

THE IMPACT OF MINDFULNESS ON  
THE INTEGRATED SCIENCE CLASSROOM

by

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## ABSTRACT

This study was conducted over the winter and spring in a predominantly ninth grade Integrated Science Class. The goal was to find out if practicing mindfulness had any impact on the classroom environment and student learning. Students first took pre and post- summative tests in a non-treatment unit that focused on the study of waves. During the treatment unit, which focused on the study of astronomy, students participated in mindfulness three days a week, for two to five minutes, at the beginning of the class. Students took pre-and post- summative tests for this unit as well. They took a Likert survey, both before and after the treatment unit, to gauge their impressions of a variety of classroom factors. Additionally, students submitted short answer responses to questions related to the mindfulness treatment unit. Finally, during the treatment unit, the instructor kept a daily journal.

There was no statistical difference in the students' summative test scores when the treatment and non-treatment units were compared. There were also no statistical differences pre-and post-treatment in student answers to any of the thirteen items on the Likert survey. Student responses to the free response questions, and the instructor journal showed a positive correlation between the treatment and the classroom environment.

Based largely on the qualitative data, from the student responses and the instructor journal, mindfulness practice was shown to have a positive impact on the classroom. Students said that they were able to focus better, they were calmer, and had reduced levels of stress and anxiety. The instructor journal also showed that the students maintained better focus and were less restless on days where mindfulness was practiced.

## INTRODUCTION AND BACKGROUND

### Context of the Study

The American Academy in Prague (AAP) is a small independent school located in the Czech Republic. It is a co-ed school with a current student population of 121 students. Due to a school policy of rolling admissions, this number frequently changes as new students are added about once a month. Students' annual tuition is about \$15,000 per year (American Academy, n.d.). With the average national salary being equivalent to just below \$14,000 per year (Czech Republic Average, 2019), the tuition presents a significant barrier to entry for many Czech families. As a result, most of our students' families are in the top range of earners. Only six-percent of students in our school are classified as economically disadvantaged (American Academy in Prague, n.d.). At this time there is no financial aid available.

Students at AAP represent 28 different countries. Czech are the largest group and represent 50% of the student population. They are followed by Americans (11%) and Russians (6%). The curriculum at AAP is taught entirely in English with 86% of our students being English language learners (American Academy in Prague, n.d.). The American Academy in Prague has only been operating for three years. It was started as an alternative to the other international schools in Prague which largely focus on the British or International Baccalaureate (IB) curriculum. The IB curriculum is a set of courses where students have to reach a series of benchmarks in a variety of course areas. In addition to the academic component, IB students must participate in a variety of extracurricular activities as well as write a 4000+ word extended essay. Finally, students



must take a series of high stakes tests to receive their diploma (International Baccalaureate, n.d.). On the contrary, AAP focuses on student class choices, which allows much greater freedom within their path of study. Students have to complete certain credits across different curricular areas but have much greater freedom with their class choice and path of study. AAP also has no compulsory standardized high stakes testing. Students who choose to take AP level classes may take their AP subject tests but it is not a graduation requirement. According to the AAP marketing materials, “American Academy focuses on the development of competencies, independence, and creativity through thematic and project-based learning” (American Academy, n.d.,p.16).

Being a relatively new school, there is little to no student support system in place. Most of the student emotional and academic support goes through the head of school or whichever teacher has the best relationship with a given student. Adolescence can be an emotionally trying time for anyone, however, I feel many of my students have a higher bar to climb over. Most are spending their day trying to learn, read and write in a second or even third language. Many have moved to Prague from other cities both in the Czech Republic and across the world and identify as a Third Culture Kid. These are children who have been raised in a country other than that of their parents’ homeland (Mayberry, 2016). Not only are they trying to make new friends but they may also be trying to navigate daily life in a new country where few speak their language of comfort. Thinking of these unique challenges gave me the desire to help students find a way to manage the stresses of their lives both inside and outside of school. Interest in mindfulness has been growing in educational circles over the last few years. Although I

had heard the word bounced around more and more I was still unsure if it was hype or reality. With this in mind, I started my own practice beginning in the summer of 2019 and I decided to make it a topic for my research.

### Focus Question

The focus question for this study was, How does the use of mindfulness techniques effect the science classroom?

Sub-questions were addressed.

- 1) Does daily mindfulness practice affect the learning of students in an Integrated Science classroom?
- 2) How does a daily mindfulness practice affect a student's comfort, engagement, and excitement about this class?
- 3) How does implementation of a daily mindfulness practice influence instructor enthusiasm, patience and relationship with the class?

## CONCEPTUAL FRAMEWORK

### Challenges in Education

In today's educational landscape, students get bombarded with more and more ways to hold their attention. From mobile phones and computer games to social networking and on demand music services, there is something available at almost every second to grab the attention of students. The resulting classroom environment can be harder to control and the students more difficult to reach. Partially in response to the new competition for student attention, teachers have been forced to adapt and adopt a variety of tactics from flipped classrooms to flashy graphics integrated PowerPoints. But what if instead of trying to compete with the attention-grabbing devices educators worked to change the nature of student attention at its core? Mindfulness may be the best technique we have to accomplish this (Jha, Krompinger, & Baime, 2007).

In addition to the challenges of reaching students, teachers have a variety of other demands placed on them. These include grading papers, writing reports, communicating with parents and colleagues, and planning lessons. Each of these stresses can take additional time outside of the classroom. Teacher anxiety levels can increase due to stressful interactions with students, parents, colleagues, and the educational system. Not to mention trying to fulfill the high-performance expectations of the profession as a whole (Schneider-Levi, Mitnik, Zafrani, Goldman, & Lev-Ari, 2017). All these factors contribute to what some have called an epidemic of teacher burnout. In the United States it is estimated that 40–50% of new teachers leave the profession after only 3 years (Steinhardt, Smith, Jaggars, Faulk, & Gloria, 2011). Most cite burnout due to lack of

support as a key driver of their choice to leave. Those who do stay may be less engaged in the success of their students. This can lead to a lack of close student teacher relationships, swifter and more punishment-based reactions to student behavior, and a lower quality classroom environment. With students spending about seven hours of their waking day at school, being subjected the negative consequences of teacher burnout can have a significant negative impact on their learning outcomes (Oberle & Schonert-Reichl, 2016). Might mindfulness also be a way to also help teachers cope with the demands of the profession as well as stay in the job longer?

### History and Types of Mindfulness

Mindfulness comes in many shapes and forms and it can have many definitions. Jon Kabat-Zinn, who many credit as the founder of western mindfulness practice defines mindfulness as, “keeping focus in the present moment deliberately, right now, and nonjudgmentally” (Positive Psychology, 2019). Others describe it as “a sustained moment to moment awareness to mental states and processes” (Stein, Ives-Deliperi, & Thomas, 2008). However it is defined, there are a few common themes with mindfulness. The practitioner is to sit or lay down and try to close their eyes. The practitioner is asked to focus on the present moment whether that is their breathing, a sound or sounds, or a specific idea. If thoughts or ideas relating to the future or past come into the mind, they are to be observed then released from attention as the practitioner returns their attention to the present moment. Often times, mindfulness is as simple as focusing on the inhale and exhale of one’s breath. Breathing is the essence of any mindfulness practice as captured in the phrase, “There are no past breaths, no future

breaths, only the present moment's breath" (The Mindful Movement - YouTube Page, 2016, n.p.).

The ideas of mindfulness are not new, rather, they date back thousands of years to ancient Buddhism. Approximately 2500 years ago in India, a 29-year-old Buddha Siddhartha left his family life of comfort to seek enlightenment. Through many years of meditation, he developed the first idea of mindfulness and came up with six ideas he called the "sisters of mindfulness". These ideas which comprised the bulk of his teaching are; compassion, acceptance, forgiveness, gratitude, loving-kindness, and best-self visualization. Each of these "sisters" reflects a goal of mindfulness practice and denotes a skill area in which the practitioner can focus to achieve greater inner peace. Buddha Siddhartha spent the next 45 years traveling through India teaching these ideas (Rosenzweig, 2013).

