IMPROVING STUDENT LITERACY THROUGH SCIENCE TEACHING TECHNIQUES:

THROUGH ANALYZING REAL-WORLD INFORMATIONAL TEXT

by

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TABLE OF CONTENTS

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

ABSTRACT

The purpose of this action research project was to determine the impact of scientific reading on student overall literacy levels. Given low literacy levels in middle school age students in Colstrip Montana, this project began to assess to what extent does the implementation of case study reading in a science classroom impact student literacy rate. This project included benchmark data from state testing to assess levels prior to and post treatment in the classroom. Eighth grade students were broken into two groups for this project, one was the treatment group, and the other was the non-treatment group. Over the course of the school year, treatment group students in the general 8th grade science classroom increased their reading assignments to include scientific journals, case studies and current scientific events. Following each scientific reading, students would complete a Likert scale to determine their understanding level and engagement for each reading. Students also completed guided journaling assignments that were used to understand the impact that the scientific readings had on their comprehension. Prior to treatment there was no statistically significant difference between the two groups of students. Post treatment STAR scores were taken to assess overall literacy growth. This led to the conclusion that students in the treatment group increased slightly in the subsection of informational text reading of the STAR test. Students in the non-treatment group did not have this increase.

CHAPTER ONE

INTRODUCTION & BACKGROUND

Introduction

I work with 40 eighth grade students in my general science class at Frank Brattin Middle School, in Colstrip Montana, and have been concerned with their reading and critical thinking abilities since I began my position five years ago. This concern has only grown as we have begun to see changing statistics in overall achievement in the middle school of the district. The problem that I focused on for my action research was the low overall literacy rates in Frank Brattin Middle School following the COVID pandemic. Colstrip school district is located 30 miles north of the Northern Cheyenne Reservation and within the Colstrip district 531 K-12 students are enrolled, with 131 of those students attending middle school which consists of grades 6-8. Of the students attending the Colstrip district, 53% are in a minority category, 39% of that being Native American. These students qualify as disadvantaged or underprivileged students (Public School Review, 2023). Because of my Native American students, I wove cultural components and approaches into my project narrative, however, I did not collect data on demographics.

While my study does not focus on the socioeconomic status of my students, I do feel it is important to mention that this could be another layer to my study or perhaps a future avenue of study. While I have access to the percentage of students in my school who qualify in the underprivileged category, I did not include this as a factor in my data collection because of the potential biases that may be associated with socioeconomic standings.

I have observed that students in the 6th-8th grade levels were not able to read informational text fluently and had a very difficult time inferring information from these readings. In my normal classroom I have been focusing on improving student literacy through science teaching techniques to help the students in this underprivileged and rural area of Montana. This observation led me to consider more ways to help improve this deficit in my science classroom.

Background

Prior to the COVID lockdown, 43% of students in the middle school were proficient in reading during the 2018 academic year (U.S. News & World Report, 2018), and this suggests that less than 50% of the students were able to read at their grade level. Since the COVID lockdown the literacy level is now at 37% of students in the middle school were proficient in reading in the 2022 academic year (U.S. News & World Report, 2022). While at first glance this is not a shockingly large drop, it is concerning that the literacy ability is so low at the middle school level.

Before I go any further, I must define what I mean by literacy in this study. I focused on the overall reading and writing ability of the students before, during, and after the treatment strategies that I developed for my AR project. I focused on finding techniques to boost students' ability to read and understand scientific writing as well as overall reading and writing. Literacy can be defined in many ways, the elements I focused on were the ability to communicate through reading and writing. Since science is so deeply steeped in writing, I find it incredibly important to find techniques that educators can easily use in the classroom that can help boost student literacy that they can use in many other areas. While science literacy (understanding major

scientific concepts) is a major component of science teaching, I focused more on the overall aspect of literacy by means of science teaching techniques. The teaching technique that I focused on was immersion in scientific readings, which will be discussed in detail further in my report. My work researched the impact of scientific readings and writings to increase student literacy. By doing so, it is my hope that students would be able to gain more insight and show greater success in other courses as well.

Focus Question

My focus question was, how can I improve student informational text literacy through science teaching techniques?

My sub-questions included the following:

1. To what extent can case studies help engage students in current scientific events?
2. To what extent can case study readings help improve students informational text reading ability?

The focus of my study was to understand the impact of engaging scientific reading on student overall literacy rates. That brings me to my research questions, starting with the broadest and then narrowing to the chosen technique. My first research question was based on what can I do in my classroom? Specifically, how can I improve overall literacy through science teaching? With this question being broad, I zoomed into some specific factors that I could control. This brought me to the idea of case studies which are short, real-world cases pertaining to a scientific idea, and scientific reading that led me to develop this question "to what extent can case studies help engage students in current scientific events?" In addition, I included an engagement component as I believe it is important that students are engaged in their readings, and believed

this helps them care about learning. My next question really focused on how I can help with the informational text deficit. Question three outlines to what extent can case studies help students improve their informational text reading abilities? These questions helped guide my framework and the overall goal for this research.

CHAPTER TWO

CONCEPTUAL FRAMEWORK

Literature Review

Since I began working on literacy within science, I found that previously completed studies were the best guidance for beginning my own research. In my investigation of supporting articles and studies, I found an article that discussed the challenge of improving science literacy with project-based learning or PBLs (DeWaters & Powers, 2006). The authors discussed how students at Clarkson University implemented a hands-on approach to math and science. In working with teachers in the area, students were immersed in standard based math practices that were applied to science. They also wrote in depth narratives of the processes that they were completing in the hands-on projects. This pertains to my research question and topic because of the focus on increasing literacy but not drifting away from how science is actually done. The findings of the article stated that they found that students who worked through this program were able to perform better in literacy-based testing than those who did not. I found the results to be very interesting as the goal is to help students to become more well versed in the literacy that surrounds science and every-day life.

