiveness of Block Scheduling and support overall student success.

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APPENDICES

Appendix A

IRB Approval

Institutional Review Board
California University of Pennsylvania
Morgan Hall, 310
250 University Avenue
California, PA 15419
instreviewboard@calu.edu
Melissa Sovak, Ph.D.

Dear Daniel,

Please consider this email as official notification that your proposal titled "Evaluating the Impact of Block Scheduling Mathematics at the Palmerton Area Junior High School" (Proposal #20-052) has been approved by the California University of Pennsylvania Institutional Review Board as submitted.

The effective date of approval is 9/10/21 and the expiration date is 9/9/22. These dates must appear on the consent form.

Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:

(1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)

(2) Any events that affect the safety or well-being of subjects

(3) Any modifications of your study or other responses that are necessitated by any events reported in (2).

(4) To continue your research beyond the approval expiration date of 8/12/22 you must file additional information to be considered for continuing review. Please contact instreviewboard@calu.edu

Please notify the Board when data collection is complete.

Regards,

Melissa Sovak, PhD.
Chair, Institutional Review Board

Appendix B

IRB Approval Extension

Re: IRB Review Request

Melissa Sovak <sovak@pennwest.edu>
Sat 9/16/2023 7:20 AM
To:Daniel Heaney <hea3849@pennwest.edu>;InstReviewBoard <InstReviewBoard@pennwest.edu>

Approved. You have an extension of your original study until 9/15/2024.

Appendix C

Raw Academic Data Collection Form

YEAR: 2016						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2016						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2016						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2017						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2017						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2017						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2018						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2018						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2018						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2019						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2019						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2019						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2020						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2020						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2020						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2021						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2021						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2021						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2022						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Math	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2022						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
Science	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

YEAR: 2022						
Subject	**Grade**	**Q1**	**Q2**	**Q3**	**Q4**	**Y1**
S. S.	A (90-100)					
	B (80-89)					
	C (70-79)					
	D (60-69)					
	F (0-59)					

Appendix D

PSSA Raw Data Collection Form

YEAR: 2016			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2017			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2018			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2019			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2020			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2021			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

YEAR: 2022			
Subject	**Performance**	**# of Students**	**% of Students**
PSSA			
Mathematics			

Appendix E

Raw Nonacademic Data Collection Form

YEAR: 2016						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2017						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2018						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2019						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2020						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2021						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					

YEAR: 2022						
		Q1	**Q2**	**Q3**	**Q4**	**Y1**
	Absences					
	Discipline					