

DON'T PEEK:  
THE COST OF LOOKING AT YOUR CELL PHONE IN SCIENCE CLASS

by  
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TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND .....1

2. CONCEPTUAL FRAMEWORK.....3

3. METHODOLOGY .....8

4. DATA AND ANALYSIS .....14

    A Case Study.....14

    Student Learning.....15

    Judging the New Phone Policy .....23

    Effect on Teaching.....26

5. INTERPRETATION AND CONCLUSION .....34

6. VALUE.....38

REFERENCES CITED.....44

APPENDICES .....47

    APPENDIX A IRB Exemption.....48

    APPENDIX B Cell Phone Policy Survey #1 .....50

    APPENDIX C Cell Phone Policy Survey #2.....52

    APPENDIX D Teacher Observations and Notes.....54

    APPENDIX E Cell Phone Policy Survey #1 Results .....57

    APPENDIX F Statistical Analysis of Treatment and Comparison Groups.....59

    APPENDIX G Statistical Analysis of Keep Phone and Comparison Groups .....61

    APPENDIX H Statistical Analysis of Keep Phone and Turn In Phone Groups....63

    APPENDIX I Cell Phone Policy Survey #2 Results .....66

    APPENDIX J Middle School Principal Survey.....68

    APPENDIX K Middle School Teacher Survey .....70

LIST OF TABLES

1. Research Design Matrix.....	14
2. Adjusted Percentages For Students Who Keep Their Phone.....	27

LIST OF FIGURES

1. Charging Station .....10

2. Treatment vs Comparison .....17

3. Treatment vs Comparison GPA's .....17

4. Keep phone vs Comparison .....18

5. Keep Phone vs Turn in Phone.....20

6. Keep Phone vs Turn in Phone GPA's.....22

## ABSTRACT

The purpose of this study was to try to quantify the effects cell phones have on learning in the science classroom. It attempts to show the various ways cell phones affect both students and teachers by taking a closer look at the effectiveness of one specific cell phone policy. The implementation of the new cell phone policy asked students to either put their phone on the side of the classroom or keep it hidden in their backpacks. Data was collected from student test scores, student surveys, teacher notes, and a survey of middle school principals and teachers. This data was analyzed for trends and patterns in order to both quantitatively and descriptively show the effects cell phones have on the learning environment. In the end, this study suggests that students who are separated from their phones perform significantly better than students who keep their phones in their pockets and/or backpacks. However, the implemented policy proved to be an ineffective way of eliminating the cell phone distraction; especially for the students who chose to keep their phone. In addition, this study also showed that removing cell phones may not only improve student learning but also creates an atmosphere that promotes better student-teacher relationships. In conclusion, the research conducted in this study suggests that the proximity of the learner's cell phone as an inversely proportional effect on learning. As such, it is important to continue to find better ways to separate learners from their cell phones for the betterment of everyone in the classroom.

## INTRODUCTION AND BACKGROUND

“I wish we would have done it sooner.”

“One of the best decisions I have helped implement in my 15 years as an administrator.”

“This has been an overall positive for everyone involved. On the parent front, many individuals have thanked me for instituting the policy.”

“...every one of us will tell you it is the best decision we've made in years and we would never consider going back!”

The above quotes are from a few middle school principals in my district when asked about their new school-wide no cell phone policy. To be clear, I am a high school chemistry teacher in the same district where eight of the nine middle schools have recently banned cell phones. Interestingly, the main reason each of those schools wanted the policy in place was for social reasons. These reasons range from wanting students to have “more face-to-face interactions” to wanting “to reduce the number of behavior incidents.” One school implemented their policy at the start of the 2016-17 school year and saw a 90% decrease in referrals and was able to cut out one of their dean positions.

Many people are aware of how cell phones have changed society. Everyone seems to have an opinion about them. Some think they are dehumanizing and make humans dumber while others attribute many social successes to them such as easily keeping people in contact and quickly spreading information. Many studies have been done about how increased screen time has impacted our brains and development (Bowles,

2018; Bowles, 2018; Ruston, 2016). But the social and developmental impacts of cell phones is not the point of this paper.

The purpose of this paper is to discuss and collect data on the academic impact of removing cell phones from the classroom. Yes, schools have a responsibility to help students be socially responsible. And many quality arguments can be made for school-wide cell phone bans on that reason alone. However, being as schools are also academic institutions, I set out to learn if there were any academic benefits to removing cell phones from the learning environment.

Many teachers will tell you the most distracting thing in their classroom is in the student's pocket. According to Larry Rosen (2017), 80% of high school teachers said their students are distracted by media in class. With that overwhelming majority, it is not hard to imagine that cell phones are a primary source of frustration for many teachers. I am no different. I am a high school chemistry teacher in Parker, Colorado. I work at a school with 2,270 students. Of those students 74.5% are Caucasian, 14.2% are Hispanic, 3.3% are Asian, and 2.3% African American. In addition, males comprise 51.3% of the student population. The school is in a fairly affluent location with only 12.8% of the students qualifying for free and reduced lunch (Colorado Department of Education, 2018).

A coworker asked me last year, "What is the most frustrating thing for you in your classroom?" The answer was obvious to me: the number of students who are frequently distracted by their cell phone. "It's *their* choice. It's *their* learning. *They* should *want* to learn," I used to think. But honest reflection led me to this truth: it was *my*

fault. I had a weak cell phone policy and did very little to discourage students from being distracted. I am the adult in the room, and I promote that which I permit. It seemed like I was encouraging students to make the poor choice to be distracted in class. So, in an attempt to take more ownership of my students' learning, I decided to undertake an action research project to try and answer the following questions:

Research Question - What is the academic impact of implementing a strict no cell phone policy in my high school chemistry classes?

Sub-Question #1 - How is student learning affected?

Sub-Question #2 - How effective is the instituted new policy at keeping students off their phones?

Sub-Question #3 - How are teachers affected?

### CONCEPTUAL FRAMEWORK

“We all understand the joys of our always-wired world – the connections, the validations, the laughs... the info... But we are only beginning to get our minds around the costs” (Sullivan, 2016, para. 25). Screen technology is nearly inescapable in our everyday lives. Computers, tablets, cell phones, televisions: they seem to be everywhere and used for nearly everything. People who own smartphones will check their phone an average of 85 times per day and 91% of them say they never leave their home without their phone (Ward, Duke, Gneezy, & Bos, 2017). It is extremely evident that we are now many years into the digital age. But, people are starting to question the impact these devices are having on society and on individuals. Researchers have asked questions about the way technology has impacted various social interactions, adult and child brain

development, changes in emotional behaviors, and much more. In addition, some researchers have studied the impact technology has had in schools. Since there are many aspects to education, I want to be clear that the following research focuses on the academic impact technology has had on student learning. If you wish to know more about the research that has been done on the social and emotional impact technology has had on teenagers I may suggest you consider looking into *Screenagers*, a documentary by filmmaker Delaney Ruston (2016), or a couple of New York Times articles written by Nellie Bowles in 2018 such as “A Dark Consensus About Screens and Kids Begins to Emerge in Silicon Valley” or “The Digital Gap Between Rich and Poor Kids Is Not What We Expected.”

Technology is prevalent in many classrooms and many schools have started increasing access to technology and are moving towards 1-to-1 classrooms (one computer for every student). Rather than investing in computers for every student, some teachers are increasingly moving towards 1-to-1 with the technology that the students already have. One article suggests taking advantage of the students’ phones because, one, the students like them, two, cell phones are convenient, and three, they save the school money by replacing the cost of computers (Kolb, 2011). But are these benefits worth the distraction cell phones might cause to the students’ academic experience?

A couple of studies looked at the frequency of distracting cell phone use. One study found that over 70% of students regularly use their phones in class, another study went even higher and determined over 80% of students are on their phone in class, while a final study simply said “a majority of college students...report using electronic media

while in class” (Berry & Westfall, 2015; Duncan, Hoekstra, & Wilcox, 2012; Uncapher, et al., 2017, p. 64). In another study, 50% of students were most likely to be distracted by their phones during lectures and that number increased to 85% during individual work time (Kay, Benzimra, & Li, 2017). In my classes the lessons are important but the individual work time is essential to student success because it is when the students begin to first wrestle with the content as they try to apply it. It is not a time that I would like my students to be distracted. But many may ask, “What’s the big deal?”

There are two severe academic consequences from the cell phone distractions. The first is time. Many students think they can successfully multitask between their school work and their phone. Bowman, Levine, Waite, and Gendron (2010) actually studied the effects of students multitasking. They found that students who were given the task of reading a text and asked to instant message during the task took an average of 22%-59% longer than the students whose only task was to just read the text. This could be because, “The absolute time that a student is on- or off-task may not be as critical as the act and cognitive cost of shifting attention from learning tasks to distracting behavior” (Kay, Benzimra, & Li, 2017, p. 986). Time in class is limited, so if students are trying to multitask, they will get through less practice problems and finish labs slower. As a consequence, their opportunity to learn suffers.

The second major consequence is academic performance. According to Duncan, Hoekstra, and Wilcox (2012), on a 4.0 scale, students who reported not using their phone at all had an average grade that was 0.36 points higher than students who reported being on their cell phone. Berry and Westfall (2015) also concluded that students with frequent

cell phone use have lower GPAs. In my classroom, 0.36 GPA points equates to about 3% on each of their test scores. That is a big deal!

