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Delaying School Start time at One High School and its Impact on Attendance

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Delaying School Start time at One High School and its Impact on Attendance

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Abstract

About 10 percent of high schools in the country start at or before 7:30 (Kelley, 2016). Other research have shown that this early start time may interfere with students' sleep cycles (Carrell, Maghakian, & West, 2010). This research study is a secondary analysis of preexisting attendance data. The study was conducted at an urban high school in Upstate New York to determine if delaying the school start time by one half hour has an impact on student attendance. The data for this study was collected by the school and anonymously given to the researcher. The average daily attendance results, in percentage form, were split by grade level and broken up by month. This research is important because delaying the school start time may lead to an increase in student attendance, and may also be more reflective of a start time students would see in college or in a career.

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Chapter One – Introduction

Problem Statement

Adolescents have self-reported, and studies have shown, that they do not receive adequate amounts of sleep on a daily basis (O'Brien, 2009). This problem is now compounded by the majority of middle and high school students being required to wake up and report to school at an earlier than the normal work hours, i.e. 8:00 AM (Owens, Belon, & Moss, 2010). This lack of sleep by schools requiring earlier than 8:00 start time has resulted in students not attending school as regularly as those that attain an adequate amount of sleep every night.

Significance of Problem

The classroom is a place where students are introduced to complex concepts and procedures (Skemp, 2006; Adler, 1998). These tasks are not easily understood nor comprehended by individuals who are alert, awake, and focused: let alone individuals who are constantly tired and struggling to stay awake. Studies have shown that when the human body is tired, it does not perform at as high of a level (Lamberg, 2009). Translate that to the classroom, and our tired students are not going to be performing as highly as they would with some extra sleep. This lack of performance leads to discouragement and lack of attendance (Owens, Belon, & Moss, 2010). Being tired also leads to students sleeping in and skipping earlier periods or entire days.

Purpose

The purpose for this thesis is to determine if delaying the school day by half an hour will enhance student attendance and promptness to school. It will be conducted at an urban public school in upstate New York serving a lower socioeconomic population. The study will compare average daily attendance along with first period attendance from the year in which the school day

started at 7:30 am to the next year where the school day started at 8:00 am. The 8:00 AM start time is more in line with future expectations students will face in their college and career.

Rationale

By delaying the school day by half an hour, we are hoping to provide students with about 30 minutes of extra sleep each night (Lamberg, 2009). Chances are, students will still go to bed around the same time, but will now be capable of sleeping in an extra 30 minutes each morning. This extra sleep should provide the students with more energy and focus (Wolfson & Carskadon, 1998). The idea is that this enhancement will allow students to be more alert (awake) in class. By being more awake, students will be more apt to participate and engage in the curriculum because their cognitive ability will be higher from the extra sleep (Danner & Phillips, 2008). This engagement should lead to a more positive student perception of the classroom and the learning environment. Increased engagement, alertness, and a positive outlook are all factors that should, in turn, enhance student attendance (Simpson, 2009).

Background of the Researcher

In May of 2013, I graduated with my B.S. in Mathematics and was certified to teach mathematics 5-12 grade and special education all subjects 7-12. I accepted a full time Mathematics position in the fall of 2013 in an urban school district. My first year teaching was in a K-8 building teaching 7th and 8th grade Mathematics. I am currently a third year teacher in that district and for the past two years, I have worked at the high school of which this study is focusing on. I am in the final stages of obtaining my M.S. in Adolescent Mathematics Education from the College at Brockport. I believe that engaged and awake students lead to healthy discourse in the classroom, thus allowing for a collaborative higher-level learning environment. This positive environment will in-turn add to increased attendance numbers across grade levels.

Definitions

Average Daily Attendance: The percentage of days a given student attends at least one class.

This is given by the equation $ADA(Student) = \frac{\text{number of days a student shows up}}{\text{number of school days}} \times 100$.

Absent: A student is considered absent for a day if and only if he or she misses every class period for that given day.

Chapter 2 – Literature Review

Adolescents require about nine to nine and a half hours of sleep per night and a study has shown that about 80% of adolescents do not receive adequate sleep on a daily basis (Owens, Belon, & Moss, 2010). Juniors and seniors have self-reported that they enjoy staying up later: many of these not going to bed until after midnight (Wolfson & Carskadon, 1998). The same study showed that high school students receive two extra hours of sleep each night on the weekend. Since students that receive more sleep, tend to be more alert in school: the investigation of the possible impact of delaying school start times has commenced. Previous action research studies have shown that students are more alert and focused with an extra hour of sleep (Dexter, Bijwadia, Schilling, & Applebaugh, 2003). These statistics have encouraged researchers to look into the school's role of adequate sleep time: does starting the school day later allow students to sleep more?

