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Effect of Artificial Nature on High School Students' Learning Experience

Jonah Perelman[1] *

[1]Randolph High School, Randolph, NJ, USA

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Abstract

The growing accessibility of technology is creating a new avenue for incorporating nature and its visual, auditorial, and olfactory sensory details into classroom environments. Replicating nature through technology as opposed to using outdoor classrooms can reduce the barriers for teachers to expose their students to nature. The dominant benefit of exposure to nature is reducing students' mental fatigue which translates into academic and well-being benefits. A treatment including a Smart Board, speakers, laptops, and an Airwick was used to determine whether they can be used together to create a beneficial nature experience for students while reading an article and answering reading comprehension questions. Contrary to the benefits of outdoor classrooms, the findings indicate that benefits of nature to reading comprehension and well-being are not likely attained when it is artificially replicated in a classroom. Teachers and curriculum writers should look toward other tools to maximize the benefits of nature for students.

Keywords: Technology, Nature, Classrooms, Sensory Details, Wellbeing

1. Introduction

1.1 Background

An average U.S. student spends 8,884 hours over nine years in school (Sparks, 2019). Because students spend twenty-two percent of their waking hours in a classroom, one cannot deny the importance of ensuring that their physical classroom environment supports not only their academic growth but also their emotional and social wellness.

Preexisting research indicates that classrooms without windows can feel stressful and overwhelming to both students and teachers because both groups have an inherent need to affiliate with nature (Kellert and Wilson, 1993). Because students lack the ability to change the classroom environment, teachers often artificially recreate nature in classrooms without windows, taping fake windows and pictures of scenery to their walls. Not only does this make students feel more comfortable in the classroom environment (Sop Shin, 2007), but also it translates to enhanced academic ability (Benfield et al., 2015). Exposing students to nature is important for their social and emotional health; however, methods of integrating nature into classrooms remain underexplored.

Current literature shines some light on the benefits of outdoor classrooms with improving the academics and well- being of students (Dennis et al., 2014). Outdoor classrooms are especially effective for students challenged by the rigid structure of traditional classrooms. While teachers tend to positively perceive outdoor classrooms, many are concerned about integrating them into curriculums. Unpredictable weather, supervision, lack of administrator and curriculum support, and potential loss of class time are common barriers for teachers to

* Corresponding Author
jonahperelman1@gmail.com

Advisor: Michelle Lonie
loniem@rtnj.org

implement outdoor classrooms (Ruether, 2018). Although some teachers and schools have developed curriculums that can be used during all months and seasons of the school year (Constable, 2015, Kervinen et al., 2018), they are not prevalent in education.

1.2 Student Perceptions of Nature

Because students are the subject of this study, it is important to understand how they view incorporating elements of nature into classrooms.

The Biophilia Hypothesis examined the idea of biophilia – humanity's innate affinity for the natural world. The authors asserted 'the existence of a biologically based, inherent human need to affiliate with life and lifelike processes' (Kellert and Wilson, 1993, p. 56). Therefore, *the Biophilia Hypothesis* implicates activities and institutions that act as a barrier to people's interaction with nature. Kahn (1997) expanded on Kellert and Wilson (1993) by applying the idea of biophilia to children. Kahn (1997) constructed four structural-development studies that involved 72 children from Texas and 44 children from Brazil. After analysis of the interviews with the children, Kahn (1997) concluded that 'young children (at least by the ages of 6 to 8 years) have moral commitments to nature' (p. 46). This paper supports the notion that children require exposure to nature to fulfill their biological need to affiliate with life. Given children spend a great deal of time in a classroom (Sparks, 2019), Kellert and Wilson (1993) and Kahn (1997) would agree that classrooms should provide opportunities for students to be exposed to nature.

Dr. Pia Sjöblom and Maria Svens build off the idea that students have an innate desire to interact with the natural environment by interviewing with 10–11-year-old students who participated in a nature school day. Sjöblom and Svens (2018) found students 'emphasized the different learning activities outdoors in comparison with the teaching they were used to in the classroom' (p. 307). The appreciation for the outdoor classroom is grounded in *the Biophilia Hypothesis* because it indicates that the traditional classroom may not have fulfilled students need for exposure to nature. Confirming Sjöblom and Svens (2018), Asmara et al. (2016) analyzed survey results from English learners' after participating in sixteen two-hour sessions of a trial outdoor school and determined 'all the 20 students were interested in joining the program' (p. 5). The students' agreement with the outdoor school further supports the notion that students desire to interact with nature in a classroom environment. Together, Sjöblom and Svens (2018), and Asmara et al. (2016) show that students hold a positive perception of spending more time with nature which supports the need for changes in the classroom setting.