Similar results have been found in two other research projects, each independent from the other. The first one was carried out at West Point, where some of the best and brightest students attend. These are students who are highly motivated to earn the best grades they can; students who have life changing incentives to stay focused in class. The study found that the students in technology-free classrooms performed 1.7% better than their peers in classes that either had no technology restrictions or banned all technology except for tablets which had to remain flat on the desk (Carter, Greenberg, & Walker, 2017). A second study was carried out by psychology professor Adrian Ward at the University of Texas at Austin. In Ward's study, 800 participants were asked to complete two tasks dealing with pattern recognition and math skills. The participants were asked to either leave their phone outside the testing room, in their pocket, or on the table. Even though the phone had no role in completing the task, Ward found that the students who kept their phones outside the room performed better than the students who had their phone with them in the room. The students who had their phone on the desk performed the worst. They conclude, "These results suggest that the mere presence of one's smartphone may reduce available cognitive capacity and impair cognitive functioning, even when consumers are successful at remaining focused on the task at hand" (Ward, Duke, Gneezy, & Bos, 2017, p. 143). Please do not miss the point of both of these studies: close proximity to technology has a negative effect on our cognitive abilities. Just

having technology present inhibits our ability to think. This could be because our brains are constantly multitasking between our device and whatever else we are doing.

It is clear that many students, even the top students, are distracted by their devices and they suffer a pretty large academic consequence as a result. But why are they so distracting? Gerow, Galluch, and Thatcher (2010) studied the causes of digital distraction, which they call cyber-slacking. They found that the main reason individuals cyber-slack is more a result of their own internal desire to keep going back to their device regardless of how many of their peers did or did not use their phone and regardless of how well teachers monitored cell phone use. It ultimately comes down to the fact that the students lack the self-control to ignore their devices. And this problem could be getting worse. In a study completed by Larry Rosen (2018), students in 2018 unlocked their phones roughly 73 times per day, or nearly 30% more each day than students in 2016. That means students, if they sleep eight hours a day, check their phone nearly every 13 minutes, on average. It is easy to conclude that students are unlocking their phone multiple times each hour even at school. Students are increasingly willing to trade their academic performance to have easy access to their phones.

Finally, the literature discusses ways teachers can help students be less distracted by their cell phones. First of all, students were asked about the classroom policies teachers have. They said the most effective cell phone policies have the harshest punishments (Berry & Westfall, 2015). However, only 45% of students said teachers should have more control over the devices (Kay, Benzimra, & Li, 2017). In other words, students know that harsh punishments for cell phone use are effective in keeping them off

their phone, but they do not want their teacher keeping them from their phone. In a study done by Tulane, Vaterlaus, and Beckert (2017), one high school student summarizes not only why a majority of students think teachers should have less control over cell phones, but also summarizes all the research well:

If texting is not allowed, teachers have more of the students' attention and are able to teach them. If every other student was allowed to have their phone out to text anyone on their contact list, then they would be getting an A in their social lives, but and F in school (p. 719).

Cell phones are really great tools that can do many great things. However, the literature makes it clear that academics are not one of them because cell phones are primarily personal entertainment devices rather than educational tools.

#### METHODOLOGY

To understand the treatment, you must first understand that for the first five years of my teaching career I had a very lackadaisical approach to cell phone use by my students. My old policy could be summarized simply as, "Just don't use your phone if you're supposed to be working on chemistry" and then had very little punishment if the students were distracting themselves by it. After being frustrated year after year by frequent cyber-slacking I knew I needed to try and change something. I decided to implement a strict "No Cell Phone" policy after receiving an exemption from the Institutional Review Board to conduct the study (Appendix A).

On the first day of school I implemented my treatment for all 109 of my chemistry students, spread out relatively evenly across four sections. My students had nearly the same demographic makeup as the school's population with slightly more males

in the school's general student body. In addition, 12.8% were sophomores, 85.3% were juniors, and 1.9% were seniors.

I began the first class by presenting my students with the literature research I had done about cell phones. I had also set up a charging station with pockets to hold their phones. I was determined to make this the year that cell phones were not going to distract my students in class. I originally planned on asking all students to turn in their phones immediately when they walked into class. However, my school's administration team told me that if I required my students to turn in their phones, then I would personally be responsible for their phones; any damages or thefts would require me to buy a new phone. I realized I did not have an easy way to protect the students' phones, and did not want to risk implementing a policy that would not be supported by my principals. To get around this, I was told I could implement a policy that gave the students a choice. On the first day of school I pointed to the charging station (Figure 1) and stated my classroom cell phone policy: Either put your phone in the charging station to get rid of the temptation of looking at your phone or turn it off and put it in your backpack. Either way, there will never be a need for you to use your phone in class. Then, following what the literature stated about the best policies having the harshest punishments, I made it known that if they were caught with their phone out, regardless of the reason, I would confiscate it and keep it locked in a drawer for the next three to four hours.



*Figure 1.* The charging station used to carry out the treatment.

While this is mainly a descriptive study, describing what happens when I provide a cell phone policy, I also wanted to make two different comparisons to measure the treatment's effectiveness. First, my 2018 students can be compared to my 2016 and 2017 students for an entire semester. The 2016 and 2017 students are grouped together as the Comparison Group while the 2018 students are the Treatment Group. The major assumption here is that the only difference between the two groups is the cell phone policy (Treatment), or lack of cell phone policy (Comparison), that was in place when they took my chemistry class. While no two years or students are ever identical, I am certain the same content was taught at nearly the same pace and assessed the same way, but the students in each group are still different people. However, if the groups are large enough, and I believe they are, these concerns can be minimized. The Comparison Group

had 220 students while the Treatment Group had 109 students. Additionally, by collecting data for an entire semester, there was a significant amount of data collected.

The other comparison I was able to make was within the Treatment Group itself. Partway through the treatment I noticed that the same students either used the charging station or did not. Like the studies done at WestPoint and the University of Texas at Austin, in which both showed that the location of electronic devices impacted participant performance, I figured I could compare the students who used the charging station nearly every day to the students who kept their phone in their backpack, or pocket, nearly every day. There were 40 students who consistently used the charging station, which I labeled the Turn In Phone group. They were compared to the Keep Phone group, which was comprised of the remaining 69 students. This comparison fits nicely with many of the ideas from the literature that discussed the fact that just the mere presence of our cell phones is distracting. In addition, it alleviated any uncertainties in the comparisons made between school years because the two groups received the exact same lessons. However, this comparison increased the uncertainty of comparing different people because the population size of the two groups has decreased.

These two comparisons allowed me to collect data on the academic impact of removing cell phones from my classroom. The academic impact was then measured in three ways. The first way was through the test scores of my general chemistry students; both the Treatment and Comparison groups took the same tests. My students took seven tests during first semester, and I collected their test results to use it as quantitative data to see if students perform better as a result of the policy (It should be noted that only six of

these tests will actually be used when looking at the Treatment versus Comparison groups because one of the tests was drastically changed compared to the prior two years. The other six tests that were given were nearly identical from year to year, with any changes being due to formatting rather than content.) For each test, the difference in average test score will be explicitly stated while statistical significance will be mentioned but the actual results can be found in the appendices. Statistical significance was determined using a Wilcoxon-Rank Sum test which looks at the differences in the distributions of data. These statistical significance tests were run with a 95% confidence interval and based on the assumption the Treatment Group's distribution of test scores should be shifted higher than the Comparison Group.

The second way I am collecting data is through two surveys of the students in the Treatment Group (Appendix B & C). The purpose of the surveys was to know how well the students knew and followed the cell phone policy. Each survey also allowed the students to give me insight into their thoughts about the policy, how well they thought the policy worked, and if the policy had any bearing on their engagement in the lessons. These surveys, along with my observations and a couple student interviews, are the primary data I collected for the second research sub-question regarding the effectiveness of the cell phone policy implemented.

I kept teacher notes throughout the treatment period as well. I made eleven entries during the first eight weeks of the treatment (Appendix D). I would jot down my observations of what I saw my students doing, or not doing, as a result of the cell phone policy. Most of these observations included qualitative information regarding how well

students were on task, how often I took a phone, and my general perceptions. I also recorded a few comments made by students and parents during the first couple weeks of the treatment period. After the first month of the treatment there was less dialogue about the policy. I also included information from one informal interview with a student. Other informal interviews were attempted, but they did not lead to any significant or new data. My notes and observations helped analyze and interpret all three sub-questions.

The final data I collected is something that fell perfectly into my lap. I was talking with a couple coworkers when I learned that all of the middle schools in my district had instituted a school-wide ban on cell phones this year. I decided to reach out to my feeder middle school principal and see if this was true and to ask a couple questions about it. I learned that eight of the nine schools in the district had banned cell phones and that two of the schools started the ban three years ago. I asked each principal to fill out a survey so I could learn more about their school policy and how it has been going (Appendix C). I received eight responses from the middle school principals. I also reached out to some of the middle school teachers and asked them to complete a survey regarding their view of how the policy has impacted their students as well as their teaching (Appendix E). I received five responses back from the middle school teachers. These teachers and principal surveys, along with my own observations, were helpful in answering the third and final research question about how the cell phone policy affects teachers.

Table 1 below shows how each of the instruments described above were used to address each research question. Validity of these instruments was achieved through

triangulation. The results from the unit tests, student surveys, my personal observations, and the middle school surveys provided results that were consistent with each other.