Results of Adequate or Inadequate Sleep

Before determining if school start time effects sleep habits, it is important to recognize and state the benefits of students receiving an adequate amount of sleep. Lack of sleep in adolescents has led to many cognitive issues and a deficit in academic performance (Kirby, Maggi, & D'Angiulli, 2011). Students who receive less sleep per night are more prone to have lapses in memory and poor decision-making (Lamberg, 2009). The ability to memorize is critical to the high school student because information presented in school, with practice, should become automatized, leading to memorization. Cognitive load theory defines learning as a permanent change in long-term memory, which aligns with material that has been automatized, or memorized (Van Merriënboer, Kester, & Paas, 2006). If students struggle with recalling information from long term memory then learning, and ultimately, success in the classroom will

be difficult (Baddeley, 1992). Lack of sleep effects memorization and cognitive functioning throughout the school day: thus impacting student overall performance in school (Kirby, Maggi, & D'Angiulli, 2011).

According to one study, students who received about nine hours of sleep self-reported that they were in a better mood and had a more positive outlook on the day (Owens, Belon, & Moss, 2010). In comparison: adolescents who lacked sleep had an increase in high risk behaviors and depression (O'Malley & O'Malley, 2010). Students with a positive outlook are more apt to participate in school and be an active learner in the classroom. With more sleep, this participation would be amplified because the attitude of the student would be more conducive for participation. More sleep can translate to students having a better focus in the academic setting: an increase in participation precipitates an increase in academic performance (Isham, Narayan, & Pritchett, 1995). A lack of sleep has also been correlated to an increase of stress during the day and leads to poor coping methods of dealing with the stress (Wolfson & Carskadon, 1998). Also, when students are in crisis, their academic performance is more likely to drop (Moore & Lackney, 1993). Schools seek to support students in crisis situations yet all students are expected to meet classroom requirements, assignments, and expectations. The goal is to support students and seek to minimize external stressors from students' lives, as much as possible, in hopes of supporting learning in the classroom. By sleeping more, students are less likely to be under stress and are more likely to enjoy the educational experience.

Introduction to the Problem

Lack of sleep is becoming an increasing problem among adolescents, thanks to technology. A recent study has shown that 97% of adolescents have at least one electronic device in their bedroom (cell phone, television, I-pad): twelfth graders averaged about four such

devices (Lamberg, 2009). Lamberg (2009) also states the students with at least one electronic device were found to lose 30 minutes of sleep each night in comparison to their other peers. This trend is expected to spiral upward with the increase of technology in the lives of adolescents. Cell phones keep students in constant contact with their peers, television has students staying up later to watch shows, and tablets allow students to check Facebook or Twitter through all hours of the night. As students reach high school, parents loosen their restrictions on bedtime thus leading to students who stay up later on school nights (Lamberg, 2009). Other distractors from sleep include extra-curricular activities and part-time jobs. Students who work 20 or more hours a week have conveyed that they do not receive an adequate amount of sleep on a nightly basis (O'Malley & O'Malley, 2010). Often, some of these students work the mid-night shift so they can attend school during the day. Distractions, such as technology and work, contribute to students losing sleep, and compounds the issues of early school start time.

The Biology of Sleep

Biological factors also play a major role in determining what school start time is the best. Melatonin, the sleep-inducing hormone, reaches its peak in adults around 4 AM but in adolescents it peaks around 7:00 AM (Carrell, Maghakian, & West, 2010). This means our bodies are telling most adults to be sleepiest around 4:00 AM and most adolescents to be sleepiest around 7:00 AM. Knowing this we are able to conclude that an adolescent required to wake up around 7:00 AM is the equivalent to an adult waking up around 4:00 AM. When a school starts around 7:15 AM, students are required to be alert and focused in their first period class while their body is telling them that it is time to sleep (Kelley, 2016). This internal battle is raging while the teacher is trying to convey rigorous instruction and dictating important concepts

and procedures. At this point, the student is struggling to stay awake while he or she is expected to retain critical information necessary for learning and high school graduation.

Students try to counter this issue by falling sleep earlier, but the body's circadian (sleep) cycle will not easily adapt to changes in sleep behaviors (Carrell, Maghakian, & West, 2010). Slight changes can be made, but it is extremely difficult to override this natural cycle. Falling asleep early is not an easy option for adolescents because the body finds it more difficult to fall asleep when it wants to be awake (Carrell, Maghakian, & West, 2010). When there is nothing causing students to wake up at a time that is contrary to the circadian cycle students will sleep more. The same study compared the sleep habits between summer and school time months finding that students lose around two hours of sleep per night during the school year (Carrell, Maghakian, & West, 2010).