In the western world, Jon Kabat-Zinn was the first person to bring the practice of mindfulness to use in a clinical setting. Kabat-Zinn was originally trained in biology and completed his PhD in 1971 from MIT (UMass Medical School, 2014). Through the 1970's, he explored meditation as a tool for acquiring self-knowledge and greater focus. In 1979, Kabat-Zinn founded a practice called Mindfulness Based Stress Reduction (MSBR) as a way to help people deal with chronic pain and illness (Cooper, Cetta, & CBS News, 2014). MSBR is an experiential learning course that includes eight weekly group sessions, a half-day retreat, and a core curriculum of formal and informal mindfulness meditation practices (Neff & Germer, 2012). It has been found to be quite successful in improving both mental and overall physical health. A variant of MSBR,

Mindfulness-Based Cognitive Therapy, has been successfully developed for clinicians to use with patients dealing with depression. One of the chief tenants of the Mindfulness-Based Cognitive Therapy program is for practitioners to gain awareness that there are things you can't change about your life in this moment (Hickman, 2013).

Another program that has been based on the original ideas of the sisters of mindfulness is the Mindful Self-Compassion program. Mindful Self-Compassion uses a mixture of meditation, group therapy, and positive self-talk to increase a sense of personal warmth and unconditional acceptance of the self. It seeks to teach people a way of being compassionate towards themselves by teaching self-kindness. Self-kindness refers to the tendency to be caring and understanding with oneself rather than being harshly critical. Self-kindness has been shown to be a prominent indicator of mental health. Those who show greater self-kindness show less incidence of depression and anxiety. Mindful Self-Compassion teaches via both formal (sitting meditation) and informal (during daily life) self-compassion practices (Neff & Germer, 2012).

Whether one chooses to practice mindfulness as part of a recommendation from their doctor, a formal group, or on their own at home, the practice of mindfulness has been shown to have many positive effects. As early as 1992 a study was conducted to see if mindfulness could help patients who had been diagnosed with anxiety and panic disorder. Participants took place in an MSBR program where they used meditation as a tool for biofeedback and relaxation. Not only did participants find a reduction in anxiety and panic disorder at the end of the treatment, but at the three-month follow up interview these gains were still present for most participants (Kabat-Zinn et al., 1992).

Mindfulness has been shown to reduce symptoms of Post-Traumatic Stress Disorder (PTSD) and its associated challenges. Those who suffer from PTSD show an attentional bias towards trauma related stimuli, finding it easier to focus on traumatic ideas rather than the more mundane. This focus on trauma can drive an increase in anxiety levels which is one of the main struggles of PTSD sufferers. People with PTSD respond to mindful meditation through the reframing of their attention (Lang et al., 2012). Reframing attention is done through mindful meditation by refocusing attention on the breath once the participant notices their attention has wandered. The repeated refocusing on the breath helps to train the mind to focus on the present moment. The long-term focus of a mindfulness practice, whether one's attention is focused on the breath or on other stimuli can help to control what information a PTSD sufferer will focus on and what they will not. The ability to have greater control of thoughts can be a great help and lower the symptoms of this challenging disorder.

A study published in 2016 sought to find the role of mindfulness in reducing stress levels among students in their first year of college (Ramasubramanian, 2016). Many first-year college students experience living away from home for the first time. The challenges they face can be many and include balancing class load and schedules, making new friends, or joining social structures such as fraternities and sororities. The many changes and new environments often lead to a particularly stressful time. Researchers in this study used a mix of journaling, meditation, classroom sessions and small group discussions to help students practice and understand how mindfulness could be useful in their everyday lives.

Researchers found that the mindfulness training had a number of positive effects on students. As hoped, mindfulness was shown by the students to reduce feelings of stress. These results could be seen through both entries in student journals, as well as by comparing pre- and post-treatment scores on a perceived stress test (Ramasubramanian, 2016). In addition to lower stress students reported that they were sleeping better, had easier communications between themselves and others, stayed more focused, and had a greater sense of well-being. All these results came from a 14-week, once a week seminar style-course.

### Managing Stress in Students

The management of stress and the improved feelings of well-being that are the result of mindfulness practice can be traced to parts of the brain that are, so far, only partially understood. In order to get a better view of how this practice can have such a positive effect one must first examine the brain and how it relates to stress.

The brain is a complex pathway with most structures playing multiple roles in the realms of memory, cognition, and emotional regulation. Of the many items that have a role in managing stress, attention, and anxiety two key structures are the amygdala and the prefrontal cortex (PFC). The amygdala is the part of the brain which controls our fight or flight response to fear or other stimuli (Hölzel et al., 2009). It is a place where one's reactive emotions live. The PFC is the emotional regulator of the brain. It is responsible for moderating the amygdala and slowing down the fight or flight response when necessary. In brain imaging studies the degree of connectedness between these two parts has shown to be a determining factor in how well one can respond to stressful



situations. The greater the degree of connectedness is thought to reflect a greater emotional regulation in adults (American Mindfulness Research Association, 2014). Additionally, the larger the physical size of the connection between the PFC and the amygdala, the easier it is for one to regulate their emotions.

Children and adolescence with anxiety have a heightened reactivity in the amygdala. This is believed to be the result of a weaker connection to the PFC (Shonkoff et al., 2011). One place this can be seen is in children who live in repeatedly stressful situations. Brain scans show that severe stress resulted in diminished connections between the PFC and the amygdala. This diminished connection is most likely the result of the stress hormone cortisol (Yan, 2018). Cortisol gets released in the blood as the body attempts to override the PFC and reacts instinctively when necessary. Normally, once the stressful situation is relieved the cortisol level is diminished and the connection is remade. However, when an individual is subject to repeated stress the cortisol can breakdown the connection between the amygdala and the PFC, resulting in a permanent reduction in communication between these two control centers. The result of chronic stress can be an impairment to cognitive function and emotional function. This impairment can be seen to have a negative impact in attention and academic achievement (American Mindfulness Research Association, 2014).

Chronic stress at home has been shown in many studies to cause troubles for students at school. Almost every teacher has had the student who is doing fine, but then in the middle of the year, suddenly starts to miss assignments and receive lower test scores. Alternatively, the student may begin to act out in class and seem to have less

control of their daily impulses. Upon investigation the teacher will often find that a family member has become sick, the student's parents are fighting or getting divorced, or there has been a change in the family financial situation for the worse. The teacher can see that the stress that is occurring at home has been translated into the academic realm. Many students will bounce back and either come up with their own coping strategies or the situation will improve. Unfortunately for some, the stressors never alleviate and the problem will become chronic. The resulting chronic stress causes a breakdown in the PFC amygdala connection and can lead to a host of other problems. A 2012 study suggests that, "many adult diseases should be viewed as developmental disorders that begin early in life and that persistent health disparities associated with poverty, discrimination, or maltreatment could be reduced by the alleviation of toxic stress in childhood" (Shonkoff et al., 2012, p e232).

Although it is not fully clear how mindfulness can be seen to have such a positive impact on so many, there are some telling signs from recent brain research. One tool researchers have developed to measure mindfulness is the Mindfulness Assessment Awareness Scale. An individual's score is based on their answers to 15 Likert items which assess their degree of mindfulness as opposed to mindlessness (Brown & Ryan, 2003). It is believed that mindfulness works to strengthen the connection between the PFC and the amygdala. Brain scans of people who rank higher on The Mindful Assessment Awareness Scale have been shown to have a greater connection between these two areas. MRI scans have shown that in individuals who have completed an eight-week mindfulness course, the amygdala appears to shrink. Additionally, the PFC appears

to thicken and build a tighter connection with the amygdala while reducing connections with the amygdala and the rest of the brain (Ireland, 2014).