Table 1  
*Research Design Matrix*

Research Sub-Question	Unit Tests	Student Survey	Teacher Notes	Middle School Surveys
How is student learning affected?	x		x	x
How effective is the policy?		x	x	
How is teaching affected?			x	x

## DATA AND ANALYSIS

### A Case Study

I wish to introduce the data by first looking at an exceptional case study in the Treatment Group. I was fortunate to have a particular sophomore student in the Treatment Group I knew in a non-academic setting during this student's freshman year. I will call this student Andrew. Andrew struggled with his grades throughout his freshman year – regularly to the point of academic ineligibility. Out of the 14 classes he took his freshmen year, he earned a letter grade of a B or better in only three of them. He ended his two freshmen semesters with GPA's of 2.14 and 2.00, respectively. However, midway through the treatment I noticed that Andrew was doing really well in chemistry. He was regularly scoring As and Bs on the unit tests. I decided to look at his other grades and noticed that he had a B or better in all seven of his current classes. What led to this

dramatic turn around? I had to figure out what changed for Andrew, so I decided to conduct an informal interview with him in October to figure it out.

I told Andrew that I was looking at his grades through the first six weeks of school and I noticed a dramatic improvement over his freshmen year. I asked him what led to such a change. His response started like many optimistic students'; he wanted to have a better year and wanted to make changes. He then said the first period of his sophomore school year was my chemistry class. That first class started with me talking to the class about wanting students to be more focused in class and how the research I had done suggests cell phones are a major distraction to student learning (note, this was me introducing the treatment). He said from that point on he had made the decision to put his phone away in every class he was in. Andrew said his decision to put his phone away and focus in class is what led to his academic improvement. Andrew ended up finishing the first semester of his sophomore year with a 3.71 GPA for the term. What a remarkable turn-around just because of one decision!

Of course, not every student is like Andrew. And it is absolutely fair to question whether the turn-around in Andrew's academic performance is a result of his personal desire to do better or because of the single act of removing the distraction of his cell phone. But I think that question misses the point. The point is that Andrew was able to get the most out of what he was doing by improving his focus. He reached his full potential.

As a teacher, I want my students to reach their full potential. I want them to focus better in class. I want to limit any distractions they may have. And if cell phones are a

major distraction in class, then I want to help my student not be distracted by them. I also want to know if Andrew is the exception or the rule. So, let's now take a look at the data and see how the treatment affected my classroom environment.

### Student Learning

Recall that the major way I am analyzing student learning is through the students' test scores. I was hoping the Treatment Group would show an increase in test scores over the Comparison Group. Actually, this is strongly supported. However, upon digging deeper into the test scores, most of the improvement in the Treatment Group is due to the Turn In Phone subset within the Treatment Group. I will try to show that the most interesting data had little to do with the new cell phone policy, but had everything to do with the location of the students' cell phones. I will attempt to show this in two different ways: first, by looking at the test scores in this student learning section, and second, by looking at the effectiveness of the treatment in the next section.

But first, let us quickly see why the Comparison Group is of little help. It is worth noting that the Treatment Group had a statistically significant improvement over the Comparison Group on 66.6% of the tests and they scored an average of at least 3% better on 50% of the tests (Figure 2; Appendix F). In addition, the students in the Treatment Group performed a combined average of 3.62% better on the first semester tests than the Comparison Group.

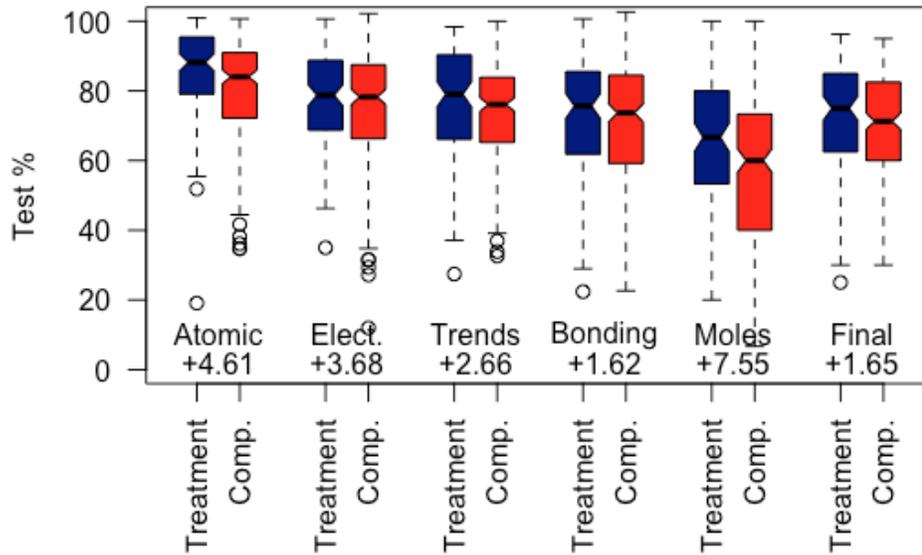


Figure 2. Comparison of test scores between the Treatment (Blue) and Comparison (Red) groups, ( $N=109$ ,  $N=241$ ).

This is interesting data. It seems pretty straight forward that the treatment was effective. But some may be wondering if these two groups are even worth comparing. How do I know the Treatment Group is not just a better group of students? A quick look at each groups' GPA distributions can help answer this question (Figure 3).

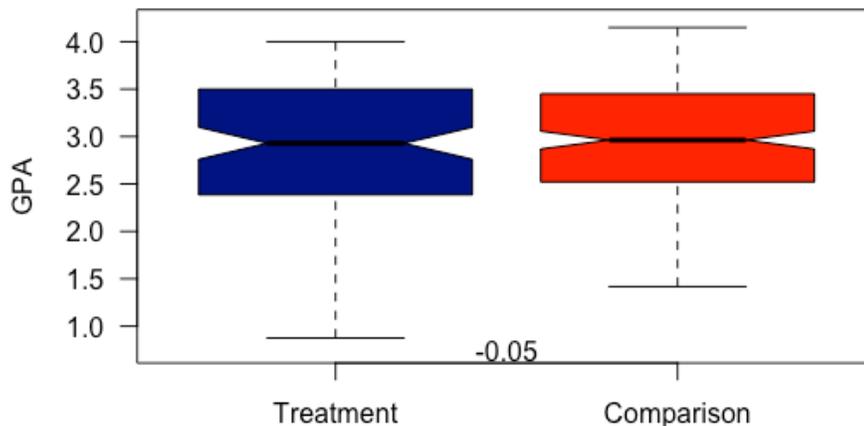


Figure 3. Comparison of GPA's between the Treatment (Blue) and Comparison (Red) groups, ( $N=109$ ,  $N=241$ ).

The distributions are nearly identical, suggesting there is very little difference between the two groups. So again, Figure 2 seems to suggest the treatment worked very

well. The problem is that I could not stop thinking about the two sub-groups within the Treatment Group: The Turn In Phone Group and the Keep Phone Group. If the new cell phone policy was effective for all, or nearly all, of the Treatment Group then both of these sub-groups should outperform the Comparison Group. However, when the Keep Phone Group is compared to the Comparison Group a different story turns up. Figure 4 shows that these two groups are nearly identical.

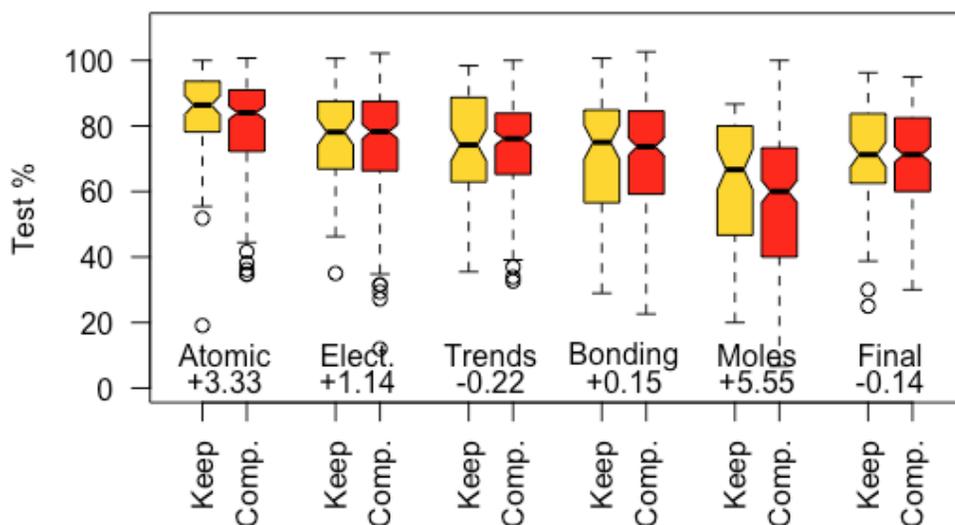


Figure 4. Comparison of test scores between the students who keep their phone (Yellow) and the Comparison group (Red), ( $N=70$ ,  $N=241$ ).

The distributions for the two groups are very similar and none of scores show a statistically significant difference in distributions (Appendix G). It is interesting to note that on two of the tests the students in the treatment did actually perform much better than the comparison students. However, half of the test averages are nearly identical. Even more interesting is the fact that the Final test has nearly exactly the same score distribution – which indicates the same level of long-term proficiency for the students who keep their phones. In other words, there is strong evidence to support the fact that the Keep Phone group is no different from the Comparison Group. This is not surprising,

though, because there were no differences between these groups: they were taught the same material in nearly the same way, given nearly identical assessments, and had their cell phones present to distract them. All of these students had basically the same experience in my class.

So, what does this mean? It means the treatment was not as effective as I hoped, which I will discuss in the next section. It also means that any differences between the Treatment Group and Comparison Group are because of the Turn In Phone Group. In other words, the difference is not because of the strict no cell phone policy but rather because of the students who used charging station. As such, the focus should not have anything to do with the Comparison Group, because the Keep Phone students are basically the same group of students as the Comparison, but should be solely based on the two groups within the Treatment Group.