Amount of Sleep in Relation to Performance

In a different, unrelated study, a school delayed the academic day by one hour and found motor vehicle accidents decreased by 16.5% in juxtaposition to a 7.8% increase across the state during the same time period (Danner & Phillips, 2008). Though this does not show an academic correlation, it can be argued that a reduction in car accidents can be attributed to an increase in focus. This focus is correlated to these students receiving an extra hour of sleep each night. It is also reasonable to assume that the focus would be prevalent in the classroom, resulting in a higher achievement rate for these adolescents. This study was duplicated in Virginia finding that the county with the later school start reported 4.5 times less accidents in students 16-18 years of age (Vorona, et al., 2011). The results of both studies are statistically significant enough to show a correlation between sleep duration and alertness and focus.

Studies on Delaying School Start Time

A study in Minnesota showed significant impact on student alertness by delaying school start time past 8:30 am (O'Malley & O'Malley, 2010). Teachers reported that they “never saw the students more alert” and the school environment seemed “calmer.” O'Malley and O'Malley (2010) also reported: attendance increased and students were less likely to show up to school late. This study also showed a significant increase in academic achievement for late start schools (8:30 and later) in comparison to their early start counterparts (7:00-7:30 AM). These statistics can be attributed to the 34 minutes of extra sleep that late start students averaged per night. With some of the concerns addressed earlier being nullified by more sleep, the students were able to focus more on their academics and performance.

Another discovery researchers made was the increase in students who remained at the same high school for their entire academic career (Wahistrom, 2002). Consistency is important for students to be successful. By staying in one school students are not challenged to learn new school rules or expectations, their friends remain the same, and faculty and staff members are able to create a relationship that can last across grade levels. If students are able to develop a meaningful relationship with a faculty or staff member they most likely have someone they can go to for help or consultation. School consistency creates a safer feeling environment for students and can also motivate them to work harder because they have a vested interest in the school (Moore & Lackney, 1993). The district that the study focused on had open enrollment and school choice, yet with the later start times students tended to stay in one place (Wahistrom, 2002). This can be attributed to being more alert, having a more positive outlook, and feeling more comfortable in the school environment.

Additionally, Wahistrom (2002) stated that attendance increased overall, but when broken into subgroups the statistic becomes more insightful. Late start schools did not have a

significant impact on the students who continuously attended the same high school, but had a large positive impact on those that were not continuously enrolled in the same school. Those that stayed at the same school were attributed to having more persistence and would have finished high school no matter what time it started. Many of those that transferred schools because of the start time felt they would be more successful if they could sleep in a little more (Wahistrom, 2002). This thought process is directly correlated to the teachers' report of a more focused and calm environment. When students actively choose a school, it instills a drive to learn because they made the decision independently. Students that are given school choice take ownership of that decision and are more willing to become involved in the academic process.

A similar study in Rhode Island corroborates these findings. By delaying school one hour they found that absences and tardiness declined by 45% (Owens, Belon, & Moss, 2010). Not only were school absences down, but individual class absences decreased too. The health center at the school found an 11% decrease in fatigue related cases (Owens, Belon, & Moss, 2010). This resulted in more students attending class and more opportunities for them to be engaged with the learning materials.

Though the Minnesota study found a positive influx in attendance, school climate, and school continuity, the same could not be said for letter grades. Though the late start schools showed a slight increase in performance grades, they could not be deemed as statistically significant (Wahistrom, 2002). There are many factors that go into performance grades and much of the variability causes them to not be as statistically significant. For instance many grades are based on teachers' grading policies, and, unless schools have standardized grading policies, each teacher grades differently. Grades trended up slightly, but not enough to say the late start time made a major difference.

Qualitative Feedback from Studies

Student interviews from the Wahistrom (2002) study showed many of the major components that factor into when the school day should start. Students (from late start schools) reported that they received more sleep at night and no longer fall asleep in class. Students also reported that their stress level has decreased, but they did not feel a major impact on their grades. The issues students reported was that with sports: practice time, and some games, would cut into their last period class, causing them to miss quality instruction. Students also felt that when they got home and finished their homework, there was not much time left to do anything. Many reported that it would be nice to have more time in the afternoon to participate in activities, but it was nice to receive some extra sleep each night (Wahistrom, 2002).

