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## The Effects of the Gradual Release of Responsibility Framework on Student Metacognition During Collaborative Work Time

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The Effects of the Gradual Release of Responsibility Framework on Student Metacognition  
during Collaborative Work Time

Kyle Skillings

A Capstone Project submitted in partial fulfillment of the  
requirements for the Master of Science Degree in Education at  
Winona State University

Spring 2021

Winona State University  
College of Education  
Rochester Education Department

CERTIFICATE OF APPROVAL

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CAPSTONE PROJECT

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The Effects of the Gradual Release of Responsibility Framework on Student Metacognition  
during Collaborative Work Time

This is to certify that the Capstone Project of  
Kyle Skillings

Has been approved by the faculty advisor and REDG 618 – Action Research: Capstone Project  
Course Instructor in partial fulfillment of the requirements for the  
Master of Science Degree in Education

Capstone Project Supervisor:



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### **Abstract**

Teachers are considering different models of instruction for student metacognition during work times. The questioning of student metacognition is a part of teaching, and it is something that can be recognized by making changes to allow students to recognize this. Finding more of an insight on how students think about thinking is the driving force to this research. This study was completed in a Southeastern Minnesota fifth grade classroom. For this study, the observer will implement a gradual release of responsibility framework during collaborative work time to determine the effects on participant metacognition. With metacognition as the focus, the observer examines participant engagement, productivity, and characteristics of interactions as defining factors for the study. Findings suggest that the framework does impact metacognition for individual students based on the factors of the research.

### **Keywords**

Student Metacognition, conceptual framework, collaborative work time, collaborative inquiry, social constructivism, collaborative learning, social inquiry, interdependency, GRR, gradual release of responsibility, Lev Vygotsky, Zone of Proximal Development, collaborative strategies, social metacognition, metacognitive strategies

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## **The Effects of the Gradual Release of Responsibility Framework on Student Metacognition during Collaborative Work Time**

### **Background of the Study**

Student metacognition is a learning construct that teachers often plan for and consider during lesson implementation. Metcalfe & Shimamura (1994) explain that metacognition is measuring whether students understand what they are supposed to be working on, as well as what they are learning. Le (2016) discusses the challenges of perspective and productivity in co-constructive work environments. These challenges bring forward instances that suggest students are not engaged in the instructive material. Gu, Chen, Zhu, & Lin (2015) suggest that these challenges can be met and altered with the use of social metacognitive strategies during collaborative academia. The driving question for this research surrounds metacognition. Do participants know what they are instructed to do at all times? How can this be determined during collaborative work time? To reflect these questions, the use of newer conceptual frameworks explains student contemporary learning experiences with an interdependent approach (Traver & Matera, 2021).

Implementing a conceptual framework for the process of instruction provides students with the necessary tools, guidelines, and expectations for their academic work. According to Qureshi, M., Khaskheli, Qureshi, J., Raza, & Yousef (2021), students who learn through collaboration build powerful concepts and ideas in group discussions and their interaction with peers or instructors. Traver & Matera (2021) suggest that a (re)Visioned Interdependency Model of the Gradual Release of Responsibility allows students to take responsibility in their learning through interdependent academic work as a vital component to instruction. Considering the development of goals, problem analysis, reciprocal inquiry, generating problem solving, and

interdependency, teachers are allowed to plan and structure lessons with student metacognition in mind (Traver & Matera, 2021). Kaendler, Wiedmann, Rummel, & Spada (2015) state that teachers play a beneficial role in student interactions. With this in consideration, teachers must take time to implement collaborative learning in daily instruction for students to remain engaged, productive with the assigned task, and have the nature of student conversations remain pertinent to academic work. Metcalfe & Shimamura (1994) suggest that productivity should measure whether students are working on the assigned task through various collaborative strategies or through academic work. According to Kapur and Bialaczyc (2012), a challenge with productivity is that it is not something that can be determined during instructional work but rather through assessment tools presented to the students. This can be provided through the consideration of productive struggle in work time. Student conversations also suggest what they are working on. Teachers listen to student conversations during collaborative interactions to gauge the nature of conversations. The nature of conversations explains whether the social aspect of interdependent work is pertinent to the work assigned or if the conversations are off task and off focus. Amato-Zech, Hoff, and Doepke (2015) defines engagement as students self- assessing themselves. Students do this by asking themselves the simple question “Am I paying attention?” (p. 211). Students present their interests and engagement in various ways. Lastly, with a conceptual framework considered for implementation, finding various translations of collaborative work time through other teachers allows the researcher to determine what is effective in their educational setting in comparison to others.