Literacy and Science

When discussing literacy, I feel science is a great place for students to gain knowledge and practice their literacy skills with all sorts of topics. Literacy and science tend to go hand and hand in my mind as literacy includes multiple forms of communication skills (Hapgood &

Palincsar, 2007). These ideas helped solidify the importance of the intertwining ideas of science and literacy. The authors detailed various benefits of improving literacy through scientific instruction and reviewed many articles performing research on the topic. I found this helpful to review because it could support my ideas of using scientific journals and reading to help students improve their informational text reading abilities. Science is a discipline that can help students increase their abilities in English and Language Arts concepts, History, and Math. Because of the versatility of science, I believed that it would be the perfect place to help students with their literacy skills. While the authors of the article stated that most of the student writing done in science courses lies in the keeping of lab notebooks and is typically catered for the teacher, however it still can help boost the valuable summarization writing skills.

In understanding the difference between my approach to literacy and scientific literacy, I reviewed this Masters of Science in Science Education (MSSE) thesis written by Emily Martin Hall, which focused on understanding literacy in secondary science (Hall, 2021). The statement,

> As a secondary Earth Science teacher, I noticed that my ninth-grade students focused on learning content but were less proficient reading and summarizing scientific articles, assessing scientific sources, and apply what they learned in the classroom to the real world. I wanted to prioritize these three foundational parts of scientific literacy in my ninth-grade Earth Science Classroom. (Hall, 2021, p.11)

hit strongly with me. This is exactly what led me to my choice of literacy as my focus. Within their dissertation, Hall focuses on improving scientific literacy and suggested it applies in all areas of literacy.

Hall details how Maine, the state in which this study was completed, was one of the states that helped draft the Next Generation Science Standards (NGSS) that have been adopted in many places now, including Montana. Hall details how the reasoning for this research was to help

students understand the sources and scientific material that leads into all the factual concepts that we teach. The ability to pull key information from text is a section of literacy which is increasingly low among my students and can be crucially important for their brain development and understanding. Helping students learn to identify the key points, factual sentences, and possible misconceptions acts as a key component of literacy and critical thinking which will serve the students for their entire lives.

Cultural Background

Cultural roots are an important factor for me to consider with my students and I found it important to include a source that discussed the importance of the Indigenous Science Knowledge (ISK) model. In this article, from Science Education (Bang & Madin, 2010) the authors, investigated how a cultural process through science education can reach many students from Native American tribes. This paper focused on tribes within Wisconsin but can easily be applied in many other areas (Bang, & Medin, 2010). This article begins by discussing the underrepresentation of Indigenous people in the world of Science Technology Engineering and Math (STEM) and how a cultural approach with increased rigor may drive involvement. This article stated that the purpose of the study was to involve the community and help increase Indigenous student involvement in STEM. The construction of their research project was to engage teachers and community members to develop integrated classroom content and pedagogy regarding science education.

Bang and Medin, (2010) used an approach that assumed Native science is not "folk wisdom" but can be used to adapt science curricula with the culture of the historic tribes. The ISK model is a way of looking at science through a more holistic and creative lens. This ties well

to literacy because of the importance of being able to think critically to understand readings and find the connections to what is being said. The authors stated the importance of the connection to place and history when students are being introduced to scientific topics to help boost the engagement factor and allow the connection to be made.

When working with literacy levels with science teaching I looked to previous studies that have been done on the topic. In 2010, two researchers at the University of Florida compared inquiry-based science teaching techniques to inquiry-based science teaching with readings attached to the lessons (Fang & Wei, 2010). In this study the researchers implemented two models into the middle school that worked with 6th grade students. The inquiry-based reading model had active reading strategies outlined in the model, such as concept mapping and questioning. They collaborated with two teachers, one had an ample amount of experience with the textbook and the other was a first-year teacher that was inquiry driven. Throughout the study, the teachers engaged in six lessons that focused on the model they were given. For this study, they utilized 140 consistent students between the two teachers and 93 students that were used as a comparison group that utilized just the inquiry-based model. Of the 140 students that completed the inquiry-based model plus reading, the results showed a mean on science literacy of 66% with the mean for the inquiry-based model only being 57%.

The authors summarized their conclusions with, "we found that the ISR students significantly outperformed their peers in the fundamental sense of science literacy" (Fang & Wei, 2010, p.270). These conclusions suggested that student literacy is increased by implementing the readings with the inquiry-based model, and I think this is incredibly important. This research helped solidify my goals with my students and how literacy level plays such a major role in the

student success in science classes. In this study the authors focused on overall literacy as well as scientific literacy which I believe is a great way to intertwine concepts together.

CHAPTER THREE

METHODOLOGY

My methods within this study had specific phases to help me work through the information that my students needed to successfully complete the treatment. Phase one began when students completed the Standardized Test for the Assessment of Reading (STAR) test for assessing reading and language arts. Once the testing was complete, I gathered their scores and began to compile the benchmark data. These benchmark data were split into two random groups, treatment, and non-treatment groups. I split all 40 8th grade students randomly in half, with 20 in each group. This helped me visualize the level of my students prior to phase two. Phase two began at the beginning of my second quarter, October 27th, 2023. Phase two included the implementation of scientific readings, including case studies, scientific research, and current events in science. Once my treatment group of students read the information, they answered a Likert scale survey (Appendix A) about their feelings in reaction to the specific reading. Phase three included added reflective journaling after an assigned reading. This added a layer to the responses received after a reading, with each journaling day starting with guiding questions (Appendix B). Phase four included data analysis and finalizing the results. The final phase four took place throughout the month of May, as it was concluded post student academic school year end-date.