Teacher responses were insightful into the behavior of their students. Teachers reported that students from late start schools were more alert and attentive during the first two periods of the day (Wahistrom, 2002). The results, however, were divided on the issue of the number of students falling asleep in class and the benefit to their professional teaching practices. Most teachers reported they liked the later start time juxtaposed to the coaches who preferred the earlier start time (Wahistrom, 2002).

Conclusion

Delaying school start times for adolescents has its benefits and downfalls. Much of the current research has shown extremely important positive correlations between student perceptions and delaying the start of the academic day. Mood, alertness, focus, and attendance are all positively increased when the school day starts at least an hour later (Dexter, Bijwadia, Schilling, & Applebaugh 2003). The issues tend to arise when dealing with conflicts of after-school activities and sports. By starting the day an hour later, the day must end an hour later,

resulting in scheduling conflicts between the academic day and afterschool games and practices. The significant statistic found by the survey is that grades were not majorly effected by school start time (Wahistrom, 2002), an intriguing fact since focus and alertness is positively affected by the later start. While the debate continues about what time school should start, the decision should be made with the students' best interest in mind. Like most educational research, the data does not give a clear answer to the question but important results to consider. It may be that one school start time does not fit all schools, but it is important to consider what start time would be beneficial for most students.

All of this previous research has sparked an interest in the educational community. Are these studies the rule or the exception? Does this only work for a certain population, or for everyone? Does delaying the school start time only work in certain regions, or all across America? This paper is investigates performance of students at an urban school in upstate New York before and after a delayed school start time.

Chapter Three – Study Design

Introduction to Study

This research is from an urban high school in upstate New York. The school had notoriously struggled with attendance issues. After being introduced to similar research as shown in chapter two, the school decided to delay the start of the school day by one half hour.

While there are many variables that affect student attendance, delayed start time is the focus of this research. Instead of trying to look at multiple consequences of the time change, this study has narrowed the window to its effects on attendance. The research question is, while research has shown that delaying the school start time leads to more alert and focused students, do these changes also correlate with increasing the student attendance across all grade levels?

Important Note

Looking at the different factors on student attendance, this study was designed to determine the effects of delaying the school day one half hour. It is important to note that in each sequential year, schools are constantly attempting to better themselves in order to better serve our students: the school being studied obviously falls into this category. It is imperative to observe that all data reported in this study cannot be solely attributed to the delay in school start time due to the variability between school years. Schools may: put new systems in place; hire new staff members; add additional instructional periods; or attempt to change the culture of the school for the better. All of these attempts may skew the data some, but the major change between school years is the delay in school start time, which is the focus of this research.

Procedure

The study compares the average daily attendance gains between a control and experimental group. This research will compare the attendance by comparing grade level, to the previous year's data. The population was split into a control group and experimental group to

provide clarity on the effects of delaying the start time. The control group consisted of the seventh and eighth grade population. In the previous year all grade levels, seventh through twelfth, started at 7:30 AM. In the 2015-2016 school year, the seventh and eighth grades began at this same time, but the ninth through twelfth grades, considered as the experimental group, started at 8:00 AM. This study compared the attendance gains of the control group to that of the experimental group thus providing a stronger lens on the effects of delaying the school start time.

Analysis considered gains in average daily attendance between year one (2014-2015) and year two (2015-2016). The data will be collected from the school’s Principal of Data and Accountability. The data provided the researcher with percentage values (broken up by grade level) to represent each month. For instance under 7th grade data the researcher may receive a table like seen below.

Table 1:

<i>Seventh Grade Average Daily Attendance 2015-2016</i>						
September	October	November	December	January	February	March
98%	97%	98%	95%	92%	94%	91%

It is critical to understand what the percentages in Table 1 represent. To do so, we must formally develop a definition for absent. The computer will inspect each student and look for a date in November that the given student missed every class for that day, and that student is then considered absent for that day. To compute a 98% in November would take four steps:

1. Take the number of all the 7th graders and multiply that by the number of school days in November.

2. Subtract the number of total absences in November from the number you obtained in step one.
3. Take the difference in step two and divide it by the product determined in step one.
4. Take this quotient found in step three and multiply it by 100 to obtain the average daily attendance for the month.

In order to see a year by year comparison a similar table for 7th grade attendance from the previous school year (2014-2015) is presented in Table 2. The two tables will be merged to form a table as seen below.

Table 2:

Seventh Grade Average Daily Attendance

Year	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2014-	87%	87%	85%	82%	83%	81%	83%	84%	83%
2015									
2015-	96%	96%	95%	93%	92%	93%	91%	94%	93%
2016									

The study compares the percentage gains across the different months to determine if there was a month in which there were major gains, or if there is a pattern of growth across the months. This data will be put in a master table as shown below.