The work by Kaplan and Kaplan establishes the foundation for the universal need for humans to interact with the natural environment. This is expanded upon by the works of Kahn (1997), Sjöblom and Svens (2018), and Asmara et al. (2016) who display scholarly agreement that students welcome increased interaction with nature.

1.3 Benefits of Viewing Nature

Viewing nature is a key component of reducing mental fatigue in students. Benefits to students' wellbeing and academic ability are often realized when their mental fatigue is reduced.

The Experience of Nature: A Psychological Perspective proposed Attention Restoration Theory which asserts that nature is a mechanism, like sleep, to reduce mental fatigue. In a classroom setting, the struggle to pay attention is 'central to what is experienced as mental fatigue. If mental fatigue is the result of an over worked capacity for directed attention, then resting this capacity would seem to be the route to recovery' (Kaplan and Kaplan, 1989, p. 182). Mental fatigue grows because of a cluttered and confusing classroom setting with no outlet for students to redirect their attention. To reduce mental fatigue, exposure to wilderness environments is 'powerful, and the experience was deeply restorative' (Kaplan and Kaplan, 1989, p. 182). Benefits to reducing mental fatigue through nature can be fulfilled through the five sensory details: touch, smell, visuals, taste, and audio.

Visual sensory details are often the most apparent component of students' interactions with nature. Elaborating on Kaplan and Kaplan (1989), Sop Shin

(2007) examined how forest views affect employee stress by studying windowed and non-windowed offices. Sop Shin (2007) found that participants 'who had opportunities to view forest scenery through windows from their workplace had less job stress' (p. 251). This benefit is applicable to students because both employees and students spend equally extended periods of time in enclosed spaces with often limited access to viewing nature. In agreement with Sop Shin (2007), Kahn et al. (2008) determined that viewing nature is beneficial for reducing student's mental fatigue; however, the study clarified that artificial nature does not appear to reduce mental fatigue. The experiment included a treatment with an empty wall and a treatment with an artificial window where participants in both treatment groups completed a series of tasks like proofreading and drawing for one hour. When participants 'looked longer out the glass window, they had greater physiological recovery; but that was not the case with the plasma window, where increased looking time yielded no greater physiological recovery' (Kahn et al., 2008, p. 198). This paper demonstrates that artificial nature does not appear to reduce student's mental fatigue; however, Kahn et al. (2008) overlooked benefits to participants' cognitive abilities. Benfield et al. (2013) explored this gap by examining students who met in classrooms with window views of a concrete wall and students in classrooms with window views of a grass field including blossoming trees. Students who had the ability to view nature 'rated the course curriculum, classroom resources, and classroom materials more positively than students with no natural view. Objective indicators of classroom attendance and course grade were not wholly supportive of natural views, but final course grades were shown to be higher in the natural window-view condition compared with the concrete view' (p. 149). Benfield et al. (2013) postulates that the natural views could be responsible for 'lowering student stress, restoring student attention, and/or enhancing the overall mood' (p. 153). Although the exact mechanism in which the benefits were realized is not clear, the relationship between natural views and higher final course grade could be further explored by research which seeks to incorporate artificial nature views.

Together, the work by Kaplan and Kaplan (1989), Sop Shin (2007), Kahn et al. (2008), and Benfield et al. (2013), demonstrate the academic and well-being benefits to students. Kaplan and Kaplan (1989) first demonstrated that interaction with nature causes students to remain attentive during classes by preventing mental fatigue. Sop Shin (2007) builds off Kaplan and Kaplan (1989) by revealing stress decreases when employees are situated near windows with forest views, while Kahn et al. (2008) demonstrated that this benefit cannot be replicated with plasma windows. Benfield et al. (2013) applies this line of research to students and shows how well-being and final course grades was higher in classrooms with nature views.

1.4 Implications of Nature Sounds and Smells

Olfactory and auditorial sensory details are often important components in students' exposure to nature. Understanding the benefits of sounds and smells associated with nature is important to narrow the gap between student's academic ability and wellbeing and their exposure to nature.