As student attention is at the heart of the challenge to the classroom teacher it would be best the educator to do anything they can to increase the quality of attention they receive from their students. For this, mindfulness may be the key. In a 2014 study scientists at MIT looked at the brain and how it focused attention. They could see that the PFC is the brain's control center for attention (Baldauf & Desimone, 2014). It is here that much of the visual stimuli that we receive is processed and deciphered. Focusing on how to train the brain, and enlarge or strengthen the PFC appears to be at the heart of the attention challenge. The way to increase the size of the PFC, as with most desired outcomes in the body, from bigger biceps to a faster mile, training is key. Through repeated practice, an individual is able to build strength or skill and with the brain that is no exception. Repeated practice of brain refocusing has been shown to build the PFC and the attentional networks we seek (Zelazo & Lyons, 2012). "If students don't learn how to shut out distraction and center their attention, they are at risk of suffering both academically and physically" (Silver & Stafford, 2017, p. 12).

Research has shown that helping students learn how to self-regulate their behaviors through mindfulness has a pronounced positive effect on classroom management issues in terms of reduced conflict and bullying, as well as on individual behavior such as controlling impulsivity and attentional focus. As a result of this finding, since 2007, educators have been experimenting with and implementing mindfulness in their classrooms (Silver & Stafford, 2017).

One of the most recent studies on mindfulness in the classroom was published in January of 2019 and showed great promise. In two sixth grade classrooms at middle schools in the Boston area, researchers sought to learn what effect mindfulness could have on students. In a group of unknown size, half of the students were assigned to a mindfulness treatment while the other half of the students participated in a computer coding experience. Half of the students in the mindfulness cohort participated in pre- and post-treatment brain imaging. Mindfulness was taught at the end of the school day for 45 minutes, four times per week. At the end of the treatment, researchers found that students who participated in the mindfulness experience showed a reduction in stress when compared to those in the treatment group as well as an improvement in attention. On post scans from those who participated in mindfulness there was a reduced response of the amygdala, the center of the fight or flight response, when compared to the scans completed before the treatment (Krachman, Guttierrez, Scherer, West, & Gabrieli, 2019).

Finally, mindfulness programs have been shown to reduce teacher stress and fatigue, two of the greatest culprits leading to teacher burnout. Teachers set the tone not just for their individual classroom, but for the school as a whole. The tone that is set can have a significant impact on the emotional well-being of the students at that school. A teacher who is socially and emotionally competent will foster a sense of community in their classrooms. They will create more engaging lessons and develop closer relationships with their students (Jennings & Greenberg, 2009). Unfortunately, when teachers are unable to manage the emotional demands of their work, they frequently suffer from burnout.

In 2014 a group of educational professionals from across school districts in England were selected to participate in a mindfulness-based instructional training ( $N=108$ ). The trainings took place once a week over nine weeks and lasted for 75 minutes at a time. After treatment, teachers noted a significant reduction in their level of stress when measured on a Perceived Stress Scale (Beshai, McAlpine, Weare, & Kuyken, 2015). Additionally, both pre and post treatment teachers took a test that was designed to measure self-reported well-being. While the scores of the non-treatment went down slightly on this test, the scores of those who participated in the mindfulness treatment rose significantly post-treatment. “In light of the reported stress levels among teachers, and given the unique role of teachers as health promoters within the school system, the findings of this study point to a promising intervention that may be capable of supporting teachers in their work place” (Beshai et al., 2015, p. 206).

## METHODOLOGY

Treatment

Students in American Academy's sixth period Integrated Science class were delivered the mindfulness treatment over five weeks in the winter of 2020 ( $N=16$ ). Several data collection instruments were used in order to assess student's response to the treatment.

Initially, pre- and post-tests were given for a non-treatment unit. The strategy was to collect data on student learning in a non-treatment unit to use as a base for comparison. Students were also given a pre and post-test for the treatment unit. Next, a mindfulness survey was given to students both initially and after the treatment unit. Throughout the treatment unit, the instructor kept a daily journal, both on days when mindfulness was practiced and on days when it was not. Finally, at the end of the treatment unit, due to school being closed related to issues around the COVID-19 virus, students were emailed a six-question free response survey to hear their thoughts on the treatment. Additionally, three students completed the post treatment test online due to missing the final day of class. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for work with human subjects was maintained (Appendix A).

American Academy has a five day a week, six period schedule, where each class meets every day of the week. The mindfulness treatment took place three days a week on Mondays, Wednesdays, and Fridays. In a normal week, students practiced mindfulness for the first one to ten minutes of the period. On weeks which had schedule conflicts, the

practice was moved to alternative days but maintained three days of the treatment. During the five-week treatment, students were exposed to a variety of mindfulness techniques that focused on different topics. Mindfulness was practiced 3 days a week

In the first week of the treatment, students were exposed to the ideas and practice of mindfulness. Students watched a short video, practiced finding a mindful sitting position, and sat for their first short meditations. Following the introduction week, each week maintained a similar schedule for each new focus idea. Two days of the week were silent meditation while the third was a guided meditation. Themes covered during different weeks were; acceptance, compassion, forgiveness, and gratitude. On the first day, the teacher would give a five-minute talk about the meaning of the week's theme. Students were asked questions and allowed to discuss what the theme meant to them. This was followed by a short meditation of five minutes or less. On the second day of the weekly mindfulness curriculum, the theme was reviewed and students were given a prompt related to the theme that they focused on during the short meditation session that followed. On the final day of mindfulness for the week, students participated in a guided meditation based on the weekly theme.

#### Data Collection and Analysis Strategies

To collect data on the impact of mindfulness on student learning, the Waves Test was given for a non-treatment unit and was compared to the Astronomy Test for the curricular material taught during the treatment unit. For the non-treatment unit, the Waves Test was given at both the beginning and the end of a five-week unit on the study of wave properties including sound, light, and the electromagnetic spectrum (Appendix

B). For the treatment unit, the Astronomy Test was given both at the beginning of the end of a five-week unit on astronomical distances, stars, and our solar system (Appendix C). Each test consisted of 20 multiple choice questions, with a few of those questions relating to the interpretation of a diagram. For each unit test, the normalized gain was calculated for each student. The normalized gain was calculated to determine differences in student knowledge. Normalized gains of less than 0.3 were considered low gains, 0.3 to 0.7 was considered a medium gain, and normalized gains greater than 0.7 were considered high gains (Hake, 1998). Additionally, the mean normalized gain for all students was calculated for each unit. Finally, the mean student score from the beginning and end of the treatment and non-treatment units were compared to the mean student score from the end of the treatment and non-treatment units. This data was displayed by using a box and whisker chart.

The Mindfulness Likert Survey was administered to understand how a daily mindfulness practice affected student comfort, engagement, and excitement about Integrated Science class (Appendix D). The Mindfulness Likert Survey, a 13-question instrument designed to gauge student impressions of the classroom environment, was administered. The survey was given at both the beginning and at the end of the treatment unit. Students were asked to respond to a series of statements on a scale of Strongly Disagree (1), Disagree (2), Agree (3), or Strongly Agree (4). Scores for the Mindfulness Likert Survey were tallied and each item was subjected to a Wilcoxon Signed Rank test. The test was used to see if there was a statistical difference between student impression



of the classroom environment before and after the treatment. This test is appropriate in this situation because it can be used to compare ordinal data of paired groups.

In response to the third focus question, how does implementation of a daily mindfulness practice influence instructor enthusiasm, patience, and relationship with the class, the instructor used the Instructor Journal Questions (Appendix E). This journal was kept on both the days when mindfulness was practiced and the days that it was not. After the treatment unit, the journal entries were analyzed for themes.

Finally, all students were emailed a form with the six Student Interview Questions (Appendix F). The interview questions were designed to gather a deeper understanding of the student and the perceived change in the instructor during the treatment unit. Ten students provided responses to the questions in the form. The data was analyzed for themes and used to support other findings (Table 1).

Table 1. Data Triangulation Matrix.