The next step is to average the percentage gains and determine if a certain grade level has shown more growth in attendance than any of the others. The study will also compare the 7th and 8th grade gains to those of the high school. This analysis will provide the strongest evidence into whether or not delaying the school start time has increased attendance.

Table 3:

Percentage Increases per Grade Level

Grade Level	September	October	November	December	January	February	March
7	+9%	+9%	+10%	+11%	+9%	+12%	+8%
8	+2%	+2%	+6%	+9%	+8%	+7%	+0%
9	-5%	+2%	+3%	+5%	+9%	+10%	+6%
10	-1%	+3%	+4%	+4%	+5%	+7%	+4%
11	+5%	+6%	+4%	+1%	+5%	+6%	+1%
12	+1%	+1%	+2%	+0%	+4%	+5%	+0%

The study also contains a section on tracking a certain group. For instance the 2014-2015 year’s ninth graders should represent a statistically significant population of the 2015-2016 tenth graders. Therefore the study was able to determine if the data revealed any statistically significant growth between the data from a grade level in the 2014-2015 year and the data from the next sequential grade in the 2015-2016 school year. For example in September, 2014 the 9th graders had a 74% average attendance rate and in September of 2015, tenth graders have an 80% average attendance rate for the month. This shows for that particular group of students, 4% more of their population attended school in September of 2015-2016 than in the previous school year. If every cohort is examined by month, groups of students can be tracked to determine if the delay in school start time had a major, minor, or no impact on student attendance.

Chapter 4 – Data Analysis

Month By Month Data Analysis

The data from the study was broken up by months, allowing the researcher to eliminate any extraneous months that do not follow the trend of the other data. Other community factors or events could diminish or increase school attendance for a given month. For example, December tends to be a month with lower attendance rates in both groups because of the holidays, but April is a larger attendance month for middle school because of state testing. In splitting the data by months, the April attendance bump in the control group can be easily seen and its effects can be weighted accordingly. By inspecting the monthly intervals as a progression of time: the researcher is able to determine if the data is consistent throughout the entire year.

The tables below contains the average percent that the student population, for a given grade level, attended school. This data was used to analyze the data for the entire study. The study divided the data into different time intervals, and also considered cohort years along with grade level comparisons. All of the attendance data received from the school has been compiled in the tables below.

The data below included every ninth grader at the school. Because of the significant amount of ninth graders who do not receive enough high school credits to move on to tenth grade, the ninth grade data is split into two groups. Group 1 contains the continuing ninth graders (those that failed ninth grade the year before), and data group 2 is comprised of the new ninth graders (first year in ninth grade). Unfortunately, for this school, the ninth grade data was only separated for the 2015-2016 school year. In the 2014-2015 year the data for ninth graders was combined into only one category. This does slightly diminish the ninth grade data, but still

2015- 2016	80%	82%	82%	80%	80%	80%	81%	82%	80%
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Eleventh Grade Average Daily Attendance

Year	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2014- 2015	82%	82%	85%	84%	80%	80%	83%	81%	81%
2015- 2016	87%	88%	89%	85%	85%	86%	84%	85%	84%

Twelfth Grade Average Daily Attendance

Year	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2014- 2015	83%	82%	81%	79%	76%	75%	80%	80%	81%
2015- 2016	84%	83%	83%	79%	80%	80%	80%	81%	79%

Comparison By Class Data Analysis

After compiling the figures listed above, the study compared the monthly data in successive years broken up by grade level. If the percentage in the 2015-2016 school year was higher, the percentage increase will show positive. If the 2014-2015 school year percentage is higher, the percentage increase will show negative. Below is the compilation of all the percentage increases and decreases for each month broken up by grade level.

Table 7:

Percentage Increases and Decreases by Grade Level

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
7 th Grade	+9%	+9%	+10%	+11%	+9%	+12%	+8%	+10%	+10%
8 th Grade	+2%	+2%	+6%	+9%	+8%	+7%	+0%	-1%	-2%
9 th grade	-5%	+2%	+3%	+5%	+9%	+10%	+6%	+7%	+8%
10 th Grade	-1%	+3%	+4%	+4%	+5%	+7%	+4%	+5%	+6%
11 th Grade	+5%	+6%	+4%	+1%	+5%	+6%	+1%	+4%	+3%
12 th Grade	+1%	+1%	+2%	+0%	+4%	+5%	+0%	+1%	-2%

Average Percentage Increase by Grade Level

It is imperative to consolidate the percentages above in order to provide an overall view of the attendance changes per grade level. To do this, the percentage gains were averaged and compiled in the table below. This compilation gives us a holistic view of each grade level for the entire year. This afforded the opportunity to compare and contrast grade levels with the view of the entire year. Since each year is comprised of nine months, the researcher has enough data to make significant claims about overall trends. The effects of a few events or activities in the school or community that may diminish attendance for a time is minimized by the large amount of data. Note the control group in this table are the columns listed 7th and 8th with the experimental group being the columns of 9th-12th.