The Turn In Phone group scored over 3% higher than the Keep Phone group on 100% of the tests with 71% of the tests showing a statistically significant improvement (Figure 5, Appendix H).

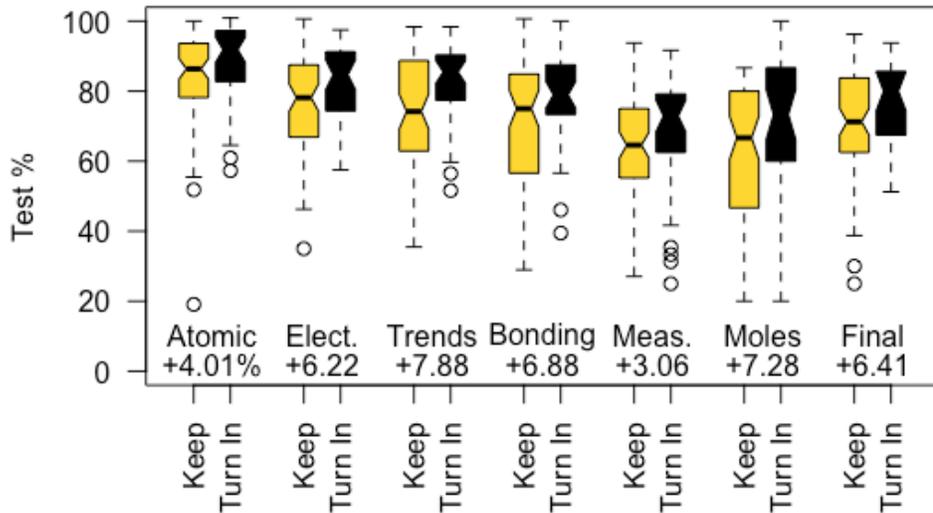


Figure 5. Comparison of test scores between the Keep Phone (Yellow) and Turn In Phone (Black) groups. ( $N_{\text{keep}}=68$ ,  $N_{\text{Turn In}}=41$  (Atomic Theory, Electrons, Trends),  $N_{\text{keep}}=74$ ,  $N_{\text{Turn In}}=35$  (Bonding, Measurements, Moles)  $N_{\text{keep}}=82$ ,  $N_{\text{Turn In}}=27$  (Final)).

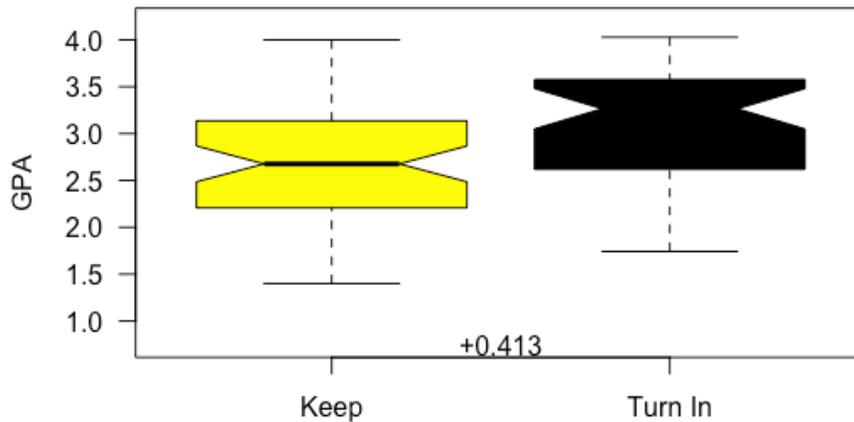
The students who used the charging station performed, on average, 5.96% better than the students who kept their phones. This is nearly double the three percent the literature led me to expect! While the magnitude is a bit surprising, the fact that the students who turned in their phones performed better is not surprising. And I have yet to meet anyone who is surprised by this, because people generally understand that cell phones are distracting.

These results can be confirmed more qualitatively through the surveys given to the students and other teachers. On the student survey, nearly two-thirds of the students agreed that they would pay attention better in class when they do not have access to their phone (Appendix E). One middle school teacher simply said, “The kids seem to be more focused.” Another said, “students are more on task without the distractions of the cell phone.” In addition, just over two-thirds of the students agreed they are more engaged in the happenings of class when they do not have their phone (Appendix E). A different

middle school teacher added, “They certainly seem a bit more engaged knowing they can’t check their phones every two minutes.” It seems as if most students and teachers understand cell phones inhibit learning. But what about the students who think they pay attention just as well regardless of where their phone is?

I believe the remaining one-third of the students who disagree with both of those statements fall into one of two categories. On one side, they believe their phone actually does not distract them regardless of where it is. As one student stated, regarding why they use the charging station less, “I learned to ignore my phone, it wasn’t a problem, so why should I put it somewhere else?” On the other end of the spectrum are students who really do not want to acknowledge their phone could be a problem and they do not want to give up control of it. This is seen in the fact that half of the students think schools should *not* try to control cell phones, even when two-thirds of them think they do better in class without their phone (Appendix E).

There is no question the students who distanced themselves from their phones performed significantly better than the students who kept their phones in their backpacks or pockets. But some would argue that it was not the distance relative to their phone, but rather, just good students who chose to put their phone on the side of the classroom. At first glance, this theory seems plausible when looking at each groups’ GPA distribution in Figure 6. For the purposes of Figure 6, all of the students who turned in their phone for either one or both quarters have been grouped together as the Turn In Phone Group. Similarly, the Keep Phone Group is comprised of the remaining students who kept their phone all semester.



*Figure 6.* Comparison of GPA's between the Keep Phone (Yellow) and Turn In Phone (Black) groups, ( $N=60$ ,  $N=49$ ).

The students who were willing to turn in their phone were better students by an average of 0.413 GPA points. This equates to roughly a four percent difference in final grade in each class. It appears that the treatment was a good way to identify many of the higher achieving students in my classroom. However, I would like to suggest that the act of them turning in their phone actually made them even better students. Remember, Figure 2 showed a nearly three percent difference between the Treatment Group and Comparison Group and Figure 5 showed a nearly six percent increase between the Keep Phone Group and Turn In Phone Group. What accounts for those differences?

First off, based on GPA, the students who turned in their phones are expected to achieve an average of four percent better than the students who keep their phones (Figure 6). They actually performed nearly six percent better (Figure 5). In other words, the Turn In Phone Group overachieved by two percent.

Second, a deeper look at some of the students in the Turn In Phone group can show how some of the students performed when they turned in their phone compared to when they kept their phone. For this comparison, each of the students' test scores were

compared to the class average. Their distance from the class average was calculated then averaged with the same results from the other tests in the same quarter. This way, I was able to compare how well the students did, compared to themselves, during the quarter they turned in their phone compared to when they kept their phone. Of the students who only turned in their phone for one quarter, 68% of them performed better during the quarter they turned in their phone, with an average increase of 2.08%. While many of these students were already high achieving students, the act of separating themselves from their phone improved their academic ability.

In addition to quantitative data, there are three more points I would like to make concerning the differences between the Keep Phone and Turn In Phone groups.

First of all, the data I collected not only confirms the literature, but is even more extreme. Almost every study in the literature references college students, so I was not surprised to see adolescent students, whose brains are less developed, have more drastic results. Most of those college students did not have a choice as to the technology limits during the study. If the presence of technology affects students at West Point by nearly two percentage points it makes sense that it would affect less motivated high school students more drastically. I can only surmise as to why this occurs, but humans struggle to multitask. It is possible that when we have access to our phones, our brains are essentially multitasking between what we are doing and what might happen on our devices.

Secondly, looking back at Figure 5 and Figure 6, the distribution of students shows the Turn In Group is not only comprised of high achieving students, and that the

Keep Phone Group is not only comprised of lower achieving students. Some of the students who turned in their phone did not perform well, and some students that kept their phone performed very well. This is why it is important to understand that student test scores are correlated to their phone's location rather than caused by their phone's location. We are not all equally distracted by our phones. But the charging station did limit the cell phone distraction for the students who used it. I believe the data does suggest, though, that less distracted students perform better. I was able to talk to one student who used the charging station during the first quarter but not during the second quarter. I told him he performed an average of eight percent better on the unit tests when he turned in his phone. His response was simply, "I'm not surprised." He said he just got in the habit of not turning his phone in and he still had the grade he wanted.

Lastly, like the case study with Andrew, asking if the cell phone is the sole cause of the Turn In Phone Groups nearly six-percent increase is the wrong question to ask. We should be asking how we help our students get the most out of what they are doing. We should be asking how we limit the distractions our students have in the classroom. If removing cell phones from my classroom helps my students be more focused and more engaged, and the result is improved learning (as seen by the improved test scores), then I believe I have helped eliminate at least one major distraction for my students.

#### Judging the New Phone Policy

The original goal of the new cell phone policy was to make it so that students would never be distracted by their phones in my classroom. I wanted them to be focused more on chemistry than whatever was happening on social media. The only way I figured

that could happen would be by implementing a strict no-cell phone policy by building a charging station and asking the students to use it to hold their phones rather than their pockets or backpacks. My notes and observations, along with student responses on the surveys, helped me see that this policy was not as effective as I hoped.

