

RUNNING HEAD: Brain Breaks

DETERMING EFFECTIVNESS OF BRAIN BREAKS ON STUDENT PERFORMANCE

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## ABSTRACT

This study was conducted to determine if taking short breaks called Brain Breaks effectively increase retention of new material delivered through lecture to high school students. Lecture is an activity that is necessary to uniformly give students information in a verbal and visual way. If done correctly it can be engaging and informative at the same time however, some educators in the interest of saving time may spend an entire class period delivering information in this way. In general this is not considered a best practice because it makes it easy for students to become disengaged therefore making the time spent on lecture inefficient. Studies done by Robert Marzano (2012) have shown that increasing student movement increases engagement and therefore a higher probability of information retention. This study determined how effective taking short breaks called Brain Breaks are at increasing the retention rates of high school chemistry students. Participants in the study were four Chemistry classes, students age 16-18 year old. During a class period where students were listening to a lecture and viewing a presentation two classes were given a Brain Breaks and the other two were not. A Brain Break is a short break of 2-3 minutes in which the students engage in another activity to help them become refocused on the lecture. The findings of this study show there is not a significant increase in retention by the classes of Chemistry students receiving the Brain Break. After review of the data and research available at this time there it is believed that there is still a need to decrease the span of time students are required to listen to lecture to increase the amount of information retained. While this study did not support an increase in assessment score after lecture due to Brain Breaks there is still a very common theme in the research that shows the effective ways to increase engagement and the probability of student success is to take short breaks and get students involved in physical activities.

## INTRODUCTION

### *Background, Issues and Concerns*

There have been concerns about student engagement and knowledge retention during lecture. Students must be engaged in the lesson for it to be effective yet it is a struggle to cover all the content information and keep students actively involved in the lesson. As a result, often students have to “sit and get” information for an entire class period. It is important to ensure that valuable class time is used effectively and ensures that students are retaining as much information as possible. Teachers often have the question arise, “How can I keep my students engaged and cover all the information?” Researchers are concerned that our current education practices do not agree with the brain research.

### *Practice under Investigation*

Despite evidence on attention span and retention rates of learners, many high school lessons still include large portions of lecture requiring the student to sit and remain focused on the classroom. This practice ignores an expanding body of research on brain activity.

### *School Policy to be Informed by Study*

Some information in every class must be delivered to students through lecture or explanations. If there is sufficient data to support brain breaks then it would be beneficial to students’ education to include them during periods of lecture.

### *Conceptual Underpinning*

Learners have a limited attention span for effective retention of information. It is important that class time is utilized effectively to ensure student performance is as high as possible and cover the entire necessary curriculum. Brain research shows that a person is only able to retain certain amounts of information at one time. “If you are really paying attention to learning something new, the time limit is 20 minutes before the brain says ‘enough’.” (Fox, p.

2008, p.38) Anything over the learner's retention threshold is not beneficial and therefore not a utilizing class time efficiently. Depending on the outcome students may benefit from brief breaks and therefore retain more information. Taking the breaks would then allow the teacher to be more engaging to students thus making good use of limited class time. Because the students are more engaged, in theory, this should also improve their overall achievement over the new information that is covered during the specified class period.

*Statement of the Problem*

Learners' only have a limited attention span and become unfocused on the task if they must sit and listen for long periods of time without a break. Teachers should make modifications to this practice in order to increase the amount of information the student retains during a lecture session.

*Purpose of the Study*

This study will determine the effectiveness of brain breaks during periods of instruction on the overall knowledge retention of students in high school. This will be done through a comparison of assessment scores after a lecture class period of approximately 40 minutes between four high school chemistry classes, two receiving a brain break. The data will determine if a brain break has an effect of the information retained thus making the class time more useful by providing the break.

*Research Question*

Is there a difference in student performance between students who receive brain breaks and students who do not receive brain breaks?

*Null Hypothesis*

There is no difference in student performance between students who receive brain breaks and students who do not receive brain breaks.