Table 8:

Average Percentage Increases by Grade Level (Average Daily Attendance)

Grade Level	7 th	8 th	9 th	10 th	11 th	12 th
Average Percentage +/-	9.7%	3.4%	5%	4.1%	3.9%	1.3%

Finding 1

The research shows that the middle school (control group) showed an average increase of 6.55% across grade level attendance, while the high school (experimental group) showed an increase of 3.575%. If we were to look solely on students who attended the school before and after the time change (i.e. eliminated 7th grade data since they are new students to the environment), there would be an almost identical increase in attendance. Therefore, under this lens, we cannot conclude that delaying the school start time by one half hour impacts student attendance by grade level.

Long Term Class Analysis

Instead of breaking the data up on a monthly basis, we decided to look at a longer snapshot of student data. We compiled all of the student data from the first 20 weeks of school and decided to look at the gains made over the first semester. The goal was to see if the data from semester one matched the findings from the month by month comparison. This portion was almost used as a validity test: determining if the trends in data from semester one matched the whole year month by month results. The data is shown below.

Table 9:

Semester 1 Attendance

Year	7 th Grade	8 th Grade	9 th Grade	10 th Grade	11 th Grade	12 th Grade
2014-2015	84%	83%	69%	77%	82%	79%
2015-2016	94%	88%	75%	84%	87%	83%
Percentage Increase	10%	5%	6%	7%	5%	4%

Finding 2

Notice the average middle school percentage increase is 7.5% and the average high school percentage increase is 5.5%. It is important to note that the 7th grade population is new to the school and may skew some of the data. If we only look at students who attended the school for both years, we would see an average increase of 5% at the middle school and 5.5% increase at the high school. This would show a minor increase in students whose start time changed in comparison to those who did not have a school start change. Overall the findings do not allow us to conclude that delaying the school start time has had any impact on student attendance. These results are very similar to the month by month analysis, thus showing that the monthly findings hold over a long period of time.

+/-	+6%	+9%	+11%	+9%	+10%	+13%	+7%	+8%	+10%
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Cohort	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2018									
2014-	74%	74%	71%	67%	65%	65%	68%	69%	66%
2015									
2015-	80%	82%	82%	80%	80%	80%	81%	82%	80%
2016									

+/-	+4%	+8%	+11%	+13%	+15%	+15%	+13%	+13%	+14%
-----	-----	-----	------	------	------	------	------	------	------

Cohort	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2019									
2014-	88%	86%	84%	80%	81%	80%	84%	86%	86%
2015									
2015-	89%	89%	87%	83%	84%	86%	84%	85%	84%
2016									

+/-	+1%	+3%	+3%	+3%	+3%	+6%	+0%	-1%	-2%
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Cohort	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
2020									
2014-	87%	87%	85%	82%	83%	81%	83%	84%	83%
2015									
2015-	90%	88%	90%	89%	87%	87%	84%	85%	84%
2016									

+/-	+3%	+1%	+5%	+7%	+4%	+6%	+1%	+1%	+1%
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Average Percentage Increase by Cohort Year

To average the gains by cohort year the study took the mean of the percentage gains found in row four of tables 4.11 through 4.15. This allows for the study to look for trends in data that encompasses the whole school year. The averages are composed and displayed in the table below.

Table 11:

Average Daily Attendance Increases by Cohort Year

Cohort Year	2016	2017	2018	2019	2020
Average Percentage +/-	-1%	+9.2%	+11.7%	+1.8%	+3.2%

Finding 3

If we run a comparison between control and experimental groups, the control group showed a 3.2% attendance increase between years and the experimental group showed an average increase of 5.4% by cohort year. According to this data, it is fair to conclude that delaying the school day by a half hour has increased student attendance when you follow certain groups of students over time.

Long Term Cohort Analysis

In an attempt to check the long term validity of the monthly cohort data analysis, we decided to run the same semester one study as we did above for the class by class comparison. Again, this serves as a holistic snapshot along with being a test of validity for the month by month data comparison. The results are shown below.

