THE EFFECT OF MEDITATION ON MINDFULNESS

IN THE SCIENCE CLASSROOM

by

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ABSTRACT

How does having mindfulness during classroom instruction contribute to student self-awareness and understanding of content? In this study, students participated in teacher-facilitated meditation as a means to focus and become more mindful in the classroom. Pre and post-treatment surveys, one-on-one interviews and assessment data was collected across one unit to measure the effectiveness of the meditation on student self-awareness and performance. Results showed improved self-awareness of distractors during class and a slight increase of scores on assessments.

INTRODUCTION AND BACKGROUND

Context of the Study

Hawthorne Math and Science Academy (HMSA) is small, urban, public charter school located in Hawthorne, California. Five hundred and sixty-six students were enrolled for the 2019-2020 school year with 166 students in the freshman class. HMSA is a Title I school where 81% percent of students qualify for free or reduced lunch and many students have economically disadvantaged backgrounds. Sixty four percent of students are Hispanic or Latino, 14.9% African American, 7.6% Asian, 6.8% Filipino, 3.5% White, 0.6% Pacific Islander, 0.2% Two of more races and 1.6% did not report race. HMSA consistently ranks in the top 10 of California high schools and 89th in national rankings (U.S. News & World Reports, 2020). Because of this, HMSA is a fiercely competitive school in which students must apply to attend through a lottery system.

HMSA prides itself on having a 99% graduation rate and a 100% college acceptance rate for the last few years. Maintaining this high standard extends into our student body and has led to high stress levels among our students. Over the years, school staff has implemented programs to help students cope with stress including peer to peer mentorships using the Link Crew model, lunch time yoga sessions, group counseling and mindfulness exercises, such as, meditation.

Meditation in its various forms has been an integral part of self-efficacy and self-regulation for thousands of years and more recently has been used in schools and workplaces for the social and emotional benefits the practice of meditation can provide.

Also referred to as mindfulness, meditation can be defined as a secular form of consciousness in which participants are exposed to various methods of focusing attention, becoming more aware and self-regulating emotion. Students today are subjected to endless distractions such as technology, social-emotional distress, and home lives that can interfere with learning. I am interested in the connection a regular practice of guided meditation in the classroom can have to academic success, and the social and behavioral effects of mindfulness practice in the classroom.

The purpose of this research is to see if guided mediation in the science classroom is an effective means to encourage students to better understand their state of mind and encourage self-regulation of learning while also lowering stress and increasing critical thinking skills. The guided meditation was facilitated by me utilizing an existing script and done at regular intervals during the beginning of each class period. Student surveys, one-on-one interviews and assessment data were utilized to analyze the guided meditation treatment of my 60 freshman biology students.

Focus Question

My focus question was, What effect does teacher-guided meditation have on student engagement and performance in the high school science classroom?

My sub-questions include the following:

1. What effect does a regular practice of guided meditation have an on short-term and long-term student achievement?
2. What impact does guided meditation have on student self-regulation and interest in science?

3. What effect does teacher-guided meditation have on decreasing stress experienced by students?
4. What effect does the facilitation of guided meditation have on the teacher?

CONCEPTUAL FRAMEWORK

Theoretical Foundations

Open Monitoring (OM) and Focused Assessment (FA) meditation are two contemplative exercise methodologies I used in my action research. Lutz (2008) describes OM meditation as being present in the moment, noticing thoughts in the brain but not reacting to them. FA mediation involves paying attention to something specific, such as an object or sound, to stay present. Video or audio recordings of guided meditation is one method of OM meditation which can be delivered to students without putting a teacher or instructor in the position of being a mediation guide (Hartel, Nguyen & Guzik, 2017). Apps such as Calm, Headspace and Insight Timer offer pre-recorded mediations in various styles and time lengths. Three-minute audio guided meditations were used in the beginning of a graduate level Library Information Science class to give students a moment to pause and let go of stresses before class began (Hartel et al., 2017). Though data pertinent to engagement and academic performance were not part of this research, students described positive responses in a survey at the end of the semester. Students were also encouraged to refrain from excessive use of cell phones and computers during class which may have an unintended link to changes in students perceived awareness and presence during class as well.

A meditation tradition linked to the Zen Buddhism called the counting method was used by Ramsburg and Youmans (2013) with 35 undergraduate students in an Introduction to Psychology class. A practitioner of the counting method counts their breaths in a ladder sequence starting with one and going to ten and then coming back to

one. If one loses count, concentration or the mind starts wandering they are to return to the beginning and start over again. This is a type of Focused Assessment (FA) meditation as breathwork is used to focus the mind of the individual. Their study looked at FA mediation as a means for increased knowledge retention (Ramsburg & Youmans, 2013). Participants were randomly assigned to complete the counting method guided meditation or asked to close their eyes and rest before the beginning of a lecture. After the lecture all students were given a quiz and questionnaire. The quiz was used to see what knowledge students retained from the lecture and the questionnaire asked about their mood and level of relaxation. The randomized selection of students who mediated versus rested ensured that even students already familiar with meditation did not have an effect on the data. Study data showed that mediation prior to a class lecture and quiz did increase retention of information but could not predict long term changes. Empirical studies are still needed to understand whether meditation has long term effects on knowledge retention, academic performance and empathy.