*Anticipated Benefits of the Study*

This study will demonstrate the effectiveness of purposeful movement and brain breaks during a lesson. Based on the knowledge gained from this study, improvements to current teaching practices to improve information retention throughout the lesson can be made.

*Definition of Terms*

Brain Break: mental breaks designed to help students stay focused and attentive

Best Practice: a method showing superior results that is used as a benchmark and may evolve over time.

*Summary*

A study was conducted to see if there was a significant difference in students test score between those who receive a brain break during lecture and those that do not. If the t-test concludes there was a significant difference, teachers should implement brain breaks thus allowing students to perform at their highest abilities. Students have limited attentions spans it is necessary to utilize many teaching practices to aid students to be successful. After conducting this study, teachers can improve best practices by comparing the data from classes receiving a break and those without.

## REVIEW OF LITERATURE

With the necessity of students learning 21<sup>st</sup> Century skills, the plethora of knowledge at their fingertips utilizing the internet and the increased number of learning goals required by states for a student to be proficient there is an increase in the amount of information students need to learn without an increase in the time they have to learn it. This means that information must be presented in a fashion that increases the information received and retained while maintaining the time allotted. Herein lays the problem, teachers will lecture in order to present a great deal of information in a short amount of time but is this a best practice? How much do they actually retain? Would they retain more if the presentation was not a “sit and get” lesson or if meaningful breaks from listening were incorporated.

According to Herrmann-Nehdi, (2010) “The solution rest not in using our brains more (we don’t have unlimited capacity), but in using them effectively.” (p.39) This idea has caused brain-based research to determine the best practices for educators in both the school setting and the corporate setting. The findings include, “The joining of psychology (the study of the human mind and behavior) and neuroscience (physiological study of the brain) sheds light on the brain’s role in human nature and behavior.” (Fox, 2008, p.37)

The study featured in the article by Fox discusses the use of magnetic resonance imaging to study the brain’s electrical impulses to better understand the brain’s function and how that changes the way a person behaves in certain situation. In particular, this study focuses on what makes the brain function more effectively and causes information to become ingrained in our memories. “To make learning stick, the brain must move information from ‘working memory’ to the basal ganglia at the base of the brain. That requires heavy lifting: Working memory is energy-intensive; your brain literally tires out after learning.” (Fox, 2008, p.38) This means that if students spend time learning they will actually become fatigued. The study goes on to say that, “Neuroscience confirms the suspicion that ‘the brain shuts off after a certain amount of time, and there is a limit to how much information can be digested.’”(p.38) Another article by Ken Buch is

of the opinion that companies' methods of producing high volumes of work in a short amount of time is counterproductive and is actually causing employees to be less productive. The article explains several different areas of the brain employees use to carry out particular functions such as routine tasks and problem solving activities. It states that employees' brains are often overloaded and do not have the time necessary for the brain to process and recover therefore causes them to become stressed, overly tired, and less productive. The article proposes that by lessening stress to the brain it will increase employee productivity. Lessons the corporate world often come from best practices in the educational world or vice versus so if productivity is increase by decreasing the volume of work needed in a short amount of time then that too may apply to schools. (Buch, 2010, pp. 42-47)

Many suggestions are available which may help to increase the brain's function and therefore retention on new information. While it is not reasonable for the classroom to do as the Fox study suggests, sleep after learning new information, it is possible to do other things within the classroom and allotted time to combat this fatigue and therefore possibly increase knowledge retention rates of students.

One such suggestion is that, "Movement in the classroom is a small, but potentially important, part of effective teaching." (Marzano, 2012, p.89) It even goes on to state that, "Teachers who are sensitive to the need for student engagement-and the role of movement in enhancing that engagement-will have greater success in sustaining student's attention levels." (p.89) With an increase in engagement there is an increase in knowledge gained in a period of time. One study on the increase of physical activities within school and the effects it had on the students involved stated that, "Further work is needed to promote generalization of physical activity throughout the child's day" (Sallis, 1997, p.1333) This study suggested that an increase in physical activity was necessary in both the addition of physical education courses but also needs to be included within the classroom setting as well. One such way to include this physical activity in the classroom is to allow time for Brain Breaks during lecture. "Movement increases the

amount of oxygen to the brain. Consequently, when a teacher sees that students' attention levels are waning—for example, during a class period right before lunch—he or she might ask students to stand up and take a stretch break.” (Marzano, 2012, p.89)