Focus Questions:	Data Source 1	Data Source 2	Data Source 3
<i>Primary Question:</i>			
How does the use of mindfulness techniques affect the science classroom?	Student survey	Student pre- and post-test	Student responses
<i>Secondary Questions:</i>			
Does daily mindfulness practice affect the learning of students in an Integrated Science classroom?	Student pre- and post-test	Student responses	Instructor journal
How does a daily mindfulness practice affect a student's comfort, engagement, and excitement about this class?	Student survey	Student responses	Instructor journal
How does implementation of a daily mindfulness practice influence instructor enthusiasm, patience, and relationship with the class?	Instructor journal	Student responses	

## DATA AND ANALYSIS

Results

The first tools which were used to evaluate the mindfulness treatment were the Waves and Astronomy tests. The Waves Test was given both before and after the treatment unit, while the Astronomy Test was given before and after the treatment unit. These tests were designed to answer the question about daily mindfulness practice affecting the learning of students in an Integrated Science classroom. From the results that were obtained, comparing pre and post-unit tests of the non-treatment and treatment units, there was a mean normalized gain of 0.45 and 0.5, respectively. Since the gain for each unit was greater than 0.3, the gain is considered to be moderate (Hake, 1998). This means that there was a statistically moderately significant gain for both the treatment and the non-treatment unit. The percent difference between these two gains is 10.5% (Figure 1).

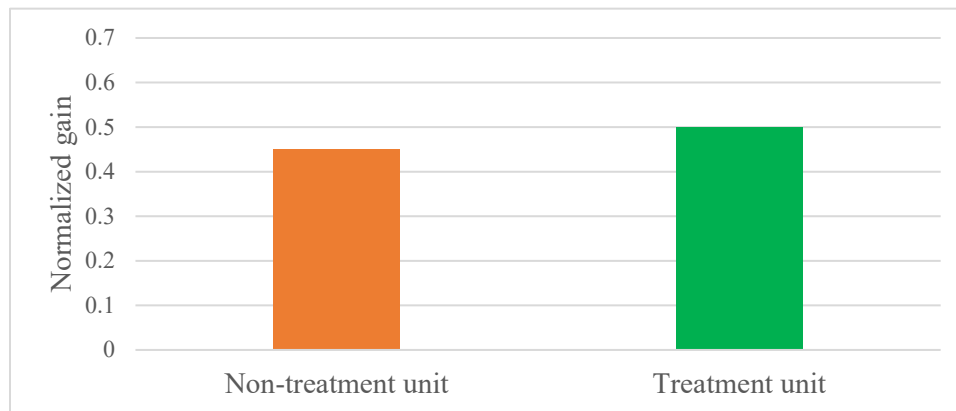


Figure 1. Normalized gain of treatment and non-treatment units, ( $N=16$ ).

In addition to the normalized gain the student median score was analyzed. In the non-treatment, there was a change from 35% on the pre-test to 64% on the post-test. For

the treatment unit, there was a change from 42% on the pre-test to 70% on the post-test.

This reflects a gain of 29% and 28%, respectively (Figure 2).

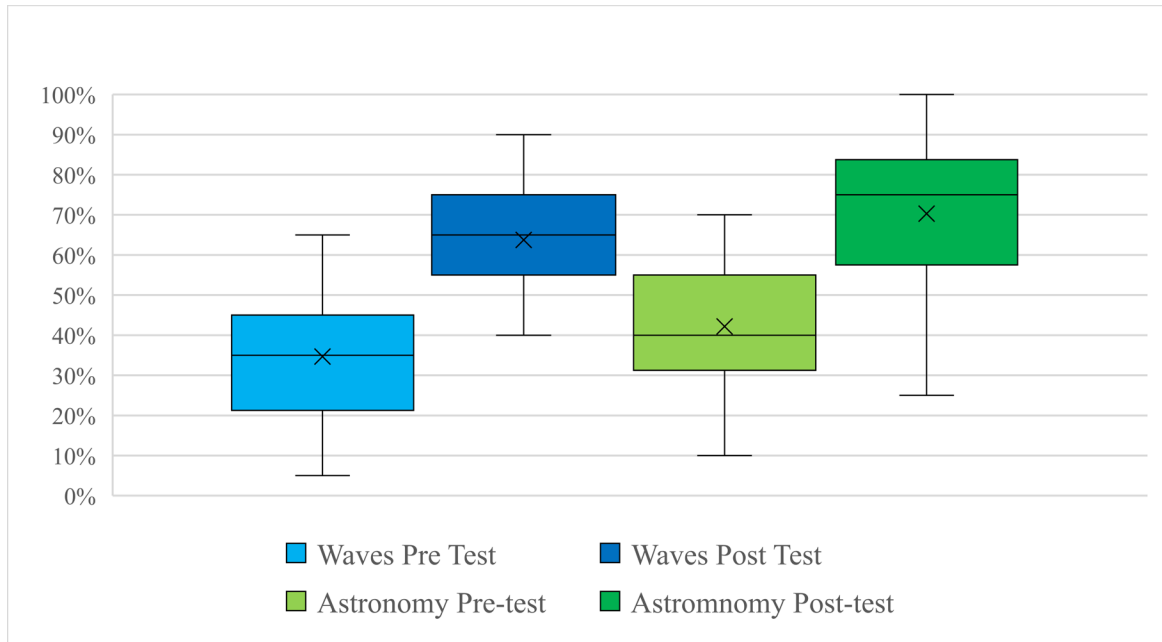


Figure 2. Non-treatment compared to treatment unit, pre- and post-test student scores, ( $N=16$ ).

As a final test, the normalized gain of the scores in the treatment and non-treatment tests were subject to a Wilcoxon Signed Rank test. This test is appropriate, as it can be used to compare interval data when a sample size is less than 30. In this test, the null hypothesis states that there is no statistical difference in the scores between the pre and post-test. The Wilcoxon test showed a p-value of 0.88866. In this type of test, the result is significant if  $p < .05$ . This means we accept the null hypothesis as being true, there is no statistically significant difference between normalized gain calculation of the treatment and non-treatment units.

The results of the Mindfulness Survey were used to gain a better understanding of the question about how daily mindfulness practice affects a student's comfort,

engagement, and excitement about the class. This item was a Likert survey which contained thirteen items. The survey was given to the same group of students both before and after the treatment period ( $N=16$ ). All of the items had a Likert scale of four choices that ranged from Strongly Agree to Strongly Disagree, but had no neutral choice. For the use of statistical comparison response choices of Strongly Agree were assigned a numerical rank of four, Agree was assigned a numerical rank of three, Disagree was assigned a numerical rank of two and Strongly Disagree was assigned a numerical rank of one.

When looking at all the Likert items, they can be grouped into three categories. Five of the items address a student's own preparation and enthusiasm for class. Individually, each item was analyzed using a Wilcoxon Signed Rank test. None of the first five items in the Mindfulness Survey show any statistical improvement between the pre- and post-survey. It can be said that since all three items have  $p$  values  $> 0.05$ , that the null hypothesis for each situation must be true. As a summative statement, one can say that learning about mindfulness did not increase a students' perception or enthusiasm for class.

Figure 3 below shows the change in enthusiasm between the pre and the post-treatment surveys. Although there appears to be movement towards the 'Strongly Agree' side of the charts, the changes are not statistically significant.