Pertinent Research

Sibinga, Webb, Ghazarian, & Ellen (2016) completed a randomized controlled trial with elementary school students on the benefits that mindfulness instruction had on psychological function and lower stress levels. Mindfulness has long been applied to clinical and therapeutic psychology practices (Kostanski & Hassed, 2008) but applications in schools is more recent. Students were randomly assigned to complete an adapted version of the mindfulness-based stress reduction (MBSR) program or health education (Sibinga et al., 2016). Three hundred students in fifth through eighth graded

provided data measured by self-reporting surveys. The Children's Acceptance and Mindfulness Measure (CAMM) which is a ten statement Likert-scale based survey was used to measure mindfulness. The Perceived Stress Scale (PSS) also based on the Likert scale system measured students' stress. Other surveys were also given that measured students' ability to cope and regulate emotions. Their research is based on well-known psychological self-reporting surveys used to examine baseline emotional functioning before and after treatment. The connection of emotional functioning and academic performance is seen when students are exposed to stress and trauma. Their study showed that students who participated in MBSR had lower levels of symptoms linked to depression and post-traumatic stress disorder. Very little research has been done regarding mindfulness in urban school settings but there is promising data that mental, emotional, physical health all benefit from a high-quality mindfulness practice (Sibinga et al., 2016).

Lin and Mai (2018) recently published the results of Mindfulness Meditation (MM) on freshmen college students' academic performance. Use of experimental and control groups, short-term and long-term improvements in academic performance were measured using formative and summative assessments. Their research is in line with what I fulfilled for my action research. Throughout the review of literature, both primary and post-secondary studies have been completed but there is a lack of research on secondary school students. Their study of first-year college student shows similar ages to my students and allowed for a comparison to my students.

Students in the experimental group of their study practiced a rhythmic breathing technique for 10-20 minutes at the beginning of each class period. The control group was given the same amount of time at the beginning of class to self-review from the previous class. The procedure for each class period was first MM (experimental) or self-review (control). The teacher presented the new chapter, the teacher led a review of chapter, students took formative assessment, and reviewed the assessment results. In the first two weeks the control group scored higher on the formative assessment but from the third week on, the experiment lasted 12 weeks, the experimental group scored significantly higher. Understanding the connection mindfulness has to long term academic performance was also measured using summative assessments at the six- and twelve-week mark of the class. Scores between the experimental and control group on both summative assessments shows minimal differences in academic performance. As with many mindfulness studies the connection between mindfulness practice and long-term academic performance needs more research.

Cognitive Emotions

Social and behavioral effects of mindfulness practices in the science classroom include better self-regulation of emotions, self-efficacy and increases in the value of science (Tomas, Rigano & Ritchie, 2016). Group work to create a video on a topic previously taught in an elementary school was used as the research component. Since group work can make up a majority of many science classes such as labs, dissections, engineering programs and projects it is important to understand how emotions can change student learning during these events. Changing in emotions can be seen through physical

movements but often go undetected even to the individual experiencing them so an emotion diary was one method to keep track of how students feel during instruction. Video recordings and interviews also serve to see interactions between students during group work. When students experience negative emotions or feelings towards assignments or instruction it can often lead to less interest in future lessons. Teaching students to understand and acknowledge their emotions can lead to greater engagement. Positive emotions can increase student interest in science and increase motivation (Tomas et al., 2016). Negative emotions can have a negative effect if emphasis is placed on the reason or object of negativity and students begin to associate those feelings with that type of lesson or assignment.

George (2013) and Larson (2018) both looked at how outdoor experiences can change students' motivation, engagement and achievement in science class. Though the experiment of doing science outside is not the focus of my action research their methods of collecting data on student motivation and engagement are tools that I would consider in my collection of data. Emotional states and overall mental awareness during school play a large part in students' experiences. A science motivation survey used by both George (2013) and Larson (2018) and a student engagement survey used by Larson provide examples of ways to collect qualitative data on attributes of cognitive emotions. Although both motivation and engagement surveys have limitations due to the self-reporting aspect of the questions, individual interviews with students can also be used to elicit questions about their answers.

METHODOLOGY

Demographics

Sixty students in two sections of ninth grade Biology class at Hawthorne Math and Science Academy were the subject of this research. Students were between the ages of 14 and 15 with 45% identifying as male and 55% female. Eighty-one percent of students qualify for free or reduced lunch, making HMSA a Title 1 high school. At the beginning of the school year, meditation was introduced to students at random intervals to acquaint students with the guided meditation exercise and evaluate if it could be a sustainable component of the daily class plan. During the spring semester guided mediation was introduced as a daily component of class.