The literature reported the best cell phone policies are made clear to the students. From the survey it is obvious the students understood the policy. Not only did 98% of students agree that the policy was clear, but 96% of students could regurgitate the policy in their own words (Appendix E). One day, an administrator walked into the room and I included them in the lesson. Long story short, the administrator made a comment to the students that they should just look something up on their phones. It was a proud moment for me when the students quickly replied, “We can’t!” This showed me the students knew the expectations with cell phones. Not only did they know the policy but 88% of them agreed that the policy is fair (Appendix E & I). One student who agreed the policy was fair wrote on the second survey, “[The policy] helps kids learn better and that’s all Mr. Etter wants.” The students knew the policy and understood why I implemented it.

However, one major flaw stood out in the data regarding the surveys. While 72% of students agreed the policy was effective, only 60% of students said they never looked at their phone. If the policy were truly effective, those percentages should match because the policy was that students should never look on their phone. The students knew the policy, generally thought it was fair and effective, and yet some still chose not to follow it. There are two reasons this could be the case. First of all, they may consider something effective just because they know what it is. In this case, effectiveness is based off of

knowledge. For example, just because I know diet and exercise are an effective way to lose weight does not mean I will diet and exercise. My knowledge does not change my behavior. To bring the analogy full circle, the effectiveness of diet and exercise is not determined by my actions. Another possibility is that they judged it to be effective because they use their phone less in my class than other points in the day. Rather than effective being that they are on their phones *zero* times, it could be that they are on their phone *less*. While it was not the hope or goal of the policy, I would certainly agree with the students on this definition of effectiveness. The cell phone distraction was significantly less in my classroom throughout the treatment than during any other semester of my teaching career. According to the second survey, I only took a student's phone 29 times during the semester (Appendix I). While that is still a lot, it comes out to roughly once every-other-week in each class period. I did not have to worry as much about phones as I had in the past.

But how effective was the policy at limiting distractions? To answer that question, I needed to look at how often the students who kept their phones looked at their phones. On the first survey, just over 60% of students said they look at their phones "zero" times each class – but that includes the students who turned in their phone (Appendix E). If I remove the Turn In Phone students from that 60% (because they never looked at their phone during class because they turned it in), then I can more accurately see how often the Keep Phone students looked at their phone. Table 2 shows these adjusted percentages. You will see that nearly 65% of students who kept their phones on them looked at their phone at least once during class time.

Table 2  
*Adjusted Percentages For Students Who Keep Their Phone*

On average, how many times do students who keep their phone look at their phone during class time?	35.38% Zero times	44.62% 1 time	18.46% 2-3 times	1.54% 4 or more times
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*Note.* (N=65).

To rephrase this data, 45 students would look at their phone each day when they should have been doing chemistry. Over the course of the semester, that means there were well over 4,000 times students looked at their phone in my class. And I only caught 29 of them. No wonder the students said they believed their typical classmate looked at their phone at least once per class (Appendix E). Clearly, my cell phone policy struggled in limiting the cell phone distraction; at least for the students who chose to keep their phone. For the students who kept their phone, this policy was not be as effective as I hoped it would be.

This data makes sense with Comparison Group and the Keep Phone Group comparison made in Figure 4 in the Student Learning section. Recall that the comparison showed absolutely no difference between the two groups. They were statistically nearly identical. While the cell phone problem was not as blatant for the Keep Phone Group as it was for the Comparison Group, there was still a problem. One solution could be figuring out how to have a harsher punishment, as suggested by the Berry and Westfall in literature. Yet another would be figuring out a way to increase participation in using the charging station. The implementation of my new cell phone policy, while a good start, did not eliminate the cell phone distraction in my classroom.

Effect on Teaching

Relationships. That is what teaching is about. Why? Because, as a coworker told me a couple years ago, “Relationships build rigor.” Relationships with students lead to rigorous learning of not only content but also character. During the treatment I found that I was able to connect better with students and, as a result, the academics benefited.

Throughout the treatment I noticed I had more interactions with my students during the passing periods than I used to. Most of the students would walk into my room and put their phone away right away. As discussed above, they either put their phone in the charging station or in their backpack. Regardless of where they put their phones, the act of putting their phones away meant they had a couple of minutes at their desk with little to do. Think about it. As a society, whenever we are waiting for something we are almost always on our phone. Whether it be waiting to place our order at a restaurant, waiting for the movie to start, waiting in the doctor’s office... whenever we wait we are often on our phone. Students waiting for class to start are no different. These few minutes before class started turned out to be valuable time for me to better connect with my students because the phone-barrier was gone. One example of this was during a passing period when a student, who regularly used the charging station, opened up to me about her father passing away five years ago. I was able to develop a deeper connection with this student because I shared with her how my mom passed away when I was her age. It is very possible this connection would have occurred at some point throughout the year, but I know it would not have happened if she were actively engaged with whatever was happening on her phone.

I also noticed more students building relationships with each other. Rather than be on their phone, they would talk with each other more than my students did in prior years. For one class in particular, the charging station became the congregation point for students before class started. It provided them a central place to hang out before class started. This was also a consistent theme among the middle school principals and teachers as well. One middle school principal said that the kids now talk to each other at lunch and look each other in the eye. One teacher said, “In the halls [students] are talking rather than texting.” Schools should be helping students grow up, and a part of that is learning to interact with other people. One impact of removing cell phones from schools is that it helps improve the students’ social skills.

Removing cell phones not only helped my students improve their interpersonal skills but had some academic benefits for me too. I found that my frustration with cell phones had decreased, and I am not alone. “I spend less time worrying about whether students are on their cell phones. It's nice to know that I don't have to watch them as closely to make sure they are not on their phones because I know they don't have it with them,” said one middle school teacher. Another agreed, saying, “I no longer have to police kids and tell them to get off their phones.” It was exhausting to feel like I am the cell phone police rather than the teacher. Throughout the treatment I could focus on what I was teaching. I used to get annoyed at the frequency of students using their phones. It seemed like every class period multiple students would be on their phones. At the extremes, I used to take phones nearly every class period in a day. However, during the treatment, the first time I took a phone was one week into class (Teacher Notes). After

that, I took phones when I saw them, and it was, at worst, a couple times a week. With the treatment I spent a lot less time taking student's cell phones. In other words, when students use their cell phones they did not just distract their owners, but also distracted me from what I was teaching. The new cell phone policy helped alleviate that.

One other major benefit I noticed was when I would transition into a lab or individual work time. The transitions were fast. Students would quickly start doing what they were supposed to do. Transitions used to be a time for students to quickly check for updates on their phone, often respond to the notification, then get to where they needed to be. Not only were the transitions fast, but I could not help but smile the first time I looked around the room and noticed every student was on task. Well, maybe some were still distracted, but zero students were distracted by their phone. I wrote down in my notes, "Students who were disengaged in the activity were not spending the time on their phone - they were looking around the room or daydreaming." This became a refreshingly common occurrence in my class. This was confirmed by nearly every middle school teacher and principal. As one middle school teacher said, "Kids can always find a distraction but they overall seem more focused." Another said humorously, "My students are less distracted, although that doesn't necessarily mean they are paying more attention to me." There are many distractions in the classroom, yet with all these educators noticing significantly improved student engagement as a result of banning cell phones, it indicates that the cell phone is a very major distraction in the classroom. Class time is the most valuable resource teachers have. If removing cell phones leads to fewer minutes

wasted in transitions and more students engaged in activities, then teachers can better maximize the precious time they have with their students.

One major concern that always arises when talking about the students' cell phones is what the parents think. I was relieved to find that almost every parent I told about my new cell phone policy was very supportive of the policy. At back-to-school-night, a couple weeks into the treatment, not a single parent suggested I change my cell phone policy. In fact, most were thankful and some even wanted it to extend further. One parent said about the charging station, "I wish every classroom had something like that." Another parent said to me during conferences, "You are allowed to *make* [my son] use your charging station. Get that thing away from him." These interactions were not just limited to my experience. One middle school principal stated, "On the parent front, many individuals have thanked me for instituting the policy." Another expanded a little more and said, "Parents have been nothing but completely supportive of the policy - though initially there was some trepidation (mostly irrational)." I can imagine most of those fears fall under the endless category of "what if" questions and deal with wondering how they would get information to their kid quickly. A simple call to the school asking to relay a message to their kid can get the job done in most cases. And in more severe cases, like to notify the loss of a loved-one, the parent most likely is going to pick up their kid from school anyways. There is no need to notify the kid ahead of time. A third principal explained that it initially was not perfect with the parents, but they were able to get nearly all of them in agreement with the new policy. They said, "We had some cranky parents initially, but I did two parent evenings and everyone except one cranky parent was

converted.” Parents and teachers want the same things. They want the students to be successful. As such, parents are increasingly willing to support technology bans at school if it helps their child be more successful.

Some may be wondering if there were any negative effects the treatment had on my teaching. Admittedly, there were a couple of times I wished I could have let students quickly look something up. I use an online homework system in my classroom and I do not have enough computers for every student. I rarely let students work on the online homework in class. But, on those rare times, I had a student or two who were not able to work on it because all the computers were taken and I would not let them use their phone to access their homework. I also know that there are a few apps out there that have educational benefits, but I never have used them. To this point, a teacher said, “Sure, there might be some apps that we can no longer use but it's made a big difference in classroom behavior.” In other words, the improved classroom behavior outweighs any educational app out there.

One middle school teacher explained their experience with cell phone throughout their career. They said, “I really tried to use cell phones off and on throughout the years. The issue is that there are always notifications coming through. Whatever we are doing was never enough to keep them focused.” Asking kids to use their cell phones in class is asking the modern twist on giving a kid a piece of candy and asking them not to eat it. The temptation is often too great.