Menza suggests a learner can take a break from studying to increase the effectiveness of their learning. Taking several breaks including watching funny video clips, stretching, and eating foods containing chemicals that aid in relaxation and brain function.(Menza, 2012, p.106) Brain Breaks are short period of movement, two to three minutes doing something else, taking a break, that could possibly increase engagement without spending too much valuable class time. The program MindUp suggests that students have, “...daily brain breaks that teach them to focus their minds. Brain Breaks improve kids' ability to retain information, remember, innovate, and create.” (Holiday, 2011, p.29) Physical activity and activities that relax the students can, “contribute to physical, social, emotional and cognitive health...” (Trenberth, 2005, p.1-2)

Physical movement is just one thing that Brain breaks can provide. It will also increase the number of breaks allowing, “...trainers [to] break learning into bite-size nuggets.” (Fox, 2008, p.38) This is another effective way to increase the brain's ability to retain information as mentioned in the article *The Brain at Work*. With the brain only being able to learn new things for about twenty minutes and the average high school class period being forty to sixty minutes long this is far too long to expect for valuable learning to take place. When you take the time several to, “quiet down the emotion and noise in the center part of your brain, the prefrontal cortex lights up. This is where executive function takes place. This is the part of your brain that really retains information, remembers, innovates, and creates.” (Holiday, 2011, p.29) Applying this to the classroom could likely increase knowledge retention of students and create a better use of classroom time on the part of the teacher.



## RESEARCH METHODS

### *Research Design*

A quantitative study was conducted to determine the effectiveness of Brain Breaks on student's assessment scores after a period of lecture. The independent variable was the status of the students either having brain breaks or not having brain breaks. The dependent variable was the student test scores. If the difference is found substantial in scores based on brain breaks, teachers should be informed and implement brain breaks during instruction.

### *Study Group Description*

Groups consisted of four high school chemistry classes of 24-29 students each. Students are males and females age 16-18. Students of varying backgrounds and ability levels. The sample group is comprised of 25% minority students, 10% free and reduced lunch and no English Language Learners (ELL) students. Chemistry is not a required course so students have chosen to take this course and the majority are college-bound students with only four students currently wanting to pursue a technical career.

### *Data Collection and Instrumentation*

Data collected during the 2012-2013 school year from four high school chemistry classes. Assessment data was collected at the end of a lecture class period. The assessment questions were created directly from the lecture information presented during a single class period. Each class was given the assessment at the end of class.

### *Statistical Analysis Methods*

A t-test will be conducted to find if there is a substantial difference in groups either receiving a brain break or not. The group is broken into two categories: those with a break and those without. The percentage correct they received on the post lecture assessment was collected for

108 students from 4 different chemistry classes, 54 received brain breaks and 54 did not, and then analyzed.

## FINDINGS

The findings of this study show there is not a significant increase in retention by the classes of Chemistry students receiving the Brain Break as shown by the following table. The values determined by the study did not support the theory that breaks help students retain more during lecture.