**Purpose of the Study**

The purpose of this study is to determine student metacognition during collaborative work time through the implementation of the (re)Visioned Interdependency Model of the Gradual Release of Responsibility. This can be measured by analyzing and observing student engagement, productivity, and interactions during the intervening work time. Through this intervention, the researcher would be able to answer the following questions: How does a structured collaborative work time affect the level and nature of student interactions? How does the implementation of a theoretical framework for collaborative work time affect student engagement? How does the implementation of a theoretical framework for collaborative work time affect student productivity? How does the implementation of a theoretical framework for collaborative work time affect the role of the educator? With these questions in mind, the conceptual framework will be used as an intervening tool to collect necessary data to suggest a solution to these answers.

**Significance of the Study**

The significance of this study expands on any previous research on student metacognition during collaborative work time. Adding the instructional framework could suggest whether an intervening approach could allow for a more efficient collaborative work time in addition to students understanding what they should be doing at all times. With this approach and efficiency, it may allow students to have a higher sense of metacognition in this interactive educational setting.

**Definition of Terms**

Within this action research, usage of specific words or phrases should be clearly defined in order for the thinking of the researcher to be transparent, as well as having the words to be

considered in the proper context for readers. One phrase to focus on is, as shown in research question 1 within the triangulation matrix, the nature of student conversations. When considering the nature of conversations, consider details of participant interactions. Are participants being kind to one another, or are they showing disrespect? Considering the nature of conversations allows the researcher to determine participant emotions in interaction with the intervening activity. The next term clarified is student engagement. In this research, student engagement considers the participant and their level of interest in the intervening activities. Another term clarified for the research is productivity. Productivity is defined as the work a participant is doing relative to the intervening activity and assignment. If a participant chooses to talk to someone else on a topic that is unrelated to intervening activities, then they will be considered unproductive. Another term to define is collaborative work or collaborative work time. When this term is stated in action research it surrounds participants interacting with one another. With collaborative work, participants are working and interacting with at least one person or a group of people. The last term to define is metacognition within the action research. Metacognition, as defined in broad terminology, is determining whether a student understands tasks, content, or instructions in relation to collaborative work time.

### **Limitations of the Study**

This research is taking place during the COVID-19 pandemic which is affecting daily instruction within the classroom of this study. Student- participants involved in this study may have been required to be in a quarantine setting during instructional intervention. In addition, during the process of instructional intervention, student- participants were completing standardized testing. Student- participants participated in this testing for an hour each

instructional day for three weeks. This may have affected students' attitude, emotions, as well as their approaches to learning.

### **Summary**

This action research surrounds around the idea of thinking about the process of thinking, or metacognition. Applying a gradual release of responsibility framework will be implemented in daily instruction to determine its affect on metacognition during collaborative work time. This helps address the problem of a disengaged, unproductive, and unclear learning environment during collaborative work times. Finding various ways to allow participants to address the problems could bolsters an improved level of metacognition.

## **Review of Literature**

### **Theoretical Grounding**

#### ***Social Constructivism***

This research focuses on the social development of the classroom through Lev Vygotsky's theory named Zones of Proximal Development. Zones of Proximal Development focuses on how students rely on a teacher or a peer to learn and develop new ideas (Watson 2001). Obikwelu & Read (2012) explain that Zones of Proximal Development fits into the larger idea of Social Constructivism in education. This social approach considers students to drive their learning by working in groups or with one another to learn, apply, and master instructional concepts. "An individualized representation of knowledge: each person builds on his own individual experiences" (Obikwelu & Read, 2012, p. 33). With this idea, every person has their own internal thought process that is internalized. Information that we receive is being translated based on personal life experiences, thought processes, as well as current understandings.

Razfar (2003) states that human development also needs to be strongly considered during collaborative work time. Obikwelu & Read (2012) mention this through the application of applying games to social inquiry as well as developing thought processes into academic experiences. Allowing students to learn from one another by creating academic experiences allows them to expand on information and skills they have not been exposed to or understand. This process allows students to connect to personal experiences of skills they already understand and apply within their own academia.