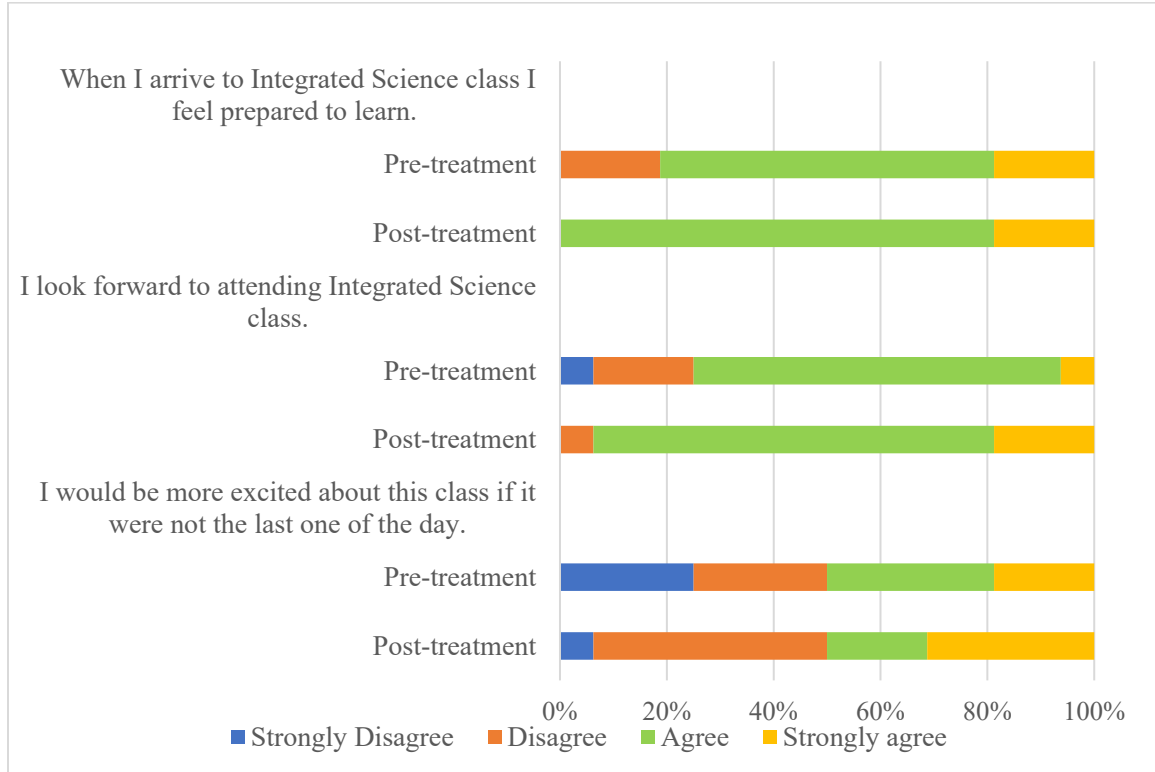


Figure 3. Likert survey responses, pre-and post-treatment, relating to student preparation and enthusiasm for class, ( $N=16$ ).

With regards to the class being at the end of the day, one student said, “The best part of the mindfulness was being able to relax for a bit and get [out] the rest of the piled up stress from our day before class [was] out.” Another student appreciated the timing of the mindfulness during the last period of the day. She said, “For me personally it was useful in a way that Science is at the end of the day and the mindfulness helpful to just stop for a for a minute and breathe and after that I felt more prepared for the class.”

The next group of Likert items asked students about their perception of their peers and their interactions with their peers during class. As in the previous group of questions, none showed a statistical improvement between the pre and post-treatment surveys.

After completing a Wilcox Signed Rank Test, all four of the questions came back with a

p value  $> 0.05$ . Two of the items, questions two and twelve, showed a slight increase in the mean response score, while the other two items, numbers three and four, showed a slight decrease in the mean response score.

One student did comment on how they thought the mindfulness treatment was good for the classroom dynamic. They said, “I think it kinda brought us a bit closer or like we are more comfortable around each other.” One frustration among students during the treatment was that not everyone was equally enthusiastic about the treatment. One student claimed, “Some students intentionally disturbing the class” was their least favorite part of the treatment.

The final group of Likert items asked the students to evaluate their engagement and focus during Integrated Science class. Once again, there was no statistical improvement between the pre and post-treatment surveys. After completing a Wilcoxon Signed Rank Test all four of the questions came back with a p value  $> 0.05$ . All items did show an improvement in the mean response score with item number seven showing the greatest improvement (Figure 4).

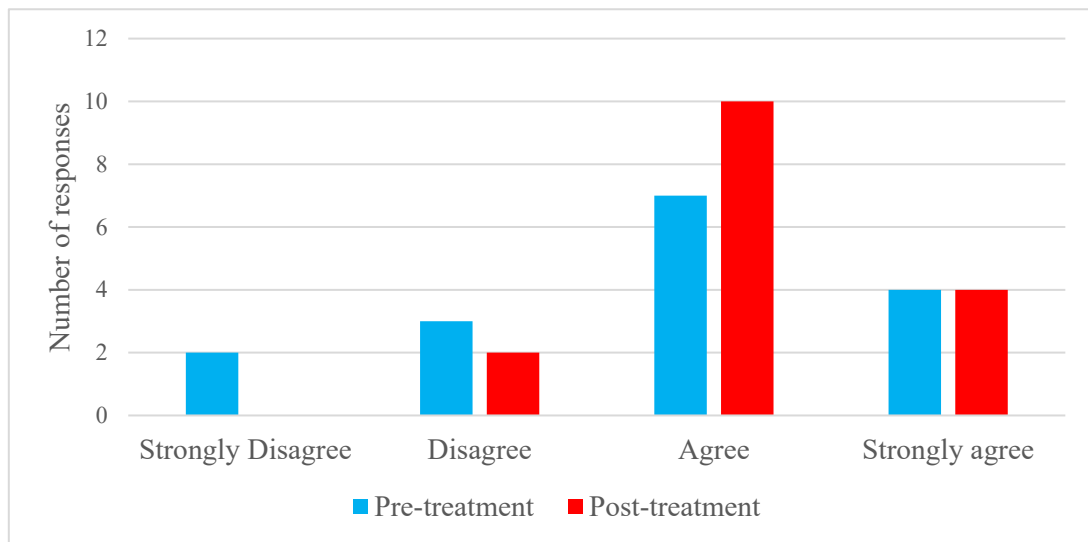


Figure 4. I often feel engaged in the lessons that are presented in science class, ( $N=16$ ).

There were no statistically significant differences between the responses pre- and post-treatment in the questions which related to engagement and focus. In post treatment responses, one student said, “I think it helped us relax before the class and after the busy day, helped us focus in a way.” Another student felt that the mindfulness was a positive experience in class because, “it gave me energy at the end of the day so I could focus more on the subject.”

The final question to be answered in this study was: How does implementation of a daily mindfulness practice influence instructor enthusiasm, patience and relationship with the class? This was accomplished by collecting qualitative data via an Instructor Journal and from student responses. The journal was kept on both days when the class participated in mindfulness and on days when they did not. The student responses were conducted via a Google form after school was closed due to concerns around the COVID-



19 pandemic. Had school not closed those questions would have been addressed in small group interviews.

Reading the Instructor Journal, some themes appear. On the third day of the treatment, one where there was a guided mediation, the instructor noted, “I liked narrating the meditation. With the calmness I found in the kids, I left the period feeling good.” On the fifth day of the mindfulness curriculum, the journal notes, “The kids seemed pretty into the meditation today. Overall, the period was pretty mellow with the introduction of a project.” On a day when school returned from a week-long, break the instructor wrote, “The class felt like it was settled and, for the most part, focused during the period.”

On days when there was no mindfulness practice, the instructor made observations which had a different tone. On the 30th of January, a day with no mindfulness, the instructor wrote, “Kids were restless all day-last period.” On another non-mindfulness day, the instructor wrote, “Some of the kids were noisy or goofing around during class I will have to speak to them individually.”

In the post treatment student responses, the third question which was asked was: Did you notice any changes in class or in your teacher over the time we practiced mindfulness? Nine out of ten students responded in a positive manner to this question. One student wrote, “Everyone had more energy.” Another student wrote, “We were more calm.”

## CLAIM, EVIDENCE, AND REASONING

Claims from the Study

The goal of this study was to see how a mindfulness practice affected a last period of the day Integrated Science classroom. A non-treatment unit was compared to a treatment unit where mindfulness was practiced three days a week. A number of different tools were used to collect data and attempt to understand the impact of the treatment on both the students and the teacher. Both quantitative and qualitative data were examined in the analysis of this action research project.