Students often read in the presence of talking, and teachers often allow students to listen to music while reading. Ylias and Heaven (2003) replicated the effect of talking by playing a television at a moderately loud volume while students read a passage and completed a questionnaire for eighty minutes. Most students reported 'being highly distracted by the operating television' (p. 1066). This paper supports the notion that television sounds, which included fluctuation in volume, is a distraction to students. In alignment with Ylias and Heaven (2003), Anderson and Fuller (2010) observed the effect of music on reading comprehension by administering reading comprehension tests to one group exposed to pop music and one group exposed to silence. The results of the study support the assumption that 'studying while listening to music detracts from the reading performance of adolescents' (p. 184). This paper demonstrates that pop music, is a distraction to students. While Ylias and Heaven (2003) and Anderson and Fuller (2010) agree that non-nature sounds like television and music can be

distracting students, no studies have explored whether nature sounds can serve as an alternative beneficial sound to students.

Incorporating nature smells into classrooms may allow for teachers to use the olfactory environment of classrooms to support academic growth and wellbeing. It must be noted there is significant variation how a nature smell is defined; however, one universal nature smell that has been known to reduce stress and anxiety is lavender. Sayorwan et al. (2012) investigated the effects of lavender oil on the central nervous system. The study concluded that inhalation of lavender oil 'significantly decreased the level of ANS arousal, namely, decreases of blood pressure, heart rate, and skin temperature' (p. 603). This paper supports the notion that lavender oil can be used to promote students' wellbeing. Expanding on Sayorwan et al. (2013), Donelli et al. (2019) examined the effect of lavender oil on anxiety. The meta- data analysis which included 13,157 participants showed 'a significant result in favor of lavender use for anxiety, either as a significant improvement from baseline within intervention groups' (p. 22). This paper demonstrates that the health benefits of lavender oil can be applied to students. Classrooms are in a unique position to attain these health benefits because of the considerable time students spend in them. While Sayorwan et al.(2013) and Donelli et al. (2019) agree that health benefits including reduction in anxiety occurs when exposed to lavender oil, both studies overlooked the effect of lavender oil on academic benefits. Current literature also remains unclear about the benefits of nature smells other than lavender oil.

The work by Ylis and Heaven (2003) demonstrated that television audio reduces reading comprehension scores in students, while Anderson and Fuller (2010) provided support that music acts as a distraction for students. For nature smells, Sayorwan et al. (2012), and Donelli et al. (2019) furthered the pool of research that lavender oil reduces anxiety.

1.5 Formulation of Research Objective

An underexplored method for fulfilling students need for nature is to integrate elements of outdoor classrooms in the traditional classroom setting through artificial nature. As seen from the work by Benfield et al. (2013) and Kahn et al. (2008), students across grades see academic benefits in terms of heightened motivation to read and increased attention to classwork. Ylias and Heaven (2003), and Anderson and Fuller (2010), demonstrated that both television sounds and music can disrupt students' ability to concentrate. Although the presented literature shows how individual nature sensory details establish academic and wellbeing benefits for students, it is unclear whether this relationship remains when these sensory details are combined or artificially replicated. This line of reasoning led to the research question: can sensory details from nature be artificially incorporated into a classroom to benefit students' reading comprehension and wellbeing?

1.6 Hypothesis

The null hypothesis is that sensory details which artificially replicate nature in a classroom has no effect on student's reading comprehension and wellbeing.

The alternative hypothesis is that sensory details which artificially replicate nature in a classroom improves student's reading comprehension and wellbeing.

2. Materials and Methods

2.1 Mixed-method Research

Quasi-experimental research and survey research worked together to test the null hypothesis. Quasi-experimental research was used to test for the academic benefits component of the hypothesis. While experimental research design would have helped to eliminate bias in the research, it was not as feasible to implement since it required the permission of more students and teachers. A survey was used to test for the benefits to wellbeing component of the hypothesis. While semi-structured interviews would be more effective at gaining additional depth, they would not be as effective at obtaining quantitative results.

2.2 Quasi-experimental Research

Quasi-experimental research design is a valuable tool because it is more feasible to conduct the current study with a smaller participant pool. Quasi-experimental research tests the null hypothesis by introducing a treatment to non- randomly divided participants. Kahn et al. (2008) exemplifies the use of quasi-experimental research as they non- randomly divided participants into baseline and treatment groups to determine the effect of artificial windows on wellbeing. The method by Kahn et al. applicable to this study because both studies aim to examine the possible effects of a treatment on a small population.