Table 12:

Average Percentage Increases by Cohort Year (Average Daily Attendance)

Cohort	2016	2017	2018	2019	2020
2014-2015	82%	77%	69%	83%	84%
2015-2016	83%	87%	84%	86%	88%
Percentage Increase	+1%	+10%	+15%	+3%	+4%

Finding 4

Looking at the first semester data, we found that the control group showed a 4% increase in attendance for semester one. If we were to find the average of the experimental group we found the group had attendance gains of 7.25%. Again the experimental group outgained the control group when inspecting the data grouped by cohort. As stated above, this adds validity to the month by month cohort analysis, and shows that delaying the school start time has positively influenced student attendance by roughly 3%.

Chapter Five – Summary

By listening to the accounts of many students receiving inadequate sleep in high school and observing the statistics that measure sleep duration and cognitive functioning, it is natural to then study the impact of school start time on student achievement. The purpose of this study was to determine if delaying the school start time by half an hour would create a positive effect on student attendance. The exact research question asked in this study was “Though research has shown that delaying the school start time leads to more alert and focused students, do these changes correlate with increasing the student attendance across all grade levels?”

Summary of Findings

The hypothesis of this study was that all grade levels would show attendance gains because schools constantly work to improve student attendance on a yearly basis. It was also the belief of this study that those grade levels effected by the delay in school start time would out gain their peers that did not have such a change. It was expected that the high school experimental group would show at least a 3% gain over the middle school control group.

The study discovered that, across the board, attendance did increase throughout all grade levels. However, this fact cannot be solely attributed to delaying the school start time. The seventh and eighth grade students made attendance gains this year, and they started school at the same time as the previous year. Because of this, the research had to look deeper to determine if the delay in start time truly impacted student attendance.

When the study compared the monthly data for the same grade level across two years, the data was highly inconclusive and even contrary to the experiment’s hypothesis. As expected, for each grade level the attendance percentages went up (i.e. eight grade this year attended a higher percentage than eight grade last year). The issue arose when the control group (seventh and eighth grade) far outgained the experimental group by roughly 3%. Even when looking at the

first semester view, the control group still out gained the experimental group by about 2%. Both of these statistics do not support the idea that delaying the school start time helped increase student attendance.

After receiving this data analysis, it would seem that the study has failed to confirm the findings of the aforementioned research. However, the study also inspected the data under the lens of tracking groups of students by cohort year (i.e. comparing this year's tenth graders to last year's ninth graders). The idea behind this thinking is each group should be comprised of roughly the same students from the previous year. Therefore we can see if the delay actually helped students, because we're looking at the majority of the same kids from one year to the next. This also eliminates the dilemma of statements like, "This year's eleventh graders are way worse than last year's." Looking under this lens proved to be highly insightful and extremely supportive of the previous research. When comparing attendance gains by cohort year, findings three and four discovered the experimental group increased by an average of 5.4% verse the control group increase of 3.2%. In comparison to students who started school at the same time, the research shows over a 2% increase for students who received the extra half our in the morning to get ready.

When comparing the two data groups and determining which one holds more weight there are many factors that make both data sets valid. To dismiss findings one and two would be foolish because the age of the student plays a role in what time the circadian cycle effects them most (Carrell, Maghakian, & West, 2010). Hence it is wise to compare grade level by grade level because the students represented should be around the same age. Since the control group outgained the experimental group, it raises the question of why? Perhaps research could be done to see exactly what age of adolescents require longer sleep into the morning. It may be that

middle school students are fine with an earlier start and do not require the delay that the high school adolescents need.

When looking at the second tracking method, one can see the effects delaying the school day actually has on groups of individual students. The cohort tracking minimizes the comparing of unlike students since most of the students overlap from year to year. The two data group comparisons may seem contradictory, but in reality they are not. The data has shown that delaying the school start time has overall helped students attend school 2% more than their counterparts who started school at the same time in both years. Though each grade level did not show the gains expected, overall it is fair to say that most students showed gains from being afforded an extra half hour in the morning to make it to school.

Conclusions

Based on the data from this study it is not conclusive to say that delaying the school day by a half hour creates a statistically large impact on student attendance. What can be concluded is that delaying the school day a half hour creates a minor influx in student attendance. One reason as to why the attendance gains did not mirror that of other studies may be due to the amount of time the day was delayed. By only starting a half hour later, verse a whole hour as in O'Malley and O'Malley's study (2010), the data we found would not be as statistically significant. If the school were to have delayed the day till 8:30 am instead of 8:00 am, we may have found a more significant influx in attendance at the high school level.