Precautions to maintain student confidentiality were considered and all identifiable information was kept under password protection on personal computer and a locking filing cabinet. Teacher colleagues and school administrators were made aware of the research to insure transparency. Interviews with students were conducted in a safe place with complete confidentiality. The research methodology for this project received an exemption by Montana State University's Institutional Review Board (Appendix A) and compliance for working with human subjects was maintained throughout the course of the study.

Treatment

At the beginning of each class period students were led in a guided meditation using a script (Watson, 2017) that was developed by the UCLA Mindful Awareness

Research Center (Appendix B). Lights were dimmed and blinds closed in the classroom, a sign was placed on the outside of the door asking visitors to refrain from visiting for the next five minutes. Students were asked to close their eyes and remain quiet and still for the entirety of the guided meditation. The script was read in a soft voice with pauses at the end of each line. At the end of the script a soft chime was rang to signify the end of the guided meditation. Students then began their bell work for the day. The daily treatment instruction lasted for two and a half weeks and occurred during a unit on the microbial world.

Data Collection and Analysis Strategies

A teacher modified version of the Perceived Stress Scale (PSS) (Appendix C) and the Child Acceptance & Mindfulness Measure (CAMM) (Appendix D) were distributed prior to treatment during instructional time to all students. Titles of both surveys were changed to Student Survey before being given to students to help prevent students from over or under self-reporting as the names could give students a biased perception of what was be researched.

Formative and summative assessments were completed as part of the existing curriculum in each class and scores were utilized and analyzed as data sources. Scores on the summative and formative assessments to determine short- and long-term student achievement were organized on a spreadsheet by individual class. Formative assessments such as exit tickets and in class assignments were scored on completeness and correctness. Analysis of the data included a box and whisker plot to compare assessment

scores between pre- and post-treatment. Data was used to analyze the relationship meditation has on short-term and long-term performance in science.

The Perceived Stress Scale (PSS) instrument was used to address my question, "What effect does teacher-guided meditation have on decreasing stress experienced by students?" The survey focuses on the self-regulation of students' emotions and mindfulness along with questions regarding students' individual perceptions on stress within the past month. The instrument was administered to all my freshmen Biology students (*N*=60). The survey was administered before the treatment at the beginning of a unit and again after the treatment at the end of the same unit. The survey is a modified version of the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) (Appendix C). The PSS is one of the most widely used data instruments on one's perception of stress in their individual life. Use of the PSS and the CAMM, both of which are published instruments used across many studies on stress and mindfulness insured validity among instruments and helped to triangulate data to answer my research questions.

The PSS was set up as a Likert scale with the answer options of Never, Very Rarely, Sometimes, Fairly Often, Very Often for each of the ten questions. A probing question followed three of the survey questions (8, 9, 10) to elicit further information from students. Three themes were identified from the questions and analyzed using the Likert-scale data.

A modified version of the Child Acceptance & Mindfulness Measure (CAMM) instrument was used to address my question of "What impact does guided meditation

have on student self-regulation and interest in science?" The survey focuses on students' attitudes towards science and school (Appendix D). The modified CAMM was set up as a Likert scale survey with the answer options of Never True (1), Rarely True (2), Sometimes True (3), Often True (4), Always True (5) for each of the 16 questions. Probing questions followed four of the questions (2, 7, 9, 11) asking students to explain "Why did you answer the way you did in the above question?".

Since both the modified CAMM and the PSS instruments collected individual attitudes towards self-regulation, stress and interest, a measure of the median score on individual questions was analyzed. Because students will be self-reporting answers outliers could become an issue. To combat their potential influence on the data the standard deviation for each individual question was calculated and considered in the analysis. Each question on the pre- and post-treatment surveys was analyzed for statistical significance using a paired t-test.

Four students were randomly selected for one-on-one interviews using Random Student Generator for Google Classroom, a Chrome browser extension that pulls current class rosters from Google Classroom. The one-on-one interviews were conducted at a time both convenient for the student and teacher in complete confidentiality. Interviews followed the Interview Questionnaire (Appendix E) and answers were noted during interview.

A heart rate monitoring device was worn on the wrist of the teacher while facilitating the meditation treatment sessions. Average heart rate was collected for a two-week period prior to treatment and during treatment. Heart rate was recorded at the

beginning of the class period and 15 minutes into class after the end of the meditation session. Scores were analyzed and graphed to compare heart rate differences on a daily basis. The modified PSS was completed at the same interval as students to compare pre- and post-treatment stress level changes. The data triangulation matrix shows data collection methods and reasonings below (Table 1).

Table 1. Data triangulation matrix.