From the data, there is little evidence to support any increase in student learning from the mindfulness treatment. Students did see considerable gains in scores when comparing pre and post unit test scores on both the treatment and non-treatment unit tests. However, there was no statistically significant difference between the treatment unit and non-treatment unit when the normalized gain was calculated. The mean normalized gain across all students was 0.45 for the non-treatment unit compared to 0.5 for the treatment unit.

In consideration of the sub question, How does a daily mindfulness practice affect a student's comfort, engagement, and excitement about this class, I feel there was a positive correlation. Unfortunately, the data from the Likert survey shows there was no statistical difference between the students when comparing pre- and post-treatment survey data. Despite using 13 different items, no significant change was seen. In my opinion, the answer to this question comes in the wealth of positive responses students gave in the post treatment student responses. In addition to the supporting quotes which

can be seen above, it is clear that students valued the mindfulness component as part of their classroom experience.

When asked if the mindfulness practice was a positive thing in our Integrated Science class? Why or why not?, all students responded with a positive answer. One student wrote, "I think that it was positive for sure at least for some people usually for the ones who took it seriously. I think it helped us calm down a little before the class started." One of the challenges of any teacher is getting their class to focus on the task which the teacher desires. This can become even more difficult when the class is held at the end of the day, which this class was. Students being calmer in class can be a large asset to any teacher. Another student echoed the statement by saying, "I feel like it had positive effects overall. Personally, it really helped me stay focused during class."

The mindfulness treatment also helped improve student focus in the class which, I believe, led to better engagement. "I felt like the mindfulness really relaxed me and then I could focus better," was claimed by one student during the post treatment responses. Another student stated that, "You can clear your mind and relax. This can help with learning after the meditation." Having a more relaxed, and there-by better able to focus class, is a great value to a classroom. This idea was captured in the following statement by one student, "I think it was positive. It made the class more relaxed and therefore we could learn easier."

How does implementation of a daily mindfulness practice influence instructor enthusiasm, patience, and relationship with the class?, is a little more difficult to answer. In the student response questions students were asked; Did you notice any changes in

class or in your teacher over the time we practiced mindfulness? Unfortunately, none of their answers to the third question directly related to the teacher. Therefore, the only evidence available are excerpts from the Instructor Journal.

From the journal, it is clear that on the days where mindfulness was practiced, the instructor felt more positively about the class. One day of the treatment days he wrote, "Class was calm and rather focused even though it was mostly lecture." Another day, he wrote, "Class had a good flow and I was relaxed." Finally, in a somewhat humorous writing, he said, "Were attentive especially for a Friday afternoon, I didn't fully hate them by the end of the day."

There are also some further telling quotes from the instructor journal that frame how they felt on the days where there was no mindfulness. "It was difficult to sustain their attention through the whole period today" was written on one such day. On another day, the entry notes that, "Today was a rough day." Comparing the positive comments in the instructor journal found on treatment days and the negative comments on the non-treatment days, it is clear that the Mindfulness Treatment had a positive effect on the instructor's relationship with the class.

The final evidence to present, which helps to further frame the student experience during this action research project, are the responses students gave to the question, Do you think we should continue mindfulness practice? If so, how often? All ten students responded positively to this question. One student said, "Yes, every two days at least." Another student stated, "Yes, I would continue the mindfulness practice and it would be at least like 3 times a week." Yet another student said, "I think we should it was great,

maybe do it every second day.” Finally, a student responded, “Yes, I think every other day for 5 min sounds good.”

Although it does not show up in the quantitative data I think it is clear that practicing mindfulness has a positive effect on the Integrated Science classroom. The evidence which is needed is clearly found in the student comments. Mindfulness makes students more able to focus, it makes them calmer, it makes them feel more comfortable around their classmates, and it aids in lowering their stress levels. A final quote from a student, which helps to capture their experience is this comment, “I honestly think that if we would do it in more classes, for example two times a day, it would reduce our stress and anxiety.” These positive effects can also be reflected in the comments made by the instructor in their journal on the days in which mindfulness was practiced. Overall, this treatment had a very positive effect on the classroom.

#### Value of the Study

This study showed how a non-standard practice can be used to create positive impact in the classroom. Despite using class time in a manner that is not directly related to science education practicing mindfulness can help students feel better about the classroom experience. It can also help the instructor to make their time with a class more enjoyable and less stressful. I found that I especially enjoyed the mindfulness sessions with my students. Often the flow of information is a one-way passage with me either explaining something to them or providing support as they worked on a project. Some of the only times in my teaching career, where the students and I were engaged in the same

thing, on the same level, was when we sat in silent meditation together. I really liked that part of the experience.

It was very interesting, from an instructor point of view, to see how taking such a short time out of the period, at the beginning of the class, made a positive difference for the whole class. Although you lose a little of your instruction time, I think the improved student focus and calm is more than worth the trade.

Unfortunately, as of writing this, our school is indefinitely closed with no chance of reopening for the 2019/2020 school year. Were we to continue classes this year, I would have made mindfulness a permanent part of my, largely 9<sup>th</sup> grade, Integrated Science class. Looking at the school year ahead, I plan to implement mindfulness two days a week in at least one of my classes. I think it will be interesting to compare my overall feeling towards a class of kids who participate in mindfulness all year, to those groups I have during other periods of the day.

#### Consideration for Future Research

The potential for future research opportunities in mindfulness are many. Just looking at this study, it would be easy to make some small modifications to the treatment and see what kind of effect they would have on a group of students. Is the amount of time meditating important? Is it more beneficial to do at the end of the day than in the beginning or the middle of the day? Are guided meditations more impactful or does a silent meditation derive the same benefits?

Of all future studies that I think would be interesting for further research, I would like to investigate how a personal daily mindfulness practice affects the teacher.

Although it did not show up in any of the plans for this treatment, I did find some interesting information in my research about the positive effects of mindfulness on the educator. Due to this, I tried to start my own morning mindfulness practice, starting long before the treatment took place. I was not very consistent with it, and I didn't collect any data on myself, but I think I may have become a little more self-aware as a result. I think a further study on how daily practice by educators affects their attitude towards their students would be a worthwhile endeavor.

### Impact of Action Research on the Author

This study has affected me in a few ways. First, I was impressed to see how open my students were to trying something new in the classroom. Before the study, I thought I would get some pushback from kids who thought mindfulness was too weird or not actual learning. To my surprise, the students were very amenable for the change. They easily took to the new practice and, at times, would even remind me that were supposed to practice mindfulness on a given day if I had forgotten. That the kids were easily able to try new things gives me the confidence to try new teaching strategies in my classroom that may seem out of the ordinary.

Another thing that I have learned from this is that numerical data doesn't always tell the whole story. As a science teacher, and a person with a fairly analytical mind, I expect that looking at quantitative data is the key to understanding the results of any experiment. I encourage my students, when they are writing conclusions to their lab work, to base their claims on the data which is in front of them. In this situation, I am almost always referencing the quantitative data that is collected during an experiment.

Unfortunately, this type of data didn't tell the whole story and really only helped answer one of the focus questions. The data showed no positive or negative effect of the mindfulness curriculum on the students. It wasn't until I got into the qualitative data of the student responses, and the instructor journal, that the answers to the rest of the focus questions became clear. The qualitative data was invaluable to this experience.

Action research is a thorough and effective way to implement and evaluate change in one's classroom. While I don't think I will go through the long process of creating another full action research project, I will continue to test new techniques in my classroom. This project had shown me that it is possible to test small changes and how to collect data in order to evaluate those changes.



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APPENDICES

APPENDIX A

INSTITUTIONAL REVIEW BOARD EXEMPTION



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

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**MEMORANDUM**

**TO:** Kevin Fox and John Graves

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

**DATE:** November 14, 2019

**RE:** "Impact of Mindfulness Practice on the Integrated Science Classroom" [KF111419-EX]

The above research, described in your submission of November 14, 2019, 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; and (iii) the information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by section 16.111(a)(7).
- (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.