The struggle teachers have, though, is that information is so readily available yet students still need to learn how to navigate it. Nearly every student has a cell phone. This

is great news to the school budget because the technology the kids bring is free to the school. But by now, you should be fully aware that it is not really free. It comes at the expense of the students' focus. So, for many teachers, one of the important factors in getting rid of cell phones is making sure the students still have access to the internet.

Here is another teacher's experience with getting rid of cell phones:

I used to occasionally allow students to use them for quick information or to let the students do some quick research. Fortunately, we have plenty of computers to use for that sort of assignment so I have not once missed them having their phones in class. The risk when students are using their cell phones in class is that they are unregulated. I had no control over what they were using their phone for and whether or not they were staying on task.

Yes, I agree that there are some benefits to using phones in class. But those benefits are just not worth the distraction they cause. The lesson here is that there is something uniquely different about when students use their own personal device compared to a school's device. Technology is helpful only when put in its proper place.

To summarize, the treatment in this study had a positive impact on me as a teacher as well as on all the teachers I surveyed. There were many benefits to having a stricter cell phone policy. I found that I was able to focus more on teaching and less on cell phones. Class time was better utilized. Parents were very supportive of it. And, most importantly, relationships with students became stronger. And, with a few tweaks to look more like the middle schools in this study, it could be even better.

Finally, what is interesting to note is that every teacher and principal I surveyed said that they love the ban on cell phones. Many even said they would never even consider going back. Here is what one teacher wrote:

It is safe to say that I do not personally know any teachers who would want to change the cell phone policy that we are currently using. It has made our lives easier and is one less thing that we have to worry about in our classroom management.

The social and academic benefits to removing cell phones from the learning environment are not just for the students. It is also for the teachers.

### INTERPRETATION AND CONCLUSION

The purpose of this study was to determine the academic impact of implementing a strict no cell phone policy in the classroom. I was able to measure the impact in three different ways. The first way, in response to sub-question #1, was based on student learning. The data showed a strong and significant increase in student learning because the students were more engaged in class. However, it was interesting to discover that the increase was only for the students who separated themselves from their phone and used the charging station every day. The second way I measured the academic impact was in regards to the policy itself. In an effort to answer sub-question #2, I wanted to know how effective the policy was at actually curbing the cell phone distraction in my class. What I found was that the policy was only effective for the students who used the charging station. For those students that did not use the charging station, the treatment was not effective at keeping students off of their phones. It helped decrease the distraction, but it did not eliminate the distraction. The final way I looked at the effectiveness of the new cell phone policy was the impact it had on me as a teacher. In response to sub-question #3, the study found that the new policy allowed me to be more focused on what I was teaching rather than on managing my students' attention. Along the lines of classroom management, the new policy increased student engagement as well as decreasing

transition times between activities. Finally, it helped improve the relationships I have with my students because the students were not on their phones as much during passing periods. All in all, the elimination of the cell phone distraction in the classroom benefits both students and teachers. Admittedly, the treatment I implemented had some flaws. But, it was through these flaws that a solution to eliminating the cell phone distraction arose.

The flaw in the treatment was giving students a choice. Although some very important and useful data came about because of this flaw, the goal of the new cell policy was to eliminate the cell phone distraction. Ultimately, giving students a choice is what hindered the effectiveness of the new policy. They had the choice to either use the charging station or keep their phone in their backpack. Yet, for the first quarter, nearly 63% of the students kept their phones. At first, I did not think this would be a big problem. I trusted the students to stay off of their phones during class. From my perspective, they did, for the most part. Yet from the students' perspectives, they were on their phones less than they otherwise might have been, but were still on their phones. I discovered this half-way through the treatment. So, in an effort to increase participation in using the charging station, I presented the first half of the Student Learning data to my classes. I kept it short, showed them the data, and summarized it by saying the students who used the charging station performed nearly six-percent better on the tests. I then told them they still had a choice. Amazingly, the number of students who chose to keep their phones *increased* to 68%! A closer look at the data showed that 12% of students *stopped* using the charging station while 7% of the students started using the charging station.

What this told me is that, of the 63% of students who kept their phones during the first quarter, only a small percentage of them were willing to try something in order to improve their chemistry learning. It also told me that the 12% of students who stopped using the charging station were willing to risk their learning, and consequently their grade, for the comfort of their phone. To them, a six-percent grade change was not significant enough for them to keep doing what they were doing. Or, the 12% of students did not think their phone had any affect on them. As Ward, Duke, Gneezy, and Bos (2017, para. 25) say, “This contrast between perceived influence and actual performance suggests that participants failed to anticipate or acknowledge the cognitive consequences associated with the mere presence of their phones.” The 12% of students who stopped using the charging station may have not attributed any of their success to being separated from their phone. In short, when confronted with the data, most of the students made the wrong choice when it came to their learning.

For most teachers, it is not too surprising that the majority of students were choosing their social lives over their learning. As my principal told me, that just means we need to do a better job of teaching kids logic. While I agree with him, I believe it is quite a difficult task to do without asking students to take a philosophy course because I already do not have enough time to teach all of my chemistry content I want to, let alone teach proper philosophical argumentation. Rather than making students take a course that most high schools do not offer, I would suggest that we do a better job of helping students make the right choice. As the adult in the classroom, it is up to the teacher to make the right choice for their students. Of course, sometimes making the right choice for

students means letting them occasionally make mistakes or even fail. However, those failures are often designed by the teacher to make a point about their content rather than about their classroom management. Cell phones in the classroom are never a content issue; they are always a classroom management issue. As I came to realize the first five years of my career, allowing students to make the choice to be on their phone during class is a reflection of the teacher's classroom management more than it is on the students' desire to learn. As a result, teachers (if not the school), should make the best choice for their students' education, and find ways to eliminate cell phones from their classrooms.

I believe this study shows that the best way to manage cell phones in the classroom is to create separation between the student and their phone. For the students who kept their phones, the temptation to look at their phone was too great. This aligns perfectly with what Gerow, Galluch, and Thatcher (2010) said about the reason students look at their phones is because they lack the self-control to stay off of it. They have strong internal motivations to keep track of what is happening on their phone. In addition, this study confirmed what the literature stated about how our proximity to our phone affects us. Just like in the West Point study by Carter, Greenberg, and Walker (2017) and the study done in Austin, Texas, by Ward, Duke, Gneezy, and Bos (2017) the students in this action research project who had no contact with their electronic device performed the best. Not only did they perform better, but they performed about six-percent better than the other students, which exceeds the three-percent increase which was expected by Duncan, Hoekstra, and Wilcox (2012) and Berry and Westfall (2015).

I have already shared the data with other teachers in my building and they are beginning to reconsider their cell phone policies. One coworker said, “The power of this study is that it quantifies what we have already known.” As a result, some coworkers implemented a no cell phone policy within a couple days of being presented with the data. Some of them approach their policy through the lens of behaviorism. They are experimenting with positively reinforcing the students who put their phones away for the entire class by providing credit and/or extra credit. This is similar to some phone applications that give rewards such as discounts to popular restaurants for students who lock their phones during class. These are not bad ideas. However, I wonder if these incentives actually work given the lack of self-discipline observed for many students.

There seems to be a current cultural movement placing limits on technology. While studying the topic of cell phones I have heard countless stories of schools, corporate meetings, parents, business owners, restaurants, and entertainment venues all placing limits on cell phones. Ultimately, it is not about the phone but about people focusing on the task at hand. As an educator, I have learned that I am responsible for helping my students focus in class. This study has shown me that it is no longer acceptable for students to distract themselves with their phones in my class. But I can’t help but wonder what it would be like if we were able to setup an expectation that cell phones do not belong at school any more than they do during a movie at a movie theater?

#### VALUE

Cell phones are an integral part of society, and I do not foresee them ever going away. This study has made it clear to me, and hopefully to you, that cell phones are

distracting for nearly all of my students. However, before continuing with the importance of this study for my classroom and education as a whole, I would like to consider another area of society that has cell phone policies.

As we all know, our phones are so much more than communication devices. Among many other uses, they have the potential to help make our travel time more productive. Smartphones help us with directions, taking notes, communicating with others while we are commuting, taking pictures of beautiful scenery, and looking up places to go. These are all good things. But many states have made it clear that we should not be doing these things while driving. According to the Governors Highway Safety Association (2018), 47 states have strict laws about no texting and driving while 16 of those states require hands free driving. I anticipate that number will increase in the coming years. This is because cell phones can cause drivers to be distracted. No one questions that cell phones can be helpful to drivers. But no one also questions the fact that distracted driving is dangerous. As such, we have made laws because the risks of using cell phones while driving are not worth the added benefits. This is analogous to cell phones in the classroom. The benefits of using cell phones in the classroom do not outweigh the risks of distracted learning.

I fully acknowledge that the risks of cell phones in the classroom are not equal to the life and death risks of driving. But I do believe the distractions are the same. In each case, the student and driver have their head down looking at their phones and they are not paying attention to what they are supposed to be seeing.

I see many similarities in the data between drivers and students with cell phones and yet very opposite approaches in responses to the data. The states have implemented laws about cell phones because the evidence points to the fact that they are distracting. These states do not let the individual drivers make their own choice; and they have harsh punishments in place for those that break the policy. However, in classrooms the evidence points to the fact that cell phones hinder learning yet many teachers just leave the decision up to the individual student as to whether or not they will use their phone. The states are asking drivers to focus on the task at hand. Shouldn't teachers be doing the same with their students?

After the treatment period, I decided to change the policy from an experiment to an expectation in my classroom for second semester. As one of the middle school principals said,

We are a cell phone FREE environment and that language is very important as we do not want to convey that this is a punishment...In fact, we have teachers asking to be able to [give phones back] for rewards and we have said no, because the minute we do that, we turn this system into a punishment as opposed to the expectation.