Treatment

The implementation of the treatment took place in the second and third quarters of the school year to allow time for previous testing and for students to get comfortable in the classroom. Over the course of several months, I compiled scientific journals and readings (case studies) that were useful for this study and met the following criteria:

- The reading is no more than 2 pages in length.
- The reading is written at grade level-no higher than eighth grade level.
- The reading contains key scientific terms woven into the narrative.

By establishing these criteria, I was able to find readings that were attainable for the students so that they could complete them. Since eighth grade science is a general science class, the treatment readings applied to all concepts in the science course. These concepts included, but were not limited to, understanding genetics, physics, natural selection, geologic timescale, and space. These topics lent themselves well to the treatment readings of scientific excerpts of journals and reading comprehension ideas.

To ensure that each student has the same opportunity, all the readings were printed and conducted within class time. Any written responses or guided journal entries that were done for a given reading were completed in class. This section of my AR treatment was put into place to ensure that all students were given the same opportunity and time to complete this treatment as they may not all have the same opportunities in their homes.

I thought and reflected extensively about the impact my research might have on my students and have included some of my thoughts here, for example, how can I improve overall literacy through science teaching? To answer this question, I used my class of 8th grade students

that is comprised of 20 students out of the 40 8th grade students at Frank Brattin Middle School, who were assigned to my treatment implementation. This treatment group completed guided case studies, scientific journal entries, and research papers included within their normal curriculum, and I conducted a Likert scale survey and composed a guided journaling entry after each activity. The case studies were implemented during two units of science (physics and genetics/evolution) during the second and third quarters (Oct 27th-Mar 18th) of the school year. The non-treatment group (remaining 20 students) completed case studies in quarter four once the research was complete as I compared my treatment group to both themselves (pre and post treatment) and the non-treatment group. While I only assessed the treatment techniques with one group of students, I did want to include that all my students were exposed to the treatment in quarter four as I felt it was beneficial to all students.

My AR design included these two different groups of students, so the non-treatment group is a comparison group. By using current events case studies, scientific journal excerpts, and research papers my hope was to engage students in real world happenings. To help students be engaged and lessen frustrations, I implemented some reading techniques as well. One that I started with was for a small group reading, where the students took turns reading out loud to each other in a group of four. Another strategy that I used was group highlighting, in a group of four the students read through the passage and highlighted key terms or phrases as a group. Both strategies were suggested by the English and Language Arts teacher and the special education teacher to help boost engagement and meet the students at their level in the beginning stages of this study. I slowly pulled these strategies away as the students began to gain more confidence.

Table 1. Proposed timeline of project

Date	**Portion of project ongoing**	**Portion of project done**
Oct 27th	Case study implementation begins	Introduction, purpose, and plan written.
Week of Oct 30-Nov 3	Pre-Treatment STAR scores analysis of both groups	Pre-treatment STAR scores entered into spreadsheet
Nov 3rd -Nov 22nd	Case study implementation, reflective journals completed	Reflective journals reviewed
Dec 1st -Feb 23rd	Implementation continues	Data was gathered
Feb 26th -Mar 7th	Post treatment STAR Score analysis of both groups	Post treatment STAR scores entered spreadsheet

Data Collection and Analysis Strategies

To collect data, I created the following matrix, table 2. Each point was used to assess how the students were responding to the treatment and cross-curricular ideas.

Table, 2. Data collection matrix

Research questions	**Data collection points**		
How can I improve overall literacy through science teaching?	Benchmark STAR reading test	Grades on student discussion participation and completion	Grades on student lab summaries
To what extent can case studies help engage students in current scientific events?	Student survey responses	Student connection assignments	Student understanding surveys
To what extent can case studies help students improve their informational text reading abilities?	Student reflective journals	Cross-curricular journal entries with History	Benchmark STAR reading test

To discuss the question "to what extent can case studies engage students in current scientific events?" I used student surveys (Appendix A). These surveys were Likert surveys to assess how the student felt about the use of case studies or scientific journals and if they were actively engaged or not. I decided to use a Likert scale survey and not an open-ended survey because I believe my students can be intimidated by those kinds of questions. With a Likert scale I was able to assess how the case study was received and what they felt they were gaining from it.

To address the question of to "what extent can case studies/scientific readings help students improve their informational text reading ability?" I decided to use guided journaling (Appendix B) and STAR benchmark. I chose guided journaling to help understand the extent that students were able to understand key phrases and pull important information from the text. The STAR testing benchmark was used pre-treatment and post-treatment to see if there was a reflected increase in reading level. To ensure the reliability of my data, I relied on the outlines of treatment to keep things consistent with each case study to maintain consistent expectations of case study days for my students. To ensure my techniques were reliable, I utilized both peer and professor feedback as I began my data collection. To increase the validity of my data, I used approved techniques such as Likert scales and referred to the literature for comparisons. In accordance with the policies of Montana State University, an IRB was completed and approved, full details attached in appendix C.

I also included the demographics of the treatment group as an anecdotal factor though I did not investigate the correlations between score and demographic. I thought that demographics might be a valuable feature of this project for the future because the demographics of the

students would likely impact their attitudes towards academics. I also included special education students in my sample because I teach diverse set of students and it is important to note that some of my students had an individualized education plan (IEP) to help them be successful in regular education classes.

Table 3: Demographic of Treatment group, (*n*=20).