Focus Question	Data Collection Method	Reasoning
What effect does a regular practice of guided meditation have an on short-term and long-term student achievement?	1. Exit tickets and in-class assignments (Formative Assessments) 2. Unit Tests (Summative Assessments)	Assessments will be given in regular intervals to both the treatment and non-treatment groups. Statistical data will be used to compare the level of performance in both short-term (one class period) and long-term (one unit) time span.
What impact does guided meditation have on student self-regulation and interest in science?	1. One-on-one Interviews 2. Student Survey #1: a modified Child Acceptance & Mindfulness Measure (CAMM; Greco, Smith, & Baer, 2009)	One-on-one interviews were conducted to assess students' feelings towards science. Self- reporting surveys or questionnaires on this subject in my experience have often produced mixed data results. Open-ended probing questions will be used to encourage students to share how they self-regulate and stay interested in science. A modified version of the Child Acceptance & Mindfulness Measure (CAMM) was created that measured the impact that teacher-guided meditation has on student self-regulation of thoughts and emotions.
What effect does teacher-guided meditation have on decreasing stress experienced by students?	1. Student Survey #2: a modified Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983)	The PSS is one of the most widely used data instruments on one's perception of stress in their individual life. Many psychological studies and papers have used or cited it as a legitimate source of data on current stress levels. The modified PSS was set up similarly to a Likert survey.
What effect does the facilitation of guided meditation have on the teacher?	1. Heart Rate Monitoring 2. Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983)	Heart rate can indicate current stress levels. Using a wrist heart monitoring watch, I recorded heart rate while facilitating treatment sessions. The modified PSS was also used to track the teacher's stress in their individual life.

DATA ANALYSIS

Results

The results from the pre- and post-treatment assessment scores (*N*=60) showed a correlation between treatment and students' performance on both formative and summative assessments (Table 2). The normalized gain was calculated to determine change in student knowledge from pre- and post-treatment assessments. 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). Low gains were present across all assessments indicating a small increase in student knowledge across assessments with formative assessment two seeing the largest increase, 0.19. The lowest average gain occurred with the pre- and post-treatment summative assessments, 0.03.

Table 2. Pre- and post-treatment assessment scores with average gain.

	Pre- Treatment Average (%)	Post- Treatment Average (%)	Average Gain
Formative Assessment 1	75%	87%	0.11
Formative Assessment 2	62%	80%	0.19
Summative Assessment	68%	72%	0.03

The modified Child Acceptance & Mindfulness Measure (CAMM) (Appendix D) was given to students prior to the guided mediation treatment being implemented and after two and a half weeks of the treatment being in place. Four themes were identified

from a total of 16 questions on the survey. The themes were academic performance, attention control, self-awareness and interest in science (Figure 2).

Table 3. Themes identified from modified CAMM student survey.

Theme	Question Number	Question
Self-awareness	1	At school, I walk from class to class without noticing what I am doing.
	4	I find myself listening to someone with one ear and doing something else at the same time.
	5	I find myself doing things without paying attention.
	6	I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.
Attention control	2	It's hard for me to pay attention to one thing at a time.
	3	I rush through activities without being really attentive to them.
	7	I pay attention to how my emotions affect my thoughts and behavior.
	8	When I have distressing thoughts or images, I just notice them and let them go.
Interest in science	11	I enjoy science class.
	13	Science is useful and relevant to my life.
	14	I think science is boring.
	15	I would enjoy being a scientist.
Academic performance	9	I enjoy school.
	10	I get good grades in school.
	12	I get good grades in science class.
	16	I learn in science class.

A paired t-test was used to compare the two sets of data from the pre- and post-treatment modified CAMM survey from each individual student. Questions 7, 8, 11, 12, and 16 indicated significant statistical changes (Table 4). The paired t-test established there was a change in survey questions on student-perceived attention control, academic performance and interest in science but no statistically significant connection of student self-awareness from the treatment.

Table 4. Modified CAMM student survey t-test and P-values.

Question	|t-value|	P-value
7: I pay attention to how my emotions affect my thoughts and behavior.	3.47	0.001
8: When I have distressing thoughts or images, I just notice them and let them go.	2.55	0.013
11: I enjoy science class.	2.58	0.012
12: I get good grades in science class.	2.30	0.024
16: I learn in science class.	2.48	0.016

Note N=60.

Probing questions were used to elicit further response information on questions seven and 11. Question seven asked students about paying attention to their emotions and how they affect behavior. The probing question “Can you give me an example?” was asked as a follow up to their selected answer. Prior to the treatment twenty-four students gave specific examples of an emotion or feeling and the specific behavior response they have to that emotion. After the treatment, 32 students wrote specific emotion and behavior reaction examples. Student responses included “If I'm angry, I tend to have an attitude towards things.” and “Sometimes I get upset and when I do I know I act irrationally”. Five students stated they don’t let emotions affect them including, “I don't let my emotions affect what I do”. Qualitative analysis of student responses on question seven, four themes emerged from student responses to probing questions: specific emotion and subsequent behavior, distractions, suppression of emotions and no effect (Table 5). An increase in the number of students who can recall specific emotions and a

behavior response and the paired t-test p-value of 0.001 validated the change in student attention control.