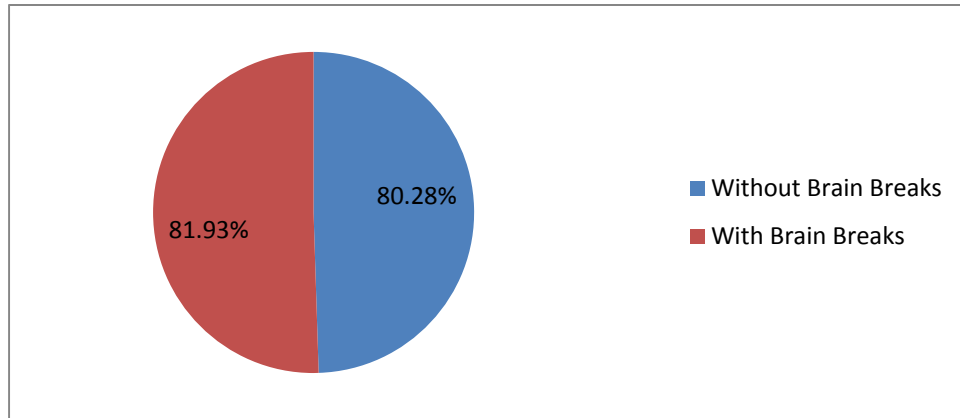
| Source              | Mean    | Mean D    | t-test   | df | p-value  |
|---------------------|---------|-----------|----------|----|----------|
| Without Brain Break | 1.48148 |           |          |    |          |
| With Brain Break    | 1.55556 | -0.074074 | -0.53600 | 52 | 0.594246 |

Note: Significant when  $p \leq 0.25$

A total of 108 students were studied to find the effects of taking a meaningful break to increase physical movement during a fifty minute long lecture. The mean for the classes without a brain break was 1.48148% and the mean for with brain break was 1.55556% with a difference of -0.074074. The t-test data for brain breaks was -0.53600 with a df of 52. The p-value is greater than 0.25 confidence level. The null hypothesis, there is no difference in student performance between students who receive brain breaks and students who do not receive brain breaks is therefore not rejected. This means that there was no significant difference between the knowledge retention rates of those students receiving a Brain Break versus those not receiving a Brain Break.

## Study of Students With a Brain Break vs. Without a Brain Break

Figure 1



As shown in the graph the average scores were 1.65% difference between those students with a two to three minute brain break versus those who received no break during the lecture.

The findings compiled answered the research question: Is there a difference in student performance between students who receive brain breaks and students who do not receive brain breaks? Both the t-test analysis and the figure show that there was no significant difference between the classes' scores who received the Brain Break and those who did not.

## CONCLUSION AND RECOMMENDATIONS

The outcomes reported from this study show that there is not a significant difference between classes receiving a Brain Break during lecture and those who are not. The findings show there was no significant difference between the two groups' performance on the post lecture assessment. The t-test results indicated that the p-value was 0.594246, higher than the alpha level set at 0.25; therefore, the null hypothesis tested is not rejected. There is no significant difference between those students receiving a break during lecture and those who do not.

Although conceptual foundations of Robert J. Marzano and the article by Adrienne Fox explaining the functioning of the brain are not supported by these findings there can still be value in the Brain Breaks. The classes that participated in the Brain Breaks participated in the lecture more and took a more active role in the class period while the classes not receiving breaks were more passive learners.

At the conclusion of this study several others should be conducted, each of which would broaden the group of students being tested and increase the diversity and sample size of the students being studied and therefore increasing the confidence of the information presented by this study. This study was done with high school students whom have chosen to take an upper level science course which might indicate that their involvement in school is greater than that of the average student. Another study could be conducted using students in a required high school course. This would increase the diversity of the group and also the ability levels of the students tested would be less similar and therefore provide more data and differing results.

Typically gender difference plays a large part in the type of effective lessons in during a given class period. Males are usually seen as more active than female students, yet females are seen to need more social interaction, something mentioned by Fox as necessary to knowledge retention. This study could compare the effectiveness of breaks that included activity or talking to see do females or males benefit more or at all from breaks in learning.

Another question arises when dealing with students of differing ages. Younger students are often seen as more immature and therefore have a much more difficult time sitting still for long periods of time. The study could expand to include younger students such as middle school or freshman high school students. The slightly decreased maturity and increase in activity level of these students could have interesting results as far as effectiveness of the breaks for students during lecture.

As always in the search for best practices it is necessary for educators to continue to expand their knowledge through professional development. The active engagement of the learners is important to the overall classroom environment so as, “Discoveries based in neuroscience about human behavior come out every week, and include breakthroughs with real impact on workplace management.” (Buch, 2010, p.42) it is important that school keep up on the research to offer our students the best chance to succeed in the 21<sup>st</sup> century environment.

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