Following consent by an eleventh-grade English teacher, the experiment was planned to occur in one English period for one school week. The experiment consisted of two baseline trials and two treatment trials in the following order: baseline in classroom, baseline in media center, treatment in classroom, treatment in media center. There was a gap day between the baseline in classroom and baseline in media center because the class did not meet. No informed consent was needed for this component of the quasi-experimental research because the classwork was integrated into the curriculum. The media center is included in the experimental design to test whether a change in the classroom setting produces any academic or well-being benefits. The classroom used in the experiment was the same classroom used by the students for their entire school year.

The treatment aimed to replicate three sensory details of nature: visuals, sounds, and smells. A nature video (https://www.youtube.com/watch?v=xNN7i TA57jM) was selected to replicate the visual and sound sensory details of nature. This specific video was chosen because of the subtle variation in volume and the visual was deemed to be non- distracting. A Smart Board was used to project the video while speakers were used to project the audio of the video in the classroom and media center. The Fresh Waters Scented Oil Airwick was chosen to replicate the olfactory sensory detail of nature. It was deemed to be a non- overwhelming natural smell and its similarity to the Lavender Oil Airwick which is known to reduce anxiety. It was plugged into the wall of the classroom and media center. Reading comprehension was measured by using an online platform named NewsELA. This platform distributed articles for students to read and annotate on their school-provided laptops, and when finished students answered multiple choice questions and free-response questions. The multiple-choice grading was done by NewsELA and the open-ended was graded by the teacher. NewsELA was chosen because students were familiar with using the platform from previous classwork.

2.3 Survey Research

Surveys are a valuable tool for testing the hypothesis because it gives insight into the benefits to student's wellbeing and perception of the treatment. This method directly tests the wellbeing component of the research hypothesis because it allows students to self-report wellbeing, which is the best way to measure unobservable components of wellbeing like emotions. Benfield et al. (2013) exemplifies the use of surveys when testing the impact of classrooms with window views to nature. Following the completion of a course, participants took a survey which gauged their opinions about having access to a view of nature. This is applicable to the current study because both surveys are given at the end of a treatment period to young students in a school environment.

An institutional review board authorized the survey and participants were made aware of a survey the class period following the completion of the experiment. An informed consent letter was provided to the participants which they took home and got signed by a guardian. Students were offered a participation grade as an incentive for completing the survey. Over the course of a week, students brought the informed consent letter to the teacher and then completed the survey. The purpose of the survey was to gauge student interest for incorporating artificial nature sensory details into classrooms and whether they witnessed any benefits to their wellbeing. The Microsoft Forms online survey was used because it was easier to tabulate results and ensure the uniqueness of each data point.

2.4 Replicability

For this method to be replicable, three crucial conditions must be met. The first condition is that high school language arts classes, specifically upperclassman, must be the participants. The current study does not account for variation in age. The second condition is that the setting of the participants must be a traditional classroom with windows on one wall and LED lighting. This condition is important because students whose settings often change may react differently to the introduction of nature sensory details. The third condition is that any classwork or tests provided to students must be given online. A key component of student's routines in this English class was using their computers to complete classwork. There can be variation in how students react to the introduction of nature sensory details based on what medium they complete classwork.

3. Results

Data was omitted when students were unable to participate in both the pre-treatment and post-treatment assignments in either the classroom or the library.

A dependent samples t-test, which compares the mean (*M*) scores between the pre-treatment and post-treatment, was used to determine whether a change occurred when applying the treatment. Standard deviation (*SD*) represents the variation in scores, and the P-value describes the probability that the results are by chance.

3.1 Quiz Scores

To test the null hypothesis that pre-treatment (M = 86.538, SD = 14.544) quiz scores were the same post-treatment (M = 87.5, SD = 20.31) scores in the classroom, and pre-treatment (M = 79.63, SD = 27.767) quiz scores were the same as post-treatment (M = 87.963, SD = 26.285) scores in the media center, a dependent samples t-test was performed. Table 1 depicts the results of the dependent samples t-test when applied to the change in quiz scores.

Table 1. Treatment does not change quiz scores.