I presented my students with the data I had collected and communicated my perspectives about cell phones and their learning. I focused on the fact that the students who turned in their phones generally performed best. I stated that I need to do what is best for the majority of my students and that the data is driving my decision making. I told them I believe the best decision for my students is for them to turn in their phones. I also changed my language from "you have the option to turn in your phone" to "it is my expectation that you turn in your phone." It is interesting to me that this slight change in

language has increased the number of students who turn in their phones from the roughly 40% during the study to just above 60% at the beginning of second semester. And I maybe see one cell phone in a student's hand each week. This is a drastic improvement over prior years when I would see multiple cell phones out each period. My students are more engaged and spend more time practicing in class - and their tests scores are still showing improvements compared to prior years. I would love for 100% of my student to not have their phone on them, but I believe that will only occur if the school implements a school wide policy or at least better supports teachers who desire to eliminate this distraction from their classroom.

I have also noticed that the students have responded very well to the policy. I think more students are willing to buy in to the policy because it has been consistent and they know it is a policy meant for their good. Any teacher knows that consistency is key when it comes to policing their classroom rules. That is why it is important to setup clear, enforceable expectations at the beginning of the year. I have also found it helpful that the students know why the policy is in place. Most people are more willing to follow the rules if they understand why they are created. They are even more willing to follow them if they believe the rule is in place for their own good. I focused on my cell phone policy because I wanted to help my students get more out of what they are doing. I have implemented a no cell phone policy because I care about each of my students learning chemistry. I plan on carrying out this policy for the foreseeable future by sharing the data in this study with my students.

I think there is much more that can be studied when it comes to cell phones in the classroom. One thing that keeps coming up in conversations I have with others is the perception that adults are less distracted by their devices than students. This makes me wonder how different age and/or maturity levels are impacted by devices being near them. I also wonder about the distraction levels of different types of devices. Do some devices, like cell phones or personal tablets, distract people more than school issued devices? And what about smartwatches? I expect to see more of these questions being answered in the coming years because there is an increasing focus on the effects of technological distractions.

When I began this study in 2018 there was very little research about the specific impacts cell phones have in the classroom. Don't get me wrong; there were many studies about how technology, and in a greater sense the internet, effects education. And since the advent of the first iPhone in 2007, it has been popular for nearly every individual, including students, to have the internet and social media at their fingertips all day. As I look ahead to the next few years of my teaching career, I foresee presenting the data in this study to all my classes at the beginning of the year to justify why I will require each student to place their phones on the side of room. I have a couple ideas as to how this will be accomplished. I believe the best option is to have the school support this policy by implementing it school wide by asking the students to keep their phones in their lockers or by using a system like YONDR which locks their phones in a pouch while allowing students get to keep possession of them. If that ends up not being the case, I may continue with the charging station, yet require that it be used rather than requesting it be used. A

similar option would be to have students keep their phones in their backpacks and have the backpacks be grouped together in the back of the room. In any event, the data shows that it is the ease of access to the phone that matters. As such, I will continue to find ways to separate students from their phones. I will also be clear with my students that I did not set out to have a no cell phone policy because I wanted to punish them; I set out to help find a way to improve their focus during valuable class time. Research about cell phones in education is still relatively young, but I believe the evidence is clear that cell phones, while they are impressive tools and provide us with many invaluable resources, hinder learning. The risks outweigh the benefits.

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APPENDICES

APPENDIX A  
IRB EXEMPTION



**INSTITUTIONAL REVIEW BOARD**  
**For the Protection of Human Subjects**  
**FWA 00000165**

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**MEMORANDUM**

**TO:** Eric Etter and Water Woolbaugh

**FROM:** Mark Quinn *Mark Quinn CJ*  
 Chair, Institutional Review Board for the Protection of Human Subjects

**DATE:** October 17, 2018

**RE:** *"Helping Students Focus: The Impact of Having a Strict 'No Cell Phone' Policy on My Classroom" [EE101718-EX]*

The above research, described in your submission of October 15, 2018, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

- (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.
- (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.
- (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.
- (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.

APPENDIX B

CELL PHONE POLICY SURVEY #1

Name \_\_\_\_\_ Per \_\_\_\_\_

Cell Phone Policy Survey

*Please note: participation in this survey is optional and will not impact you positively or negatively in any way. No personal information will be given out.*

**1) How often do you use the charging station?**

Everyday                      Almost Everyday                      Almost Never                      Never

**2) Aside from the first/last couple minutes of class, on average, how many times would you say you look at your phone during class time?**

Zero                      1 time                      2-3 times                      more than 4 times

**3) Aside from the first and last couple minutes of class, on average, how many times would you say your average classmate looks at their phone during class time?**

Zero                      1 time                      2-3 times                      more than 4 times

**4) How many times has Mr. Etter taken your phone this year?**

Zero                      1 time                      2 times                      3 or more times

**5) Mr. Etter's cell phone policy is clear.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**6) Mr. Etter's cell phone policy is fair.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**7) Mr. Etter's cell phone policy is effective.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**8) What is Mr. Etter's cell phone policy?****9) You pay attention in class better when you do not have access to your cell phone.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**10) You are more engaged in what's going on in class when you do not have access to your cell phone.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**11) Schools/Teachers should try to control student cell phones use.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**12) Is there anything else you would like Mr. Etter to know in regards to his cell phone policy? (you can write on the backside if you need to)**

APPENDIX C

CELL PHONE POLICY SURVEY #2

Name \_\_\_\_\_

Cell Phone Policy Survey: 2nd Quarter

*Please note: participation in this survey is optional and will not impact you positively or negatively in any way. No personal information will be given out.*

**1) During the 2nd quarter, how often did you use the charging station?**

Everyday                      Almost Everyday                      Almost Never                      Never

**2) How often did you use the charging station during the 2nd quarter compared to the 1st quarter?**

More often                      The same amount                      Less often

**2b) If you circled “more often” or “less often” what caused the difference?**

**3) How many times has Mr. Etter taken your phone this semester?**

Zero                      1 time                      2 times                      3 or more times

**4) Mr. Etter’s cell phone policy is fair.**

Strongly agree                      Agree                      Disagree                      Strongly Disagree

**4b) Why did you the answer the way you did in the question above?**

**5) What are some benefits to cell phones being allowed in the classroom?**

**6) What should Mr. Etter do about cell phones next semester?**

**6b) Why?**

**7) Is there anything else you would like Mr. Etter to know in regards to his cell phone policy? (you can write on the backside if you need to)**

APPENDIX D  
TEACHER OBSERVATIONS AND NOTES

## Teacher Observation and Notes: Reflections of cell phone use

### 8/14/18 -

The new cell phone policy has been in place for 3 class period now. Most students are participating by placing their cell phone in one of the slots. Each class has started with a reminder to put the phone in a slot.

**Today I saw the first cell phone being used in class.** I asked the student for it and held onto it the rest of class. I told him he could pick it up from the office. After he told me he was going to work right now, I told him the next time I see it he can get it at the end of the day, and then I gave him his phone back.

The students seem to be on board with it. They seem engaged, but not necessarily different from the normal first few days of school in the past.

**“The students just need to know the rules.” - Rose**

### 8/16/18 -

One full school week in. I reminded students every day to turn their phones into the slots on the side of the room.

I asked a couple students what they think of the cell phone policy. They said, “It’s weird not having my phone”, “I’m not tempted to get up and go look at it”, “It’s not a distraction for me because I don’t have the option to look it”, “It’s kind of nice because I don’t care about who’s texting me during class”

I asked, would you rather have your phone on you. They gave hesitant answers.

Reminds me what Rose said, “The students just need to know the rules”

We did a computer PhET activity (build an atom) and they worked really well in their groups. There was some distraction, but overall the engagement was really good.

Students who were disengaged in the activity were not spending the time on their phone - they were looking around the room or daydreaming.

I had to take one phone today because it was in a girl’s lap. I asked for the phone and told her that she could get it back at the end of class. This was strictly enforcing the cell phone policy. I probably should have asked her to turn it into the pouch on the wall (given grace the first time because I didn’t even see her on the phone).

### 9/4/18

At back-to-school night last week one parent said, “I wish every classroom had something like that” referring to the cell phone turn-in on the side of the room.

Our middle school have banned cell phones from the schools.

About half of the students turn in their phones to the side. I am unable to force the policy on my student because my administration will not back me up on the policy.

I should look at student data that shows students who always turn in their phone and those that keep their phones.

### 9/13/18

I have been more relaxed with the cell phone policy lately. I just ask students to put their phone on the wall if I see it.

With the electrons unit, students seem to be understanding it pretty well.

**9/19/18**

Conversation with Nate J about middle schools

**9/20/18**

Conversation with Trevor

**10/01/18**

I've noticed transitions are smoother.

**10/3/18**

I gave the survey today (survey #1)

**10/15/18**

Discussion with Greg (principal) about the research project. Based on the results half-way through the semester, there is plenty of research stating that the charging station directly correlates with a 6% increase in students grades. So, How do we teach kids logic? How do we help them grow up? How do we teach them to make informed decisions? Would the business world be better 3% more effective/efficient?

**10/23/18**

Talked with Angela today. How do we teach skills like logic when we are teaching them so many other things? She had anecdotal evidence that the students who currently have C's or lower in her class spend their work time on their phone.

**10/25/18**

Started getting replies from the middle school principals. Discussed with Steve today. I should interview middle school teacher students - how do they view the cell phone policy and how has it affected their policy?