Mark Quinn 



APPENDIX B

WAVES TEST

Integrated Science  
Waves Test

Name: \_\_\_\_\_

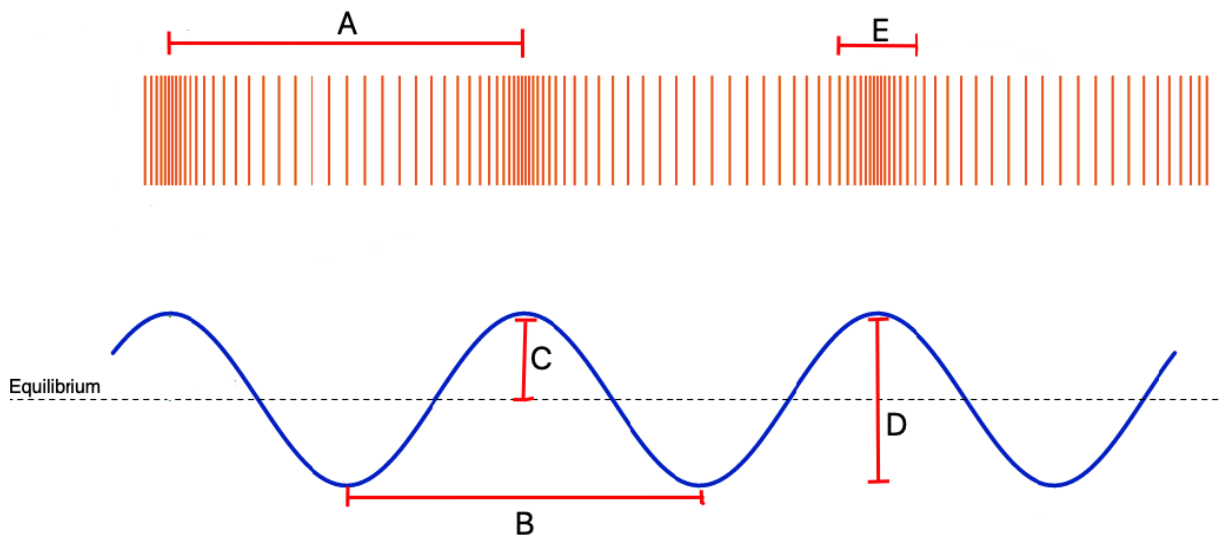
Instructions: Please answer all questions by blackening in the circle on your answer sheet. Only answers on the answer sheet will be scored.

1. Which of the following is not a transverse wave?
  - a. Light
  - b. Radio
  - c. Sound
  - d. All of these
  
2. The vibrations of a transverse wave move in a direction
  - a. That changes with speed
  - b. At right angles to the direction of wave travel
  - c. Along the direction of wave travel
  
3. The vibrations of a longitudinal wave move in a direction
  - a. That changes with speed
  - b. At right angles to the direction of wave travel
  - c. Along the direction of wave travel
  
4. A 100-vibration-per-second wave travels 50 meters in 1 second. Its frequency is
  - a. 100 hertz and it travels at 50m/s
  - b. 1800 hertz and it travels at 2m/s
  - c. 30 hertz and it travels at 60m/s
  
5. A floating leaf oscillates up and down two complete cycles in one second as a water wave passes by. The wave's wavelength is 10 meters. What is the wave speed?
  - a. 2 m/s
  - b. 20 m/s
  - c. 40 m/s
  
6. An object that completes 10 vibrations in 20 seconds has a frequency of
  - a. 200 hz
  - b. 2 hz
  - c. 0.5 hz
  
7. A 300 hertz sound wave travels at 1500 m/s in water. What is the wavelength of this wave?
  - a. 450000 m
  - b. 1800 m
  - c. 1200 m
  - d. 5 m

8. An anti-node is a position of
  - a. Maximum amplitude
  - b. Minimum amplitude
  - c. Half amplitude
  
9. The Doppler effect is a characteristic of
  - a. Light Waves
  - b. Sound waves
  - c. Water waves
  - d. All of the above
  - e. None of the above
  
10. The Doppler effect occurs when a source of sound moves
  - a. Away from you
  - b. Towards you
  - c. Either towards you or away from you
  - d. In a circle around you
  
11. A sound source of high frequency emits a high
  - a. Pitch
  - b. Amplitude
  - c. Speed
  - d. None of these
  - e. All of the above
  
12. A well-trained opera singer can shatter a wine glass with her voice. This is a demonstration of
  - a. Beats
  - b. Resonance
  - c. Interference
  - d. Sound Refraction
  - e. An Echo
  
13. If an object reflects all frequencies of visible light, it will appear
  - a. Blue
  - b. White
  - c. Red
  - d. Black
  - e. Rainbow colored
  
14. This is the lowest frequency of visible light
  - a. Red
  - b. Violet
  - c. Infrared
  - d. Blue
  - e. Ultraviolet

15. The speed of sound in air is closest to
- 150 m/s
  - 280 m/s
  - 340 m/s
  - 400 m/s
  - None of these
16. A green Object
- Absorbs green light
  - Reflects green light
  - Absorbs yellow and blue light
  - Reflects red and blue light
17. From lowest to greatest intensity which is the correct order of the waves in the electromagnetic Spectrum?
- Visible Light, X-Ray, Radio, Infra-Red, Ultraviolet, Gama, Microwaves
  - X-Ray, Ultraviolet, Visible Light, Radio, Infra-Red, Microwaves, Gama
  - Gama, X-Ray, Infra-Red, Radio, Ultraviolet, Visible Light, Microwaves
  - Radio, Microwaves, Infra-Red, Visible Light, Ultraviolet, X-Ray, Gama

Use the image below to answer questions 18-20



(Walsh, n.d.)

18. Which letter represents the wavelength of a transverse wave?

- a. A
- b. B
- c. C
- d. D
- e. E

19. Which Letter represents the wavelength of a longitudinal wave?

- a. A
- b. B
- c. C
- d. D
- e. E

20. Which letter represents the amplitude of a transverse wave?

- a. A
- b. B
- c. C
- d. D
- e. E

#### REFERENCES

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APPENDIX C

ASTRONOMY TEST

Integrated Science  
Astronomy Test

Name: \_\_\_\_\_

Instructions: Please answer all questions by blackening in the circle on your answer sheet. Only answers on the answer sheet will be scored.

1. What is one astronomical unit
  - a. The distance that light can travel in one year
  - b. 1000 km
  - c. The distance from the center of the earth to the center of the sun
  - d. 3 light years
  - e. The distance from the center of the earth to the center of the moon
  
2. What is a light year
  - a. The distance light can travel in one year
  - b. The time it takes to travel to the sun
  - c. The time it takes for all planets to complete one rotation of the sun
  - d. The distance the earth travels to complete one rotation around the sun
  - e. None of these
  
3. What is a parsec
  - a. 1000 km
  - b. 100,000 km
  - c. 2.5 Light years
  - d. 3.26 light years
  - e. 7 angstroms
  
4. Summer in the southern hemisphere occurs in December, January and February because:
  - a. The Earth is closest to the Sun then.
  - b. The Sun's light hits that hemisphere most directly then.
  - c. The Earth experiences retrograde motion then.
  - d. The Earth moves more slowly around the Sun then, allowing it to absorb more sunlight.
  - e. There are fewer solar eclipses then, resulting in more sunlight received.