Table 5. Summary of probing question seven responses.

Question	Themes	Summary of Student Responses Pre- treatment	Summary of Student Responses Post- treatment
7. I pay attention to how my emotions affect my thoughts and behavior. 7a. Can you give me an example?	Specific emotion and subsequent behavior	24	32
	Distraction from emotion	5	4
	Suppression of emotion	4	4
	No effect on behavior	5	5
Total Responses		38	45

Note: Some students left probing questions blank, so total does not equal *N*.

Question 11, “I enjoy science class”, followed up with the probing question, “Why did you answer the way you did in the above question?”. Prior to the treatment ten students connected enjoyment of science class to their grade in science and post-treatment 13 students made statements including, “I get almost all A's” and “I get good grades” (Table 6). All themes saw an increase in the number of students providing an answer to the probing question. Students who found learning or science interesting increased from nine to 13 respondents after the treatment. One student stated, “I believe science is intriguing’, and another wrote, “I find science interesting.”. The p-value of 0.012 for question 11 indicated higher student enjoyment of science class following the treatment.

Table 6. Summary of probing question eleven responses.

Question	Themes	Summary of Student Responses Pre- treatment	Summary of Student Responses Pre- treatment
11. I enjoy science class. 11a. Why did you answer the way you did for the above question?	Get good grades in science	10	13
	Find learning and/or science interesting	9	13
	Enjoys class and/or teacher	7	10
	Never been good at/ not favorite subject	6	9
	Interest in science career	4	0
Total Responses		36	45

Note: Some students left probing questions blank, so total does not equal *N*.

The modified Perceived Stress Survey (PSS) (Appendix C) was completed by students both prior to and after the treatment. The survey had four positively stated items (e.g. In the last month, how often have you felt that you were on top of things?) for questions 4, 6, 8 and 9. The remaining six questions were negatively stated items (e.g. In the last month, how often have you felt that you were unable to control the important things in your life?). The inverse of the positive stated item student answers was recorded to accurately reflect the total perceived stress score. The score of all 10 items was totaled for an overall perceived stress score for each student. A score between zero and 13 is recorded as low perceived stress for an individual. A score between 14 and 26 is moderate perceived stress and between 27 and 40 is high perceived stress. Three quarters of all students (76%) fell within the moderate perceived stress total on both pre- and post-treatment surveys (Figure 1). One student scored in the high perceived stress range on the pre- but dropped into the moderate perceived stress range on the post-treatment survey.

Another student scored in the moderate and dropped to the low stress range after the treatment.

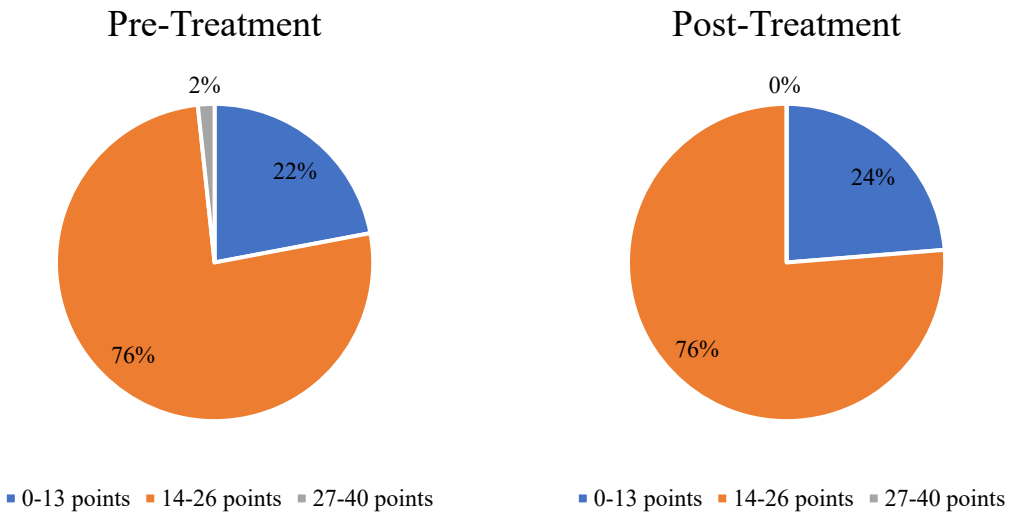

Figure 1. Pre- and post-treatment perceived stress survey scores.

Daily average heart rate during class time measured 88.56 beats per minute (bpm) during two-week period prior to treatment and 84.53 bpm during treatment (Figure 2). A 4-point drop between pre- and during treatment averages was recorded. The Perceived Stress Survey completed by the teacher at the same interval as student showed a 3-point drop between the pre- and post-treatment survey (Figure 3). A drop in average daily heart rate and perceived stress indicates that leading guided meditation was both relaxing to teacher and beneficial to reducing stress during class.