Class	Total Students	Boys	Girls	Low income Fam.	Special Education
2nd period	11	6	5	6	1
5th period	9	3	6	4	2

CHAPTER FOUR

DATA ANALYSIS

Results

Phase One-Pre-Treatment STAR Scores of Both Groups

At the beginning of my treatment, the only data I had was the STAR testing scores that I used as my benchmark. I started by compiling my STAR testing data into two groups, Pre-treatment group and non-treatment group. The treatment group was 8th grade students, so I compiled just 8th grade scores seen in the chart below. Figure 1 shows you the fall 2023 scores of the 20 students who were a part of the treatment group.

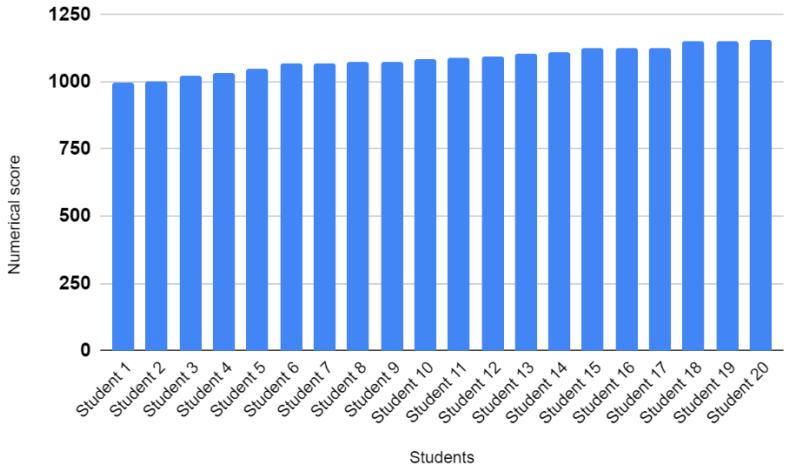


Figure. 1. STAR score of treatment group, pre-treatment, (n=20).

According to the Renaissance website for understanding STAR scores, 8th graders should be scoring between 1098 and 1165 to be considered on level with the grade. Of the 20 students that were compiled here, 12 scored below the 1098 score (Fig.1).

To assess my treatment's success, I compared the treatment group to themselves prior to the invoked treatment and to the non-treatment group, which included the remaining 20 8th grade students. To examine the performance of the non-treatment group, I assessed their STAR scores at the beginning of my research (Fig, 2).

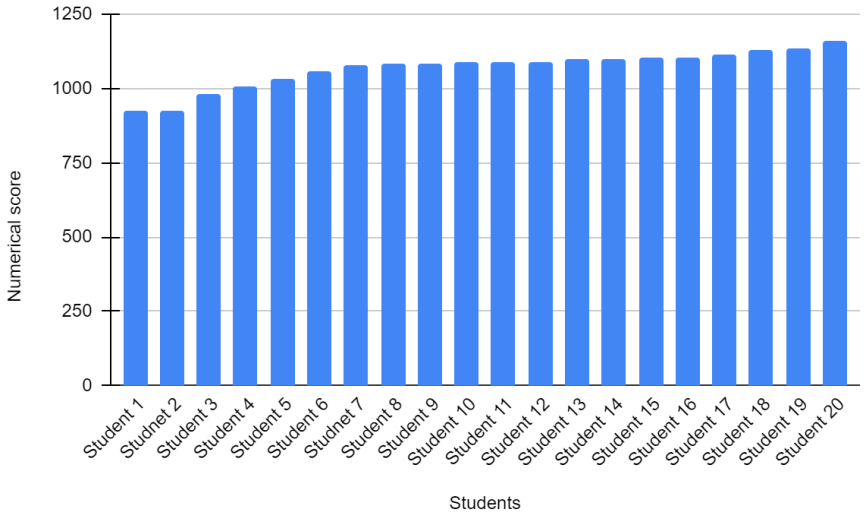


Figure. 2. STAR scores of non-treatment group, *(n=20).*

While there were individuals that scored within the grade level score range, there were also many in both groups that were well below that range. In the non-treatment group of 20 students, there were 12 students that scored below the benchmark of 1098. By comparing these two groups, I could see that both groups were evenly distributed and should show some consistent results. This was shocking to me as I randomly split the grade in half.

To understand the results of the benchmark data, I decided to look at the percentages within both groups and the overall 8th grade across my school. In the treatment group, 60% of the students scored below the STAR benchmark of 1098. In the non-treatment group, 60% of students scored below the STAR benchmark of 1098. Of the 8th grade students in my school that

I work with, 60% of the students scored below the benchmark score of 1098 (figure, 3). Again, by looking at these percentages, it is important to note that more than 50% of the students were at a lower literacy level than wanted. This showed the importance of my study and solidified my choice to select lower literacy level case studies at the beginning of my treatment.