Recommendations

This study only looked at the effects of delaying the school start time on attendance. The first recommendation is for another researcher to try a similar study, but to delay the school day a full hour instead of 30 minutes. It would be interesting to discover if the extra 60 minutes would

have an exponential impact on the attendance numbers juxtaposed to the 30 minute delay in this study. Another possible study would be to determine if delaying the school start time could truly help student grades. Wahistrom (2002) found no correlation to grades, and our study did not look at the differences in grades or test scores. However, it would be a powerful finding for a study to determine that school start time was related in any way to grades or performance on state exams.

This study is a significant and important topic in education because it is in everyone's best interest for students to be top performers in the classroom. To achieve this goal educators first need to get them there, have them be ready to learn, and only then can they utilize highly effective teaching strategies to convey useful information and discourse. School start time is just one factor in providing each child with access to the best possible education. The goal of this study was to find one way to help students come to school more often, and it seems that starting even slightly later, has had a positive impact on students coming to school. There is still much to be discovered in this area, but much groundwork has been laid for future studies to evoke quality results and data.

References:

- Adler, J. (1998). A language of teaching dilemmas: Unlocking the complex multilingual secondary mathematics classroom. *For the Learning of Mathematics*, 24-33.
- Baddeley, Alan. (1992). "Working memory." *Science* 255.5044: 556-559.
- Carrell, S. E., Maghakian, T., & West, J. E. (2011). A's from Zzzz's? The causal effect of school start time on the academic achievement of adolescents. *American Economic Journal: Economic Policy*, 3(3), 62-81.
- Danner, F., & Phillips, B. (2008). Adolescent sleep, school start times, and teen motor vehicle crashes. *Journal of clinical sleep medicine: JCSM: official publication of the American Academy of Sleep Medicine*, 4(6), 533.
- Dexter, D., Bijwadia, J., Schilling, D., & Applebaugh, G. (2003). Sleep, sleepiness and school start times: a preliminary study. *WMJ-MADISON-*, 102(1), 44-44.
- Isham, J., Narayan, D., & Pritchett, L. (1995). Does participation improve performance? Establishing causality with subjective data. *The World Bank Economic Review*, 9(2), 175-200.
- Kelley, S. (2016). Start school later to prevent sleep-deprived teens: U.S. doctors. *Reuters*. Retrieved from <http://mobile.reuters.com/article/idUSKCN0Z02MW>
- Kirby, M., Maggi, S., & D'Angiulli, A. (2011). School Start Times and the Sleep–Wake Cycle of Adolescents A Review and Critical Evaluation of Available Evidence. *Educational Researcher*, 40(2), 56-61.
- Lamberg, L. (2009). High schools find later start time helps students' health and performance. *JAMA*, 301(21), 2200-2201.

- Moore, G. T., & Lackney, J. A. (1993). School design: crisis, educational performance and design applications. *Children's Environments*, 99-112.
- O'Brien, L. M. (2009). The neurocognitive effects of sleep disruption in children and adolescents. *Child and adolescent psychiatric clinics of North America*, 18(4), 813-823.
- O'Malley, E. B., & O'Malley, M. B. (2008). 7 School Start Time and Its Impact on Learning and Behavior. *Sleep and psychiatric disorders in children and adolescents*, 79..
- Owens, J. A., Belon, K., & Moss, P. (2010). Impact of delaying school start time on adolescent sleep, mood, and behavior. *Archives of pediatrics & adolescent medicine*, 164(7), 608-614.
- Simpson, M. R. (2009). Engagement at work: A review of the literature. *International journal of nursing studies*, 46(7), 1012-1024.
- Skemp, R. R. (2006). Relational understanding and instrumental understanding. *Mathematics Teaching in the Middle School*, 12(2), 88.
- Vorona, R. D., Szklo-Coxe, M., Wu, A., Dubik, M., Zhao, Y., & Ware, J. C. (2011). Dissimilar teen crash rates in two neighboring southeastern Virginia cities with different high school start times. *J Clin Sleep Med*, 7(2), 145-151.
- Wahistrom, K. (2002). Changing times: findings from the first longitudinal study of later high school start times. *NASSP Bulletin*, 86(633), 3-21.
- Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. *Child development*, 69(4), 875-887.
- Van Merriënboer, J.G., Kester, L., & Paas, F. (2006). Teaching complex rather than simple tasks: Balancing intrinsic and germane load to enhance transfer of learning. *Applied Cognitive Psychology*, 20(3).