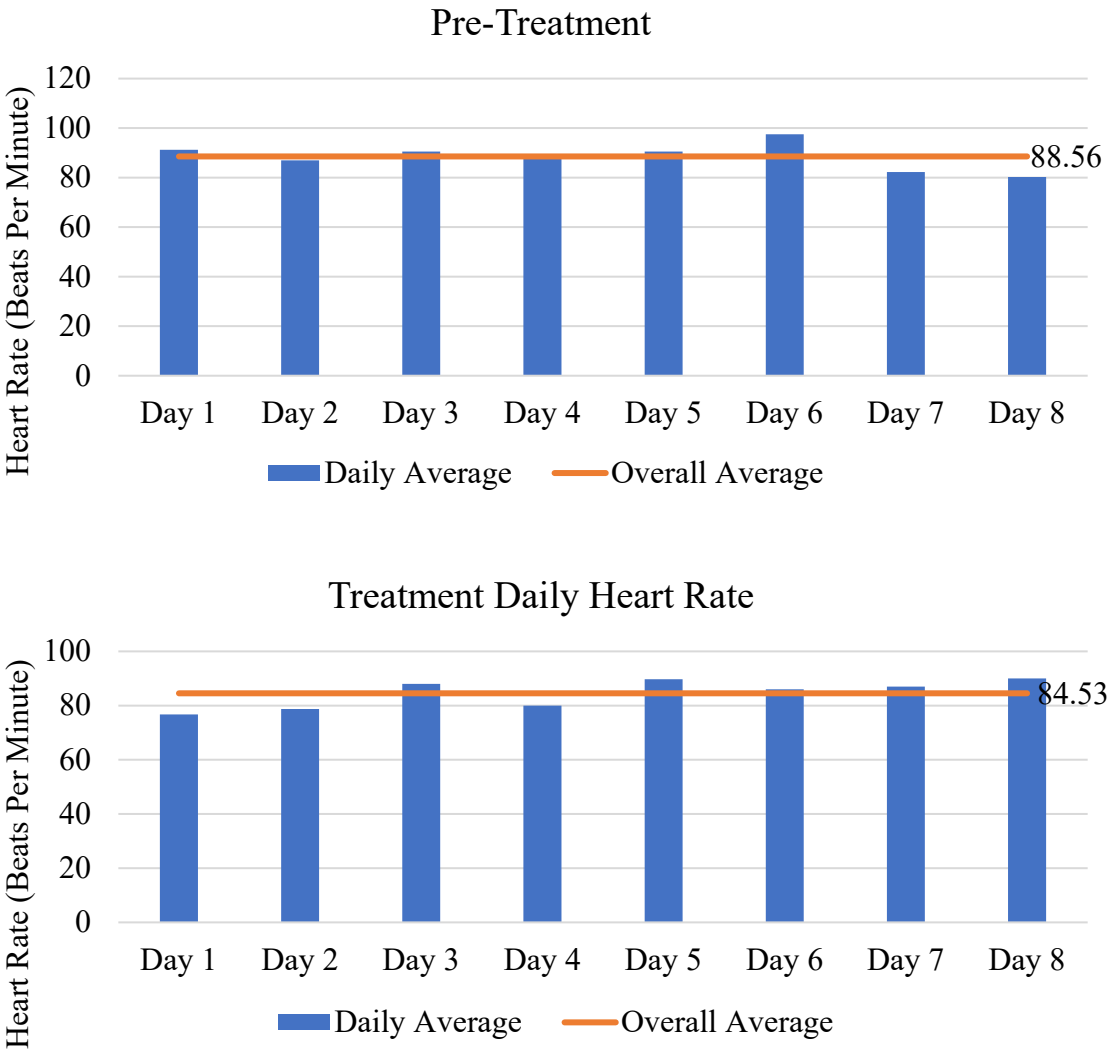

Figure 2. Pre- and during treatment teacher daily heart rate.

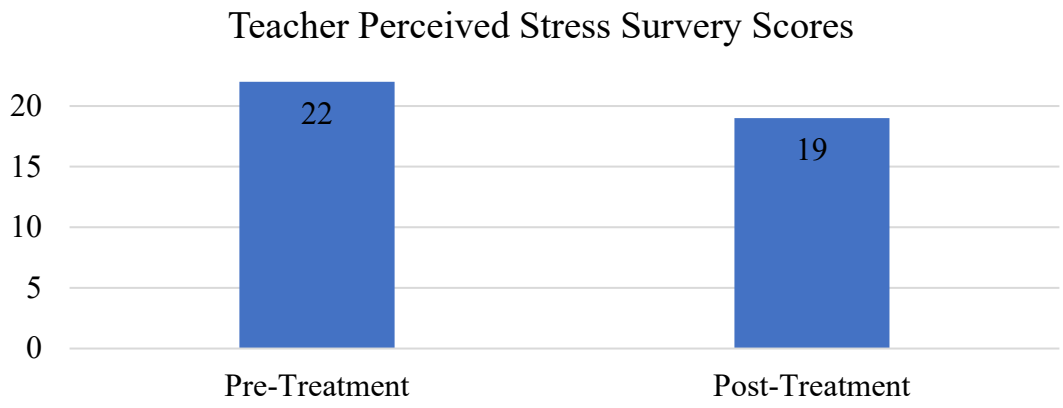

Figure 3. Pre- and post-treatment teacher perceived stress survey scores.