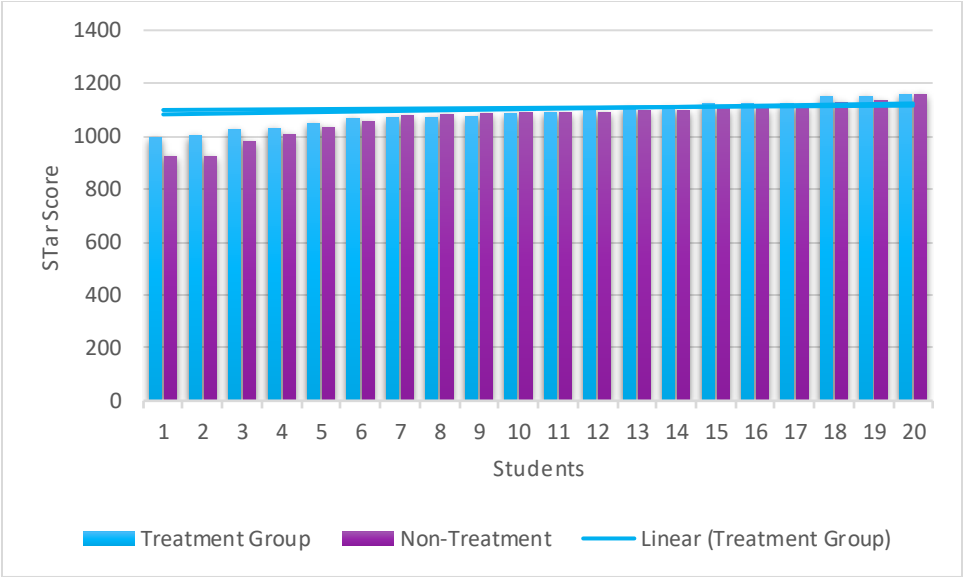
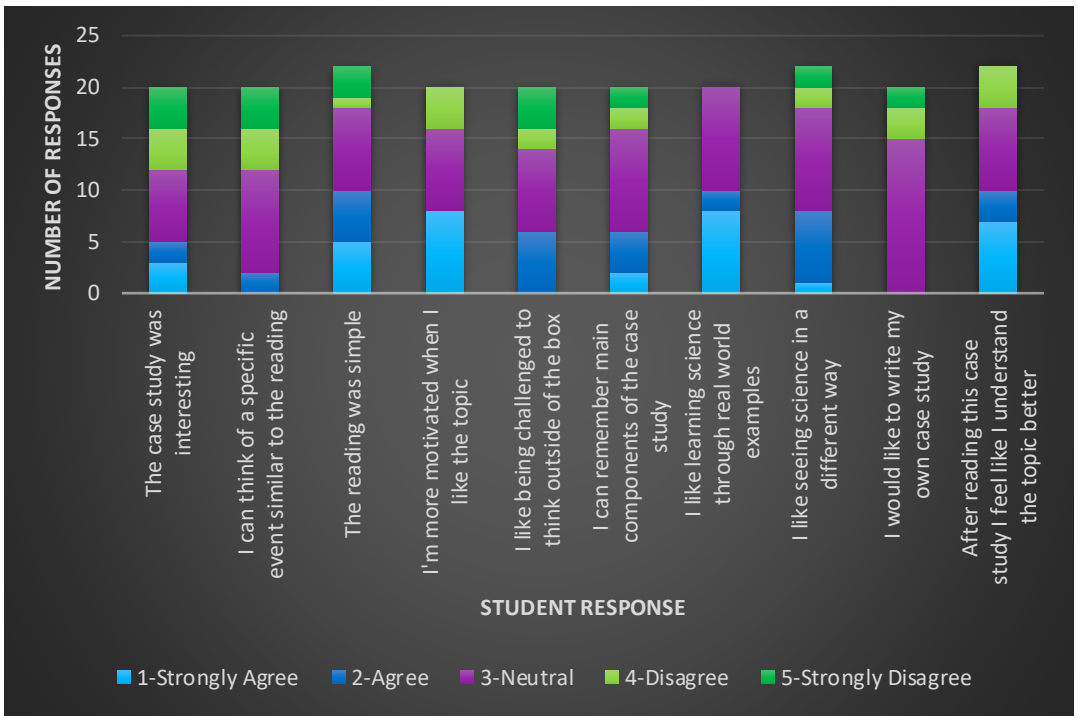


Figure 3. STAR scores, treatment and non-Treatment groups pre-treatment, (N=40).

Following a two-tailed nonpaired t test, I found that the two groups were not statistically significantly different. This was consistent with my original idea of splitting the 8th students into two random but equal groups. Data between the treatment and non-treatment groups for the pre-treatment STAR test was compared using an independent sample 2-tailed t-test. There was no significant difference between the non-treatment and treatment group pre-test scores ($p>0.05$). The p-value resulting from the t-test was 0.38904 which is significantly more than the predicted value of 0.05, thus allowing me to conclude that there is no statistically significant difference between the treatment group and the non-treatment group prior to treatment implementation.

Phase Two-Likert Survey Results

Phase two began in late November with the physics section of the year. The treatment group responded to a case study titled "Grandpa's Flying Hammer-Rotation around the center of Mass." This case study described motion with mass and fit into the curriculum of force and motion for the students. Once the case study lesson was completed with the techniques stated previously, each student responded in the Likert survey (figure, 4).