	Sample Mean (*M*)	***SD***	**T-score**	**Alternate Hypothesis**	**P-value**	**Statistically Significant**	**Margin of Error**
Classroom (n=26)	0.962	20.592	0.24	$M > 0$	0.4068	No	1.931
Media Center (n=27)	8.333	41.603	1.04	$M > 0$	0.1538	No	16.657

α=.05

As seen by Table 1, the null hypothesis failed to be rejected in the classroom, $t(25) = .24$, $\alpha < .05$, and failed to be rejected in the media center, $t(26) = 1.04$, $\alpha < .05$. Thus, the change in quiz scores were not statistically significant in either the classroom or media center.

3.2 Annotations

To test the null hypothesis that the pre-treatment (M = 17.962, SD = 10.278) number of annotations was the same as the post-treatment (M = 20.231, SD = 9.275) in the classroom, and pre-treatment number of annotations (M = 10, SD = 4.923) was the same as the post-treatment (M = 7.852, SD = 4.785) in the media center, a dependent samples t- test was performed. Table 2 depicts the results of the dependent samples t-test when applied to the change in the number of annotations in the classroom and media center.

Table 2. Treatment may change number of annotations

	Sample Mean (*M*)	***SD***	**T-score**	**Alternate Hypothesis**	**P-value**	**Statistically Significant**	**Margin of Error**
Classroom (n=26)	2.269	8.398	1.38	$M > 0$	0.0903	No	4.542
Media Center (n=27)	-1.778	2.94	-3.14	$M < 0$	0.0021	Yes	3.555

α=.05

As seen by Table 2, the null hypothesis failed to be rejected in the classroom, $t(25) = 1.38$, $\alpha < .05$. The null hypothesis was rejected in the media center, $t(26) = -3.14$, $\alpha < .05$, but since there was a decrease in annotations, the alternative hypothesis was also rejected. Thus, the change in the number of annotations was not statistically significant in the classroom while the post-treatment was statistically significantly lower than pre-treatment in the media center

3.3 Writing Scores

To test the null hypothesis that the pre-treatment ($M = 2.846$, $SD = 1.156$) writing scores was the same as post- treatment ($M = 3.308$, $SD = 0.838$) in the classroom, and pre-treatment writing scores ($M = 2.667$, $SD = 1.109$) was the same post-treatment ($M = 2.111$, $SD = 0.934$) in the media center, a dependent samples t-test was performed. Table 3 depicts the results of the test when applied to the change in writing scores in the classroom and the media center.

Table 3. Treatment changes writing scores

	Sample Mean (*M*)	***SD***	**T-score**	**Alternate Hypothesis**	**P-value**	**Statistically Significant**	**Margin of Error**
Classroom (n=26)	0.462	1.208	1.95	M > 0	0.0312	Yes	0.924
Media Center (n=27)	-0.556	1.251	-2.31	M < 0	0.0146	Yes	1.112

α=.05

As seen by Table 3, the null hypothesis was both rejected in the classroom, $t(25) = 1.95$, $\alpha < .05$, and in the media center, $t(26) = -2.31$, $\alpha < .05$. The alternative hypothesis was accepted in the classroom. The null hypothesis and the alternative hypothesis were both rejected in the media center because writing scores significantly decreased. Thus, the writing score was statistically significantly higher post-treatment in the classroom than pre-treatment, while statistically significantly lower post-treatment in the media center than pre-treatment.

3.4 Wellbeing

Sixteen students completed the survey. Table 4 details the results of the first four questions which gauged student's preferences of the treatment components.

Table 4. Student preferences of treatment components

Stimulus	**Prefers**	**Does not Prefer**
Forest Sounds	2	14
Forest Video	2	14
Airwick	6	10
Classroom	6	10
Media Center	10	6

Table 4 presents the finding that most students do not prefer forest sounds and forest video while they are reading. Table 4 also indicates that while some students prefer the Airwick while reading, most students do not prefer it.

There was one open-ended question to gauge what would make students feel most comfortable while reading. One response was omitted because it was unrelated to the survey. Seven out of the fifteen responses discuss music while six discuss no sounds or some semblance of quietness. Unique responses included exposure to sunlight, not having pressure to read, comfortable temperature, different chairs, and using paper instead of a laptop.

4. Discussion

4.1 New Understandings

Based on the quasi-experimental research, it is now understood that it is unlikely students' reading comprehension is improved when exposed to a treatment which artificially replicates nature sensory details. Table 1 indicates that student's quiz scores does not change in either the classroom or the media when exposed to the treatment. Table 2 indicates that student's annotations do not change in the classroom and decreases when in the media center. While Table 3 shows writing scores increased for students in the classroom, writing scores in the media center

decreased when exposed to the treatment.