CLAIM, EVIDENCE AND REASONING

Claims from the Study

In response to my question on how a consistent practice of guided mediation in a science classroom effects student short-term performance I found an increase in student academic achievement on short formative assessments based on the same day's lesson. Summative assessment scores during the same unit showed no significant impact of guided meditation on long-term academic achievement. My summative assessments look for deeper thinking related to the concept being taught whereas my formative assessments focus on small important pieces of information, this may be one reason for not seeing a change in student academic achievement on the summative assessments.

Data collected on student self-regulation and interest in science showed a small increase in student ability to control their attention after the treatment was implemented along with a slight increase in student interest in science. Though increases were subtle they do show that there is a positive impact with the treatment and student attention and enjoyment of Biology class. Using guided meditation to help facilitate a more personal connection with students beyond the curriculum of the classroom give students a sense of ownership in their school experience.

Guided meditation to promote mindfulness did not have an impact on individual perceived stress levels amongst students. Probing questions on the surveys did allow for students to express their stress or frustrations in a confidential way. Information gathered from student answers was beneficial to help provide more social-emotional support to students. Leading the mediation did show a slight reduction in teacher average heart rate

during class time but did not have a large impact on perceived stress levels experienced by teacher. In response to my main action research question of what effect teacher-guided meditation have on student engagement and performance in the high school science classroom, I found that there were increases in performance and student control of attention but overall decreases in stress levels remained the same.

Value of the Study and Consideration for Future

Multiple types of contemplative practices or mindfulness have been researched at elementary through college level courses showing short term benefits (Ramsburg & Youmans, 2013). With student social, emotional and academic stress levels continually increasing, it's important to help students discover and implement ways in which to deal and decrease overall stress. Gathering information from students regarding their stress levels and attention control can help teachers develop a better understanding of a student's emotional well-being and may help lower disciplinary issues in the classroom.

Qualitative data on student emotion, engagement and motivation are more difficult to analyze due to a majority of it being collected through self-reporting surveys and questionnaires, but can help provide insight into issues individual students are facing. Every data method chosen is equally important in concluding student engagement and performance in the science classroom. The length of time a meditation or mindfulness treatment is implemented should be considered based upon what changes researchers are looking for from an individual. Short-term performance could be measured in the length of one class or day whereas, stress levels and attention control are long term emotional and behavioral changes that take time to change within an individual.

As a practitioner of guided meditation to achieve mindfulness I still believe this to be my best option of contemplative practice to lead my students in. The biggest weakness of this study was brevity of the time span in which it was conducted. Early buy-in from students is important to ensure trust in the process and develop the relationship within the classroom that allows the space to be safe and welcoming for all. Overall, guided meditation to increase student mindfulness is another strategy that I will continue to use to promote positive individual well-being in my classroom. Once students understood the routine at the beginning of class and with the guided meditation lasting only five minutes, it would be easy to incorporate daily into future classes. Increase in student interest of science, engagement and attention control from this study indicates this could be beneficial for future students. One future research question I would like to look into regarding guided meditation in the classroom is its effectiveness in reducing disciplinary issues. I sensed I had less disciplinary issues during the treatment but did not collect data on it. Another idea for future research is to look at guided meditation as part of outside the classroom study habits using apps or technology that students can access on their own.

Impact of Action Research on Author

The biggest impact from this action research is knowing I have the ability to conduct research and gain a depth of information on my students to best serve them. Though the results were less than what I expected, it is helpful to know what does and does not work for a specific set of students. I have also learned that the science classroom

is more than just a space for my students to learn about science, it is also a space that students should feel relaxed and comfortable in at all times.

I will continue to use guided meditation in my classroom to provide an opportunity for students to learn techniques that can help reduce stress and increase academic performance. The small short-term increase in student performance indicates that the guided meditation could be beneficial to students on days when assessments are being given in a classroom. Teaching students a method in which the focus is being more present and learning how to self-regulate attention can help students learn to deal with stress as an individual and can even be used outside of a school setting. The techniques I developed and information I gained during this action research has helped me become a better teacher to all my students.

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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: Meredith Brandon and Walter Woolbaugh

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

DATE: January 9, 2020

RE: *"The Effects of Guided Meditation in the Secondary Science Classroom" [MB010920-EX]*

The above research, described in your submission of January 8, 2020, 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:

_X_ (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.

_X_ (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.