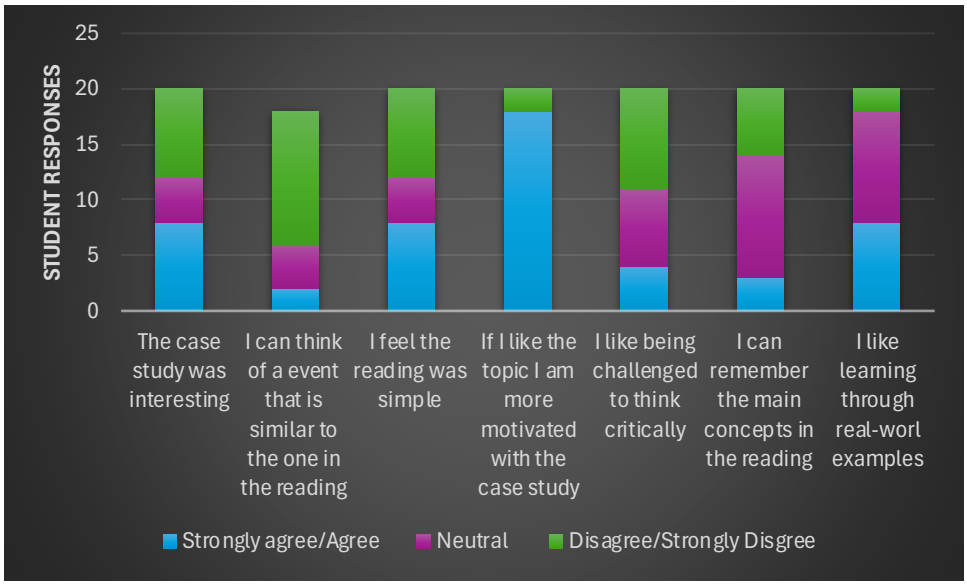


Figure, 4. Student responses to Likert survey #1 (*n=20).*

The results of this Likert survey (Fig. 4) showed that I may need to take the neutral option away as most students ended up selecting the neutral option for all the questions. I think that the students did not want to commit to an opinion.

To assess the sub question "To what extent can case studies help engage students in current scientific events?" I used specific case studies that were based on current events. The first was called Fish out of (Salt) Water. This one dealt with a Steelhead trout introduction in

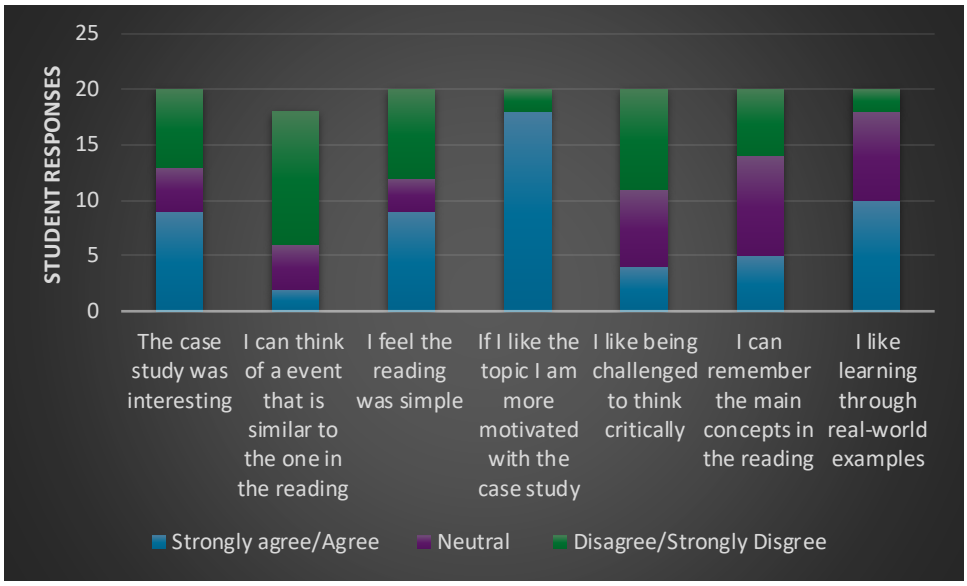
Washington and the genetic population shift that occurred. Post reading students completed a Likert scale survey to gage their interest in the current event side of the reading.



Figure, 5. Student responses. Likert scale #2 (*n=20).*

Following my first Likert scale survey, I decided to do two things, the first was to cut down the questions I asked the students as I found that they were overwhelmed by the number of questions on the survey and circled more neutrally to get it done quickly. The second thing I changed was I combined the "agree and strongly agree" and the "disagree and strongly agree" responses as it shows the same idea. I found the results much easier to understand by cutting this down. In figure 5, it that students increased their ability to form an opinion and less chose the neutral option.

Following the next case study reading the results on the Likert scales began to change. In figure 6, it is shown that there was a decrease in the number of student responses that chose the neutral option.



Figure, 6. Student responses. Likert scale #3 *(n*=20).

Phase Three-Guided Journal Responses

Phase three of my data collection and analysis began in February 2024 with the introduction of guided journal responses in addition to the Likert scales post reading assignment (Appendix B). Students were asked five summary questions that pertained to the reading assignment that was just completed. One of the questions that had the best results in terms of accuracy, was "How would you explain the case study to a peer? Explain thoroughly.". This question allowed students to think about how they could explain the main concepts that they read to a peer to help their peer understand the assignment. Many of the students included statements such as, "The main idea of the assignment was to understand trout genetics." "This should gene shift of trout populations." "The case study said that trying to identify what kind of animal a fossil was like solving a crime." "Fossils show bits of what happened in the past and you have to fill in the blanks." The student statements above pertained to two different case studies that were read between March and April 2024.

Phase Four-Post Treatment

The final phase of data showed the increase in over-all student STAR scores. Post treatment STAR scores showed an increase in student scores though 55% of the students were still below desired literacy levels. This is a decrease from the previous 60% that were below literacy levels at the beginning of this project. Figure 7 showcases the change in scores for the treatment group Pre treatment vs Post treatment. I completed a one-tailed paired t-test to analyze the impact my treatment had on the treatment group. Through the guided case studies and readings, the treatment significantly led to an increase in student scores ($t=-4.778$, $df=19$, $p<0.0001$).