Social Constructivism also considers cultural aspects to education. Learning from different lenses allows students to understand differing perspectives as well as content. Smagorinsky (2007) explains that cultural differences are expressed through thinking and

speaking. Approaching work times in diverse cultural settings with a social constructivist approach, as well as considering Zones for Proximal Development, allows for students to experience perspectives outside of their own. This approach can aid teachers to establish a more equitable learning environment if cultural, ethnic, academic, and social perspectives are recognized in the respective educational setting.

### ***Enhancing Social Metacognition with collaborative inquiry***

The essence of this research is to identify, establish, and recognize the changes in student metacognition with instructional interventions. This intervention delves into the processes of student schema as well as the schema or thought process of students during collaborative work time. A common factor for the changes in metacognition could be recognized as collaborative inquiry.

Le (2018) determined that based on theoretical analysis, the most common obstacles were presented in the form of lack of collaborative skills, free-riding, competence status, and friendship. The issue presented in this article determines that previous studies were only measured based on singular actors in the presence of collaborative learning rather than identifying the roles and duties of the student and teacher within collaborative work time. Le (2018) explains in the results of their study that students are less likely to project social collaborative skills when their assessment on collaborative work is centered around setting an academic goal in collaboration as well as general cognitive processes. These results implied that these antecedents negatively impacted student's collaborative skills and assessment.

According to Gu et. al (2015), "collaboration in the classroom is usually carried out by seating students in groups, having them discuss given topics, or assigning them joint or shared tasks. However, research indicates that grouping students to work together does not

automatically create collaboration” (p. 144). This resulted in the emergence of teacher pedagogy which suggested a change in social metacognition. Gu et. al (2015) determined that students utilize previous experiences in problem solving to process and determine newer and more complex problems. In addition to the process of problem solving, teacher support is something that should also be considered during interventions of social metacognition. Allowing students to review past experiences in utilizing problem solving skills and developing explicit and achievable instructional goals suggested positive outcomes for metacognition.

### ***International approaches to collaborative work time***

Cáceres, Nussbaum, Marroquin, Gleisner, & Marquinez (2017) state, “The world’s leading education systems are asking how they can maintain their good results, while developing countries are looking to catch up with them” (p.355). Recognizing international practices in this action research allows for a variety in interventions to determine student metacognition. Le (2016) states that knowing the setting as well as the student determines the educational climate and can also determine student productivity and motivation in academic activities.

Gu et. al (2015) mentioned the emergence of collaborative practices on an international scale. As a whole nation, China has shown that collaborative practices and social inquiry are growing and more commonly implemented in various educational settings. “Collaborative problem solving, which is an important element of collaborative and inquiry-based learning, has become increasingly popular in learning sciences around the world. Its widely accepted principle is that students should develop the ability to construct understanding by collaborating with others so that they will better understand one another, and that they will build new knowledge through the process of problem solving.” (Gu et. al, 2015, p. 144) Being able to compare personal

experiences to the perspectives of teachers around the world allows researchers to discover the differences in educational settings as well as similarities.

Le (2016) talks about the challenges and antecedents of establishing effective collaborative practices in the classroom. These antecedents could be resulted from the nature of the activities or factors of the educational setting that have already been determined. These antecedents talked specifically about free riding and student lack of engagement due to distractions. The setting of the intervention takes place at a University in Vietnam. Gu et. al (2015) state that cultural traits as well as pedagogical methods and approaches could weigh on the results of the intervention for student metacognition. For this action research, being able to identify the setting and cultures would allow a potential and reasonable comparison of these factors.

Song (2018) explains how the development of 21st century thinking skills revolves around problem solving and critical thinking in a digital age for a science curriculum in Hong Kong. Moving into a newer time where technology and various multimedia presentations are involved in the learning process can determine how students perceive academics.

### ***Collaborative inquiry and engagement***

An aspect of collaborative inquiry puts students at the forefront of their own learning. Being able to plan and formulate different thought processes to approach a problem or research allows them to become more experienced in problem solving and also motivates them to become immersed in academic content with less support from a teacher or instructor.

Song (2018) found that students who were engaged in project based collaborative learning were more likely to perform at a higher-level during work times or for the duration of an activity. In this instance, technology was used as an intervening tool to use for collaboration.

Having that at the student's disposal led to a higher sense of motivation to work on the assigned task by communicating with group members. The group that didn't have the access to technology did not provide similar levels of engagement. Establishing that intervening tool for engagement suggests that changes to student engagement are present. Being able to distinguish that engagement through tools outside of technological devices would be beneficial for any research being conducted in the future.