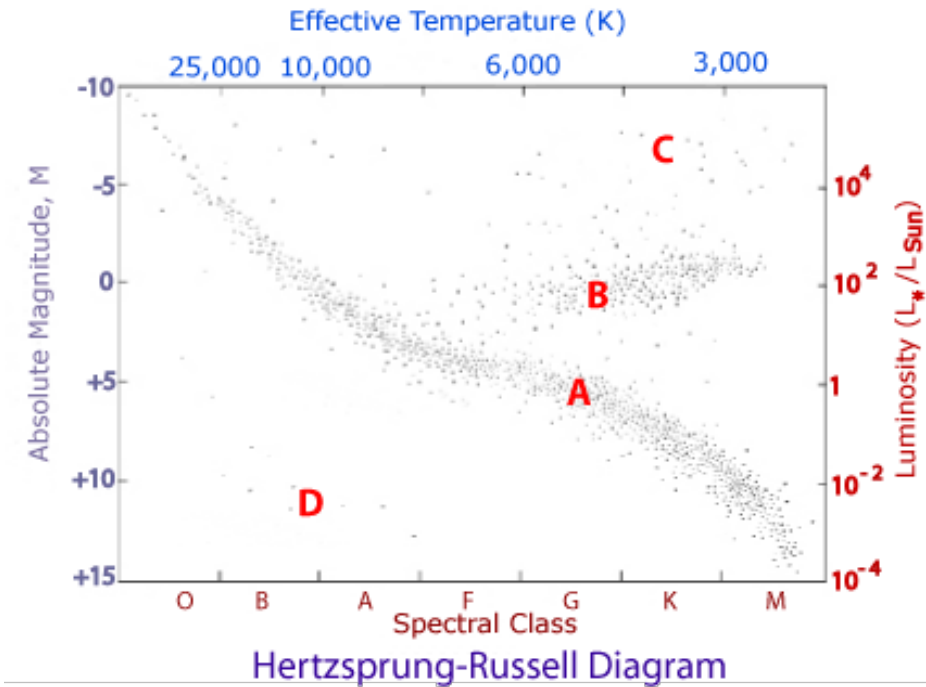
5. In the study of Astronomy what is the Big Bang Theory?
  - a. A theory suggesting our Universe came to be throughout a massive explosion, expanding ever-outwards after being confined to a single dense mass for billions of years.
  - b. A TV show
  - c. A Theory suggesting that Earth was created in a big explosion about 3 billion years ago.
  - d. A theory suggesting the eventual collision of all celestial objects in one giant explosion.
  
6. What is the shape of Earth's path around the Sun?
  - a. Square
  - b. Circle
  - c. Sphere
  - d. Ellipse
  
7. When the new moon passes directly between Earth and the Sun, what occurs?
  - a. solar eclipse
  - b. neap tides
  - c. lunar eclipse
  - d. none of these
  
8. Who was the first to utilize the power of the reflecting telescope?
  - a. Edward Hubble
  - b. Sir Isaac Newton
  - c. Galileo Galilei
  - d. Johannes Kepler
  - e. None of these people
  
9. Who first observed that an object can orbit something besides Earth?
  - a. Copernicus
  - b. Galileo
  - c. Ptolemy
  - d. Einstein
  - e. None of these people
  
10. In the gibbous part of the moon phase approximately what percentage of the earth facing side of the moon is illuminated?
  - a. None
  - b. 25%
  - c. 50%
  - d. 75%
  - e. 100%



11. Which is the correct order of moon phases
- Full moon, Waning Gibbous, Last Quarter, Waning Crescent, New moon
  - Waxing Crescent, New moon First Quarter, Full moon, Waxing Gibbous
  - New moon, Waxing Gibbous, Full moon, Waxing Crescent, First Quarter
  - New moon, Waning Gibbous, Last Quarter, Waning Crescent, Full moon
  - None of these
12. What's a sundial?
- A tool to find the stars
  - A tool to cook food from the sun's heat
  - A tool to tell the temperature
  - A tool to tell time
13. When performance is at its best How many hours in a day does a sundial measure?
- 12 hours
  - 24 hours
  - 6 hours
  - As many hours as the sun is in the sky
14. When placed on flat ground, which direction does the fin on a sundial need to be pointing for best results?
- North
  - South
  - East
  - West
15. What is Archeoastronomy?
- The study of celestial objects we have direct access to.
  - The study of how ancient cultures interpreted celestial events.
  - The study of celestial rituals worldwide.
  - The study of past civilizations on Mars and The Moon.
  - None of these.

16. What was a problem that was later found with the Mayan calendar?
- It ended in 2012
  - It did not contain enough months
  - It led people to believe in human sacrifice
  - It predicted Hillary Clinton would get elected US president
17. Do we see the same constellations all year?
- Yes, the stars are fixed in the sky above us.
  - Yes, the stars rotate at the same rate as the earth.
  - No, the earth rotates and the stars stay in the same place.
  - No, the stars rotate and the earth maintains a fixed position.
18. About how many constellations are visible in the northern hemisphere?
- 24
  - 34
  - 44
  - 54
  - 88

Use the image of the Hertzsprung-Russel diagram below to answer questions 19 & 20



(Australia National Telescope Facility, 2015)

19. Which letter represents where White Dwarf stars would be found?

- a. A
- b. B
- c. C
- d. D

20. Which letter represents where Giant stars would be found?

- a. A
- b. B
- c. C
- d. D

#### REFERENCES

Australia National Telescope Facility. (2015). Classifying Stars - The Hertzsprung  
–Russell Diagram. Retrieved from  
[https://www.atnf.csiro.au/outreach/education/senior/cosmicengine/stars\\_hrDiagram.html](https://www.atnf.csiro.au/outreach/education/senior/cosmicengine/stars_hrDiagram.html)

APPENDIX D

MINDFULNESS LIKERT SURVEY

Please choose the response that most closely reflects your opinion. Participation in this research survey is voluntary and participation or non-participation will not affect a student's grades or class standing in any way.

1. When I arrive to Integrated Science class I feel prepared to learn.

Strongly agree                      Agree                      Disagree                      Strongly disagree

2. My classmates arrive to Integrated Science class prepared to learn.

Strongly agree                      Agree                      Disagree                      Strongly disagree

3. I enjoy working with other people in the class.

Strongly agree                      Agree                      Disagree                      Strongly disagree

4. If I have a conflict with a classmate, I feel comfortable dealing with the situation.

Strongly agree                      Agree                      Disagree                      Strongly disagree

5. I feel comfortable speaking in front of my peers in Integrated Science class.

Strongly agree                      Agree                      Disagree                      Strongly disagree

6. I often raise my hand to answer questions that the teacher asks of the class.

Strongly agree                      Agree                      Disagree                      Strongly disagree

7. I often feel engaged in the lessons that are presented in science class.

Strongly agree                      Agree                      Disagree                      Strongly disagree

8. I often work on assignments just to get them done without being aware of what I'm doing.

Strongly agree disagree	Agree	Disagree	Strongly
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9. I find it difficult to stay focused on what's happening in Integrated Science.

Strongly agree disagree	Agree	Disagree	Strongly
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10. I often miss directions in the lab and have to ask a classmate or the teacher for further explanation.

Strongly agree disagree	Agree	Disagree	Strongly
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11. I look forward to attending Integrated Science class.

Strongly agree disagree	Agree	Disagree	Strongly
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12. My peers look forward to attending Integrated Science class.

Strongly agree disagree	Agree	Disagree	Strongly
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13. I would be more excited about this class if it were not the last one of the day.

Strongly agree disagree	Agree	Disagree	Strongly
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APPENDIX E

INSTRUCTOR JOURNAL QUESTIONS

Each day of the treatment unit the instructor kept a journal to address the following questions:

- What went well?
- What did not go as well as hoped?
- What should be remembered for the future?
- How did you feel in class today?



APPENDIX F

STUDENT INTERVIEW QUESTIONS

After the treatment unit students were sent the following questions via a Google form:

- Do you feel that the daily mindfulness practice was a positive thing in our Integrated Science class? Why or why not?
- For you, what do you think was the best part of the mindfulness practice?
- Did you notice any changes in class or in your teacher over the time we practiced mindfulness?
- Did you find yourself using mindfulness at any other time outside of class?
- Do you think we should continue doing the mindfulness practice? If so, how often?
- Is there anything else you want me to know?