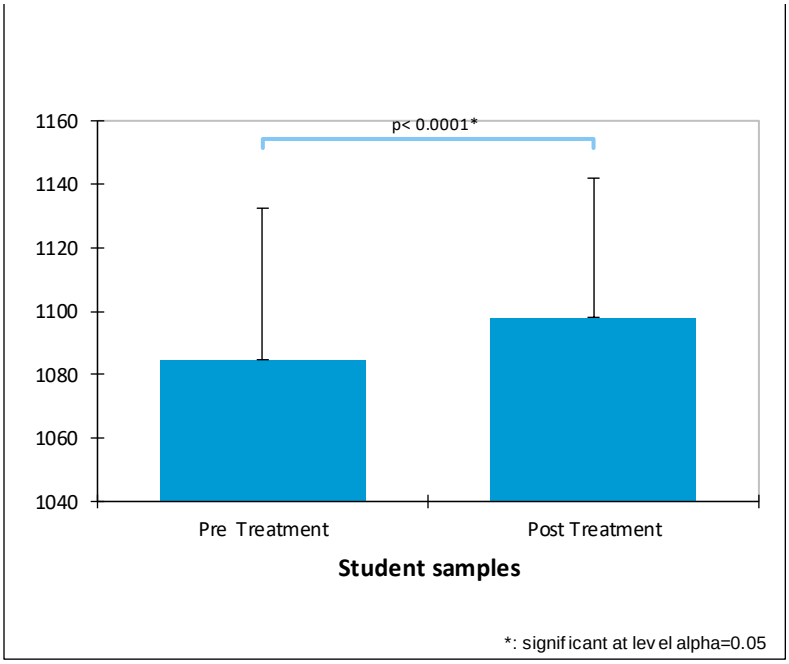


Figure 7. Means & standard deviation preT vs PostT of Treatment group (n=20).

By comparison, a paired, one-tailed t test was completed for the non-treatment group pre vs post treatment timeline. The non treatment scores post study did not significantly increase ($t=-0.933$, $df= 19$, $p=0.181$).

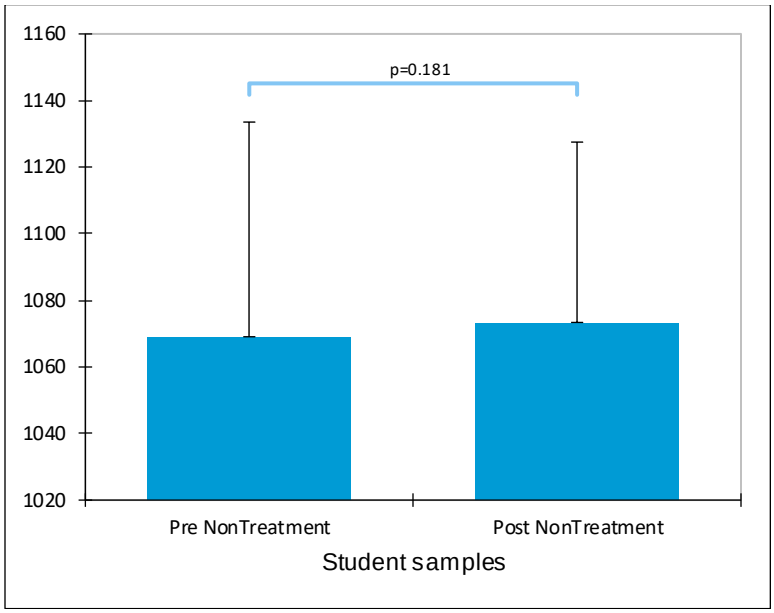
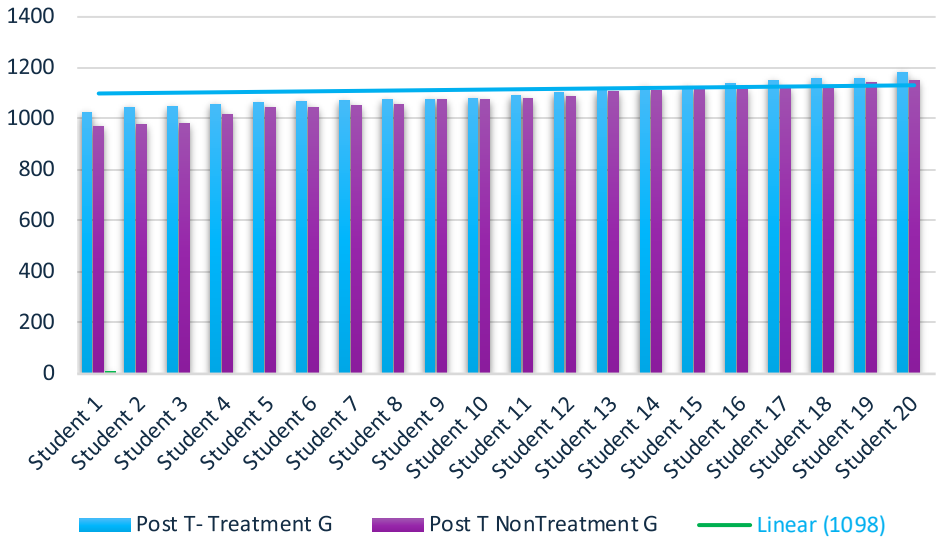


Figure 8. Means & standard deviation preT vs PostT of nontreatment group (*n*=20)

To assess treatment versus non-treatment group literacy level growth, the percentages of students that achieved an on-level score decreased in the treatment group by 5% but stayed constant in the non-treatment group at 60% of students below the desired literacy level.

Data between the treatment and non-treatment groups for the post-treatment STAR test was compared using one-tailed but nonpaired t test. There was no significant difference between the non-treatment and treatment group post-test scores (Fig. 9), (t=-1.584, df=38, p-value=0.061,).



Figure, 9. Student post-treatment STAR scores, (*N*=40).