For this research, another aspect of engagement that should be considered is the placement of the engagement itself. Student engagement and productivity go hand in hand and are evident during the exchanges they have in collaborative work times. Watson & Foster-Fishman (2012) suggest that each person involved in the collaboration should have some kind of exchange of the information being taught, researched, or considered in the search for a solution. Being able to access the same resources also affects how we are able to participate in the activities. All of these facets of collaborative work lead to a sense of power in the decision-making process for a pair or group. Knowing the educational setting and the students within each group can set students up for success in engagement as well as power within their collaborative group.

### ***Expectations and scaffolding***

While student metacognition is a focus of this study, it is imperative to determine how students are most prepared to efficiently express a skill or standard through the application of collaborative work by considering the planning and direct instruction that ensues before the work time. For this research, utilizing support through the establishment of expectations during collaboration as well as scaffolding to promote content understanding and application can be highly considered for the educational setting.

Cáceres et. al (2017) determined that students were able to perform the task at a higher level when expectations and scaffolding questions were provided for students during work time. With metacognition in consideration, more time spent into planning and modeling examples of the problem and its solution allow the students to cognitively understand and engage in the collaborative work. This line of thinking varies based on the context of the problems being presented and according to Cáceres et. al (2017), it can even hinder student problem solving skills if scaffolding takes away from the work being done independently or collaboratively.

Scaffolding can also lead to a higher sense of collaboration and productivity during co-constructive metacognitive activities. Molenaar, Slegers, and Boxtel (2014) concluded that students were less likely to ignore each other during work time and would account for every member and their opinion in a co-constructive environment despite relationships amongst students. The lack of scaffolding led to more students ignoring one another in order to complete the task independently and sought completion over collaboration. Ultimately, the end goal is skill application, knowledge, or mastery. The intent of collaborative work environments is to interdependently work towards that common goal while gaining a newly found knowledge and application to take away from the process. As Molenaar & Chiu (2014) state, “high quality interaction fosters learning.” Considering the nature and relevancy of student interactions in addition to their productivity will suggest metacognition in the classroom.

## **Method**

### **Subjects and Participants**

In this research, there were 30 total students and up to 10 teachers and educators who were considered participants during data collection. Student participants were selected randomly through the use of the “Pick a stick” strategy for individual means of data collection. The “pick a stick” strategy allows the participant- observer to pick popsicle sticks with student names out of a cup to determine who the individual participants will be for this study. The entire populous of the 5th grade classroom participated in whole group activities as well as assessments to provide substantial information for the study. The reward for student participation and completion of activities were additional choice time for students to either play or work on other academic work following the activities.

The demographics pertinent to the general populous of this study are race, culture and ethnicity, gifted and talented, special education services, age, and gender. Considering these allows data to be compared with diversity or equitable education as a considering factor for future study.

### **Researcher Role**

The role of the researcher was to support and guide students through intervention by fostering a semi structured environment. The role of the researcher was to also collect data through means of observations and notes intervening instruction. Taking time to reflect on the instruction by journaling their experience allowed for additional information pertinent to the research. The researcher conducted the interviews and provides any possible examples or scaffolds for the 5 student participants named Student A-E.

### **Participants**

The demographics pertinent to the general populous of this study are race, culture and ethnicity, gifted and talented, special education services, age, and gender.

For this research, five students were selected to participate in introductory and exit interviews, as well as student journaling based around productivity, engagement, their experiences prior and following intervention and collaboration as a whole. These students are referred to as Students A- E. Student A was an 11-year-old male who is Asian/Pacific-Islander in race. Student A was involved in gifted and talented services at the school of focus. Student B was an 11-year-old male who is Caucasian in race. Student B was involved in gifted and talented services at the school of focus. Student C was an 11-year-old female who is black in race. Student C was not involved in any additional academic services. Student D was an 11-year-old female who is Caucasian in race. Student D was not involved in any additional academic services. Student E was an 11-year-old female who is Caucasian in race. Student E was not involved in any additional academic services.

The class of 21 students served as student participants for surveys and self-assessments prior to and following intervention strategies. These students were involved in student interviews or journaling based on the collaborative activities.

In addition to student participants, there were teacher-participants that completed a survey to determine their approach to collaborative work instruction. There were ten teachers involved in this survey and their results were reported quantitatively and qualitatively based on their responses.