APPENDIX E

CELL PHONE POLCY SURVEY #1 RESULTS

*Student Survey #1 Results*

On average, how many times would you say you look at your phone during class time?	60.38% Zero times	27.36% 1 time	11.32% 2-3 times	0.94% more than 4 times
On average, how many times would you say your typical classmate looks at their phone during class time?	13.21% Zero times	24.53% 1 time	46.23% 2-3 times	16.04% more than 4 times
How many times has Mr. Etter taken your phone this year?	77.36% Zero times	18.87% 1 time	2.83% 2 times	0.94% 3 or more times
Mr. Etter's cell phone policy is clear.	53.77% Strongly Agree	44.34% Agree	0.94% Disagree	0.94% Strongly Disagree
Mr. Etter's cell phone policy is fair.	22.64% Strongly Agree	64.15% Agree	11.32% Disagree	1.89% Strongly disagree
Mr. Etter's cell phone policy is effective.	13.21% Strongly Agree	59.43% Agree	22.64% Disagree	4.72% Strongly Disagree
What is Mr. Etter's cell phone policy?	96.22% of students accurately stated the policy		"Put the phone at the charging station or in your backpack – Never be on it"	
You pay attention better when you do not have access to your cell phone.	19.81% Strongly Agree	44.34% Agree	30.19% Disagree	5.66% Strongly Disagree
You are more engaged in what's going on in class when you do not have access to your cell phone.	16.98% Strongly Agree	50.94% Agree	27.36% Disagree	4.72% Strongly Disagree
Schools/Teachers should try to control cell phones.	4.72% Strongly Agree	46.23% Agree	44.34% Disagree	4.72% Strongly Disagree

*Note.* (N= 106).

APPENDIX F

STATISTICAL ANALYSIS OF TREATMENT AND COMPARISON GROUPS

Statistical Analysis of Test Data Between Treatment vs Comparison Group		
Summary	4 of the 6 tests show a statistically significant increase between the distributions of the treatment test scores compared to the comparison test scores with an average difference in test score of 3.62%	
Atomic Theory	Wilcoxon rank sum test with continuity correction data: AtomTreat and AtomComp W = 15739, p-value = 0.0008815 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 2.070086 Inf sample estimates: difference in location 4.209927	Yes, statistical significance
Electrons	data: ElectTreat and ElectComp W = 14492, p-value = 0.04489 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 0.05001715 Inf sample estimates: difference in location 2.769942	Yes, statistical significance
Trends	data: TrendTreat and TrendComp W = 14953, p-value = 0.01339 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 0.9800795 Inf sample estimates: difference in location 3.230007	Yes, statistical significance
Bonding	data: BondingTreat and BondingComp W = 14026, p-value = 0.1546 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: -1.319989 Inf sample estimates: difference in location 1.979995	No
Moles	data: MoleTreat and MoleComp W = 15820, p-value = 0.000815 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 6.659974 Inf sample estimates: difference in location 6.670077	Yes, statistical significance
Final	data: FinalTreat and FinalComp W = 13650, p-value = 0.1217 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: -1.249945 Inf sample estimates: difference in location 2.499976	No

APPENDIX G

STATISTICAL ANALYSIS OF KEEP PHONE AND COMPARISON GROUPS

Statistical Analysis of Test Data Between Comparison Group vs Keep-Phone Group		
Summary	0 of the 6 tests show a statistically significant increase between the distributions of the comparison group compared to the distributions of the keep-phone group with an average difference in test scores being -2.01%.	
Atomic Theory	<p>Wilcoxon rank sum test with continuity correction  data: AtomComp and AtomPhone  W = 7064, p-value = 0.9717  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -5.540055    Inf  sample estimates:  difference in location  -3.030028</p>	No
Electrons	<p>data: ElectComp and ElectPhone  W = 7789, p-value = 0.7885  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -4.889958    Inf  sample estimates:  difference in location  -1.519952</p>	No
Trends	<p>data: TrendComp and TrendPhone  W = 7681.5, p-value = 0.8069  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -4.840001    Inf  sample estimates:  difference in location  -1.619956</p>	No
Bonding	<p>data: BondingComp and BondingPhone  W = 8719.5, p-value = 0.5454  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -4.230049    Inf  sample estimates:  difference in location  -0.2200391</p>	No
Moles	<p>data: MoleComp and MolePhone  W = 7360, p-value = 0.9811  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -13.32995    Inf  sample estimates:  difference in location  -6.669968</p>	No
Final	<p>data: FinalComp and FinalPhone  W = 9164.5, p-value = 0.5648  alternative hypothesis: true location shift is greater than 0  95 percent confidence interval:  -3.749948    Inf  sample estimates:  difference in location  -5.248583e-05</p>	No

APPENDIX H

STATISTICAL ANALYSIS OF KEEP PHONE AND TURN IN PHONE GROUPS

Statistical Analysis of of Test Data Between Turn-In-Phone Group vs Keep-Phone Group		
Summary	5 of the 7 tests show a statistically significant increase between the distribution of the students who turn in their phone compared to the distribution of students who keep their phone with an average difference in test scores being 5.96%.	
Atomic Theory	Wilcoxon rank sum test with continuity correction data: AtomicNoPhone and AtomicPhone W = 1704, p-value = 0.03683 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 1.655638e-05      Inf sample estimates: difference in location 3.630056	Yes, statistical significance
Electrons	data: ElectronsNoPhone and ElectronsPhone W = 1713.5, p-value = 0.01812 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 1.249961      Inf sample estimates: difference in location 5.000037	Yes, statistical significance
Trends	data: TrendNoPhone and TrendPhone W = 1718, p-value = 0.1135 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 1.610016      Inf sample estimates: difference in location 6.450002	Yes, statistical significance
Bonding	data: BondingNoPhone and BondingPhone W = 1519, p-value = 0.05679 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: -2.444774e-06      Inf sample estimates: difference in location    5.26997	No
Measurement	data: MeasNoPhone and MeasPhone W = 1485.5, p-value = 0.06734 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: -5.19352e-05      Inf sample estimates: difference in location 4.170057	No
Moles	data: MoleNoPhone and MolePhone W = 1592.5, p-value = 0.01882 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 8.310106e-05      Inf sample estimates: difference in location    6.670043	Yes, statistical significance

Final	data: FinalNoPhone and FinalPhone W = 1272, p-value = 0.04262 alternative hypothesis: true location shift is greater than 0 95 percent confidence interval: 2.510961e-07      Inf sample estimates: difference in location 5.000014	Yes, statistical significance

APPENDIX I

CELL PHONE POLICY SURVEY #2 RESULTS

*Student Survey #2 Results*

During the 2 <sup>nd</sup> Quarter, how often did you use the charging station?	23.53% Everyday	12.75% Almost everyday	28.43% Almost never	35.29% Never
How often did you use the charging station during 2 <sup>nd</sup> quarter, compared to 1 <sup>st</sup> quarter?	12.75% More often	55.88% Same amount	31.37% Less often	
What caused the difference?	Responses varied. Typical responses for “more often” regarded wanting to improve their grade. Typical responses for “less often” said they weren’t distracted by their phone			
How many times has Mr. Etter taken your phone this semester?	73.53% Zero times	23.53% 1 time	2.94% 2 times	0.00% 3 or more times
Mr. Etter’s cell phone policy is fair	73.53% Strongly Agree	23.53% Agree	2.94% Disagree	0.00% Strongly Disagree
Why did you answer the way you did?	Responses varied, but were often about how it was setup in their best interest. Those that disagreed said there shouldn’t be a policy.			
What are some benefits to cell phones being allowed in the classroom?	Responses varied, but here are common responses: Get homework done, work better with music, should be rewarded for getting their work done			
What should Mr. Etter do about cell phones next semester?	Many students said I should keep the policy the same			
Why?	Many students simply said something about “it works” and “it’s fair”			
Is there anything else you would like Mr. Etter to know?	Most students left this one blank.			

*Note.* (N= 102).

APPENDIX J  
MIDDLE SCHOOL PRINCIPAL SURVEY

- 1) What is your school's exact policy with cell phones?
- 2) What was the reason for implementing the policy?
  - 2b) Through the 1st quarter, does the policy seem to be meeting that goal?
- 3) How has the "no cell phone policy" affected your school, both good and bad? (Students? Teachers? Parents? Administration?) One or two specific examples would be great!
- 4) You may have just answered this, but I want to be sure to ask this question explicitly because a major focus of my project is on the academic impact: From your perspective (or from conversations you've had with your teachers), how has the policy impacted the students' academic performance so far? Does it seem to favor one subject more than another (Example: math sees more of an impact than history)?
- 5) Is there any other information you would like to share about cell phones with regards to your policy? Is there anything you would do differently?

APPENDIX K  
MIDDLE SCHOOL TEACHER SURVEY

**Here is the summary of (insert school name)'s policy I have:** Cell phones are to be turned off at 7:25 AM and placed in the student's backpack. A student's cell phone may not be out during the school day unless permission has been granted by an adult or during the student's lunch period

1) Is the policy above accurate? and is it followed consistently throughout the building?

2) How has your teaching/classroom been affected by the policy?

3) What do the students say about the policy?

4) If the policy were not in place, what benefits would there be to using cell phones in your classroom? Would there be any risks to using cell phones in class?

5) Have you noticed any difference in student learning and/or engagement in lessons because of the cell phone policy? (Any chance you have quantified this data?)

6) Do you know if other subjects (english, social studies, etc) view the policy differently (for the better or worse)?

7) Is there any other information you would like to share about cell phones in your classroom and/or the school policy?