CHAPTER FIVE

CLAIM EVIDENCE AND REASONING

Claims From the Study

One claim that I made following the implementation of this project is that the treatment group had a statistically significant increase in their literacy abilities from pre to post treatment. This showed that my approach significantly increased my student's literacy levels. This increase supports the approach of guided practice reading with student interest, as a valuable tool to help increase student literacy levels in all areas. The claim that I made with this study is that student's informational text literacy ability increased as students are guided through more practice readings. I predicted that the students in the treatment group would perform better on the post STAR test and were able to describe the readings in more detail. My result from this project shows that my prediction was correct. Beginning with the Likert data, I began to think of how that information could be used to shape my study. The biggest impact was to ensure that the case studies at the beginning of my treatment cycle were at a level and that they were conducive to all my students. To ensure that all students were getting as much out of a case study as possible, the first four case studies were written for reading level 6^{th}- 7^{th} grade. By starting with lower grade level reading, I predicted my students would not get frustrated with the reading and give it the effort it deserves. My results supported this prediction.

As a result of my approach of guiding students through practice scientific readings, case studies, and real-world events, my treatment students had amazing growth throughout this study. With the guided journaling responses, I concluded that the students were on the right track to the main components of the readings. Guided journaling was used specifically to allow me to gain understanding into how well the students were picking up on the key components of the reading.

To address the sub question identifying student engagement as a factor, it is noted that student engagement and interest were low throughout the project. During this project, my colleagues have been a great support to me and have been curious to see the results. I think this will be a great opportunity to help us begin to teach more collaboratively if I can find that what I am implementing is helping in all areas of the students' school career.

As is shown in the results from pre and post STAR benchmark data, with the original of 60% of students were below the benchmark, the change showed 55% of students below the benchmark. From these results it can be seen, by the increases and decreases in both the treatment and non-treatment groups, that the results were not based solely on natural progression. I can conclude that the methods implemented in the treatment group allowed these students to showcase their growth in literacy level was due to the fact that they received more guided practice in informational reading. The method used in the treatment statistically significantly increased the number of students that experienced growth during this time period. Even though when looking at the number of students that increased versus decreased in their STAR scores between the two groups, you can see that my methods did significantly impact the student's overall literacy.

Value of the Study and Future Research

The value of the study can be concluded from the results. Given that the students in the treatment group showed a significant increase post treatment, it can be concluded that this study was valuable for increasing student literacy. There are many future avenues that could be taken to further this research, with one of those being to include demographic factors in the analysis. I would like to further these ideas by investigating the relationship between demographic status and literacy level in the middle school. Since this is a rural school, I think demographics would be a valuable layer to further this research. The next question I would ask is to what extent can Indigenous Science Knowledge help engage students and boost literacy? By implementing the avenue of ISK, I believe that this would increase the student engagement section that was lower than anticipated in this study. I think this would be an interesting narrative to investigate in the future.

Impact of Action Research on the Author

The main impact of this research for me was that I obtained a better, data-based understanding of how my students were understanding informational text readings and developed techniques to help boost this ability. When I began this Action Research, I was unsure of how it would impact me and my teaching style. As I worked through the implementation, I found that I identified techniques that seem to help boost student ability. With the continuation of cross-curricular ideas, I predicted that students will be able to increase their informational text literacy level and begin to apply it elsewhere.

Another major impact from this study showed that all of the students included were capable of growth and what they needed was more practice and a method to actively do so. By having my students think about every reading that they did, I believe this reflection is what helped students increase their ability. In the future, I will be using this method with all students in my future classes. As this technique proved to be successful, I will continue to utilize this throughout my teaching career. Finally, this project has impacted my confidence in how I teach. Prior to this study, I was using case studies and guided journal in my classroom, and this study helped solidify my choice to use real world readings as a reinforcement piece of science education.

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APPENDICES

APPENDIX A

LIKERT SCALE POST READING

1 = strongly agree 2 = agree 3= neutral 4= disagree 5= strongly disagree

1. The case study was interesting and related to our topic.

   1 2 3 4 5

2. I can think of a specific event that is similar to the event in the case study.

   1 2 3 4 5

3. I feel the reading was simple and understandable.

   1 2 3 4 5

4. If I like the topic, I am more motivated to be thorough with the case study.

   1 2 3 4 5

5. I like being challenged to think outside of the box.

   1 2 3 4 5

6. I can remember main components of the case study.

   1 2 3 4 5

7. I like learning science through real-world examples.

   1 2 3 4 5

8. My science teacher cares about my progress as a student.

   1 2 3 4 5

9. I felt that the reading was difficult.

   1 2 3 4 5

10. I liked seeing science in a different way.

    1 2 3 4 5

11. This case study showed the importance of critical thinking.

    1 2 3 4 5

12. I am more interested in science when I am learning about local topics.

    1 2 3 4 5

13. I would like to investigate a topic that is local and write my own case study.

    1 2 3 4 5

14. After reading this case study I feel like I understand our topic more.

    1 2 3 4 5

APPENDIX B

GUIDED JOURNALING

1: In your own words summarize the objective of the case study in no less than 4 sentences.

2: How would you explain the case study to a peer? Explain thoroughly.

3: Relate the case study that you just read to a real-world event that you know of.

4: Explain how the case study relates to the topic we are investigating.

5: Explain how you think the case study could be applied to our local environment or if it cannot be.

APPENDIX C

IRB

Protocol Information

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Protocol Type:
Principal Investigator:
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Original
Olmstead, Aislee **Approval Date:** 12/13/2023
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Author: Olmstead, Aislee

Protocol Information

Version # 1

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Protocol Number:	2023-1057-EXEMPT		
Protocol Title:	Increasing Student Literacy through Science Teaching Techniques		
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