Based on the survey research, it is now understood that it is unlikely that students' wellbeing improves when exposed to the treatment. Although more students preferred reading in the media center over the classroom, Table 4 indicates that most students did not prefer the treatment. Responses to the open-ended question add that students often feel most comfortable when exposed to either music or no sound as opposed to any artificially replicated nature sensory detail.

4.2 Fulfillment of Gaps in Research

While Benfield et al. (2013) and Sop Shin (2007) both analyze the effect of nature views on study participant's well-being and academic ability, neither consider the effect of artificial nature views. Moreover, although Kahn et al. (2008) considers the effect of artificial nature views on participant's well-being, their study is not targeted toward students. This study fills the gap by focusing only on students and by specifically addressing artificial nature views, which has been shown does not likely benefit students' reading comprehension or wellbeing.

No studies have been conducted on the relationship between artificial nature sounds and students. Although Ylias and Heaven (2003), and Anderson and Fuller (2010) showed different ways sounds can distract students, neither focuses specifically on artificial nature sounds. This study fills this gap by incorporating artificial nature sounds and showing how it is unlikely they benefit students' reading comprehension or wellbeing.

Although Sayorwan et al. (2012). and Donelli et al. (2019) agree that health benefits occur when exposed to lavender oil, no literature has applied lavender oil or other similar substances to the classroom environment and examined their impacts on students. This study fills this gap by implementing the Airwick in the treatment and by showing it does not likely have a benefit on students' reading comprehension or wellbeing.

4.3 Limitations

On the quasi-experimental research method, while this study was originally designed to include lavender oil, which the literature review had outlined benefits for student's wellbeing, logistical barriers prevented its implementation and Airwick already used by the teacher was used instead. Although the Airwick was deemed to be similar enough to a lavender oil smell, it may not have maximized wellbeing benefits for students.

On the findings, while the reading-level and the subject remained constant among the four articles, variation in the difficulty of the quiz and open-ended questions may have skewed the findings. It is also unclear whether cofounding factors like hours slept, sickness, or stress levels caused variation in the results between the four trial days. While it is difficult to account for all cofounding factors that may cause variation in test results, it is important to recognize that the test results between trials may not have been directly comparable to one another. Moreover, the non-random selection of the English class and the small sample size limits the generalizations this study can make. The non-random selection of the English class means it is difficult to recognize how well the study represents the total student population. Because the null hypothesis was tested only by examining high school students, this study may not be representative of students across age groups. Cofounding variables, non-random selection, and a small sample size means teachers and curriculum writers should view the findings of this study cautiously.

5. Conclusion

5.1 Implications

Teachers should reconsider replicating nature in the classroom through projectors, speakers, and Airwicks if their goal is to improve reading comprehension and wellbeing for students. This study concluded that there was no significant increase in reading comprehension as it was measured through quiz scores, writing scores, and number of annotations. It also found that student wellbeing did not improve as most students disliked the changes to the classroom environment according to the survey. Although it should be noted that students seemed to

prefer the media center over their traditional classroom, teachers should weigh whether the possible increase in wellbeing is worth the possible decrease in reading comprehension.

In alignment with Anderson and Fuller (2010), this study calls into question the role of music in student reading comprehension and wellbeing. Because students were able to listen to music during the baseline trials and unable to listen during the treatment trials, it is probable that the absence of music is a factor that increased reading comprehension.

For teachers and curriculum writers who are deciding how to expose students to nature, it is recommended that they look toward natural ways of exposing students to nature like holding outdoor classes and increasing exposure to windows as opposed to replicating nature artificially in the classroom.

5.2 Areas of Future Research

The quasi-experimental method used by this study does not account for variation for age of students, their academic track (b level, a level, or honors), or time slept. Future research should focus on collecting data on these cofounding factors to explore whether there is variation in the effects of the treatment on students. Future researchers should also expand upon this study by implanting experimental research design so their study can be representative of the student population.

As indicated by the responses to the open-ended survey question, future research should also focus on the sound of rain, silence, and their effect on improving reading comprehension and wellbeing. If students indicated that they prefer reading under those conditions, then it is likely there could be an increase in wellbeing.

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