APPENDIX B

BODY SCAN MEDITATION TRANSCRIPT

UCLA Semel Institute Mindful Awareness Research Center
Body Scan Meditation Transcript (2:44)

Begin by bringing your attention into your body
You can close your eyes if that's comfortable to you
You can notice your body, seated, wherever you're seated
Feeling the weight of your body, on the chair, on the floor
And take a few deep breaths
And as you take a deep breath
Bring in more oxygen and livening the body
And as you exhale
Have a sense of relaxing more deeply
You can notice your feet on the floor
Notice the sensation of your feet touching the floor
The weight and pressure, vibration, heat
You can notice your legs against the chair
Pressure, pulsing, heaviness, lightness
Notice your back against the chair
Bring your attention into your stomach area
If your stomach is tense or tight, let it soften
Take a breath
Notice your hands
Are your hands tense or tight?
See if you can allow them to soften
Notice your arms
Feel any sensation in your arms
Let your shoulders be soft
Notice your neck and throat
Let them be soft, relaxed
Soften your jaw
Let your face and facial muscles be soft
Then notice your whole body present
Take one more breath
Be aware of your whole body, as best you can
Take a breath
And then when you're ready
You can open your eyes

APPENDIX C

MODIFIED PERCIEVED STRESS SURVEY

Name _____Age_____
Gender (Circle): **M F** Date_____

Student Survey

The questions in the scale ask you about your feelings and thoughts in the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
   Never Very Rarely Sometimes Fairly Often Very Often

2. In the last month, how often have you felt that you were unable to control the important things in your life?
   Never Very Rarely Sometimes Fairly Often Very Often

3. In the last month, how often have you felt nervous and "stressed"?
   Never Very Rarely Sometimes Fairly Often Very Often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?
   Never Very Rarely Sometimes Fairly Often Very Often

5. In the last month, how often have you felt that you could not cope will all the things you had to do?
   Never Very Rarely Sometimes Fairly Often Very Often

6. In the last month, how often have you been able to control irritations in your life?
   Never Very Rarely Sometimes Fairly Often Very Often

7. In the last month, how often have you been angered because of things that were outside of your control?
   Never Very Rarely Sometimes Fairly Often Very Often

8. In the last month, how often have you felt that you were on top of things?
   Never Very Rarely Sometimes Fairly Often Very Often

   8a. Why did you answer the way you did for the above question?

9. In the last month, how often have you felt that things were going your way?
   Never Very Rarely Sometimes Fairly Often Very Often

   9a. Why did you answer the way you did for the above question?

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
    Never Very Rarely Sometimes Fairly Often Very Often
    10a. Why did you answer the way you did for the above question?

APPENDIX D

MODIFIED CHILD AWARENESS AND MINDFULNESS MEASURE

Name _____Age_____ Gender (Circle): **M F** Date_____

Student Survey

We want to know more about what you think, how you feel, and what interests you in science. Read each sentence. Then circle the number that tells how often each sentence is true for you.

	Never True	Rarely True	Sometimes True	Often True	Always True
1. At school, I walk from class to class without noticing what I am doing.	0	1	2	3	4
2. It's hard for me to pay attention to one thing at a time.	0	1	2	3	4
2a. Why did you answer the way you did in the above question?					
3. I rush through activities without being really attentive to them.	0	1	2	3	4
4. I find myself listening to someone with one ear and doing something else at the same time.	0	1	2	3	4
5. I find myself doing things without paying attention.	0	1	2	3	4
6. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	0	1	2	3	4
7. I pay attention to how my emotions affect my thoughts and behavior.	0	1	2	3	4
7a. Can you give me an example?					
8. When I have distressing thoughts or images, I just notice them and let them go.	0	1	2	3	4
9. I enjoy school.	0	1	2	3	4
9a. Why did you answer the way you did in the above questions?					
10. I get good grades in school.	0	1	2	3	4
11. I enjoy science class.	0	1	2	3	4
11a. Why did you answer the way you did in the above questions?					
12. I get good grades in science class.	0	1	2	3	4
13. Science is useful and relevant to my life.	0	1	2	3	4
14. I think science is boring.	0	1	2	3	4
15. I would enjoy being a scientist.	0	1	2	3	4
16. I learn in science class.	0	1	2	3	4

APPENDIX E

STUDENT INTERVIEW QUESTIONNAIRE

Student Name _____Date_____

1. How is your day going? (Thank student for coming to interview)

2. When I say the word mindfulness, what does that mean to you?

    a. Where have you heard that word used before?

    b. Any other times/places you've heard that word used?

3. When you hear the word meditation what does that make you think of?

    a. What type of meditation was it?

    b. Did you do it on your own or was it led by someone?

    c. How did it make you feel?

4. Have you ever been led in a mindfulness or meditation activity in school?

    a. Was it during a core class (math, english, history, etc) or an elective (art, college prep, CIF)?

5. Would you participate if there was a regular mindfulness or meditation practice offered in one of your classes?

6. Do you think that participating in a regular mediation helps you in school?

    a. What effect do you think it might have on you?

    b. Does it help you concentrate in class?