### **Setting**

The study took place in a 5th Grade classroom located in a Southwestern Minnesota elementary School within the United States of America with general education as the focus of

the academia. The setting of this research would impact the inquiry based on the grade and developmental level of student participants, the number of participants, and the focus of content being taught. The variety in subjects taught allows the determination of the effects of the framework and its effect on metacognition during collaborative work time under various scopes. This setting is a school in which students are selected by lottery before enrollment to the school. Each student participant has their own iPad with the school being 1-to-1 on technology to student ratio. Students who have attended this school have had their own iPad since they have started their academia at the school. Students are familiar and comfortable using various technological resources provided by the school district.

### **Research Questions**

The main question that drove research is, what is the effect of a Gradual Release of Responsibility Framework on Student Metacognition during Collaborative Work Time?

Four sub questions that support a possible solution to the main question are as follows:

1. How does a structured collaborative work time affect the level and nature of student interactions?
2. How does the implementation of a theoretical framework for collaborative work time affect student engagement?
3. How does the implementation of a theoretical framework for collaborative work time affect student and teacher productivity?
4. How does the implementation of a theoretical framework for collaborative work time affect the role of the educator?

### **Data Collection Procedures**

Data collection for this research was determined by student involvement in the intervention periods of the study. If student participants are unable to complete any portion of the data collection, then their results will not be recorded for this study. Data collection will be conducted through the means of the triangulation matrix provided.

### ***Triangulation Matrix***

**Table 1**

#### *Triangulation Matrix*

Research Questions	Data Tool A	Data Tool B	Data Tool C
Q1- How does a structured collaborative work time affect the level and nature of student interactions?	Participant Interview	Participant Journal	Participant Survey
Q2- How does the implementation of a theoretical framework for collaborative work time affect student engagement?	Participant Survey	Notes & Observations	Participant Self-Assessment
Q3- How does the implementation of a theoretical framework for collaborative work time affect student productivity?	Participant Survey	Participant Self-Assessment	Productivity Chart
Q4- How does the implementation of a theoretical framework for collaborative work time affect the role of the educator?	Educator Survey	Observer Journal & Reflection	

#### ***Data Source 1- Student Interviews***

The five selected students participated in the student interviews. These interviews were conducted before and after the intervening instruction to note any information pertinent to the study. These will be given to students verbally.

1. What are your conversations like with others during work time?
2. Would you rather work independently or with someone else? Why?

3. How important is it to talk about the assigned task?
4. What helps you stay on task?
5. Why is it important for instructions to be clear for work time?
6. What happens if instructions aren't clear?

### ***Data Source 2- Student Surveys***

These were completed by all student participants and were delivered and completed by the use of google form following intervention strategies.

1. How interested were you in this work time?
  - a. Scale of 1 (Not at all) to 5 (very much)
2. How well were you able to complete the assigned task?
  - a. Scale of 1 (Not at all) to 5 (very much)
3. How productive do you think you were during the work time?
  - a. Scale of 1 (Not at all) to 5 (very much)
4. My level of work was because of my partner or group mate.
  - a. Scale of 1 (Not at all) to 5 (very much)
5. My level of work was due to the atmosphere I was working in.
  - a. Scale of 1 (Not at all) to 5 (very much)
6. The Instructions for the assignment were clear and I knew what to do.
  - a. Scale of 1 (Not at all) to 5 (very much)
7. My partner or group mates helped me complete the assigned task.
  - a. Scale of 1 (Not at all) to 5 (very much)
8. Talks with my partner or group mate were positive or productive at all times.

- a. Scale of 1 (Not at all) to 5 (very much)

### ***Data Source 3- Notes and Observations***

Notes and Observations were made on paper during the implementation of the intervention, through the productivity chart being used during instruction, or through the observer journal and reflection regarding a specific lesson or occurrence during implementation of the intervention.

### ***Data Source 4- Participant Self- Assessment***

These were completed by all student participants and were delivered and completed by the use of google form

1. I was on task during the entire lesson
  - a. Scale of 1(Not at All) to 5 (Very Much)
2. I was interested in the lesson
  - a. Scale of 1 (Not at All) to 5 (Very Much)
3. I did an equal amount of work compared to my group/ partners
  - a. Scale of 1 (Not at All) to 5 (Very Much)
4. I spent more time working than talking during the lesson
  - a. Scale of 1 (Not at All) to 5 (Very Much)

### ***Data Source 5- Observer Journal and Reflection***

The Observer completed the following intervention strategies through the use of google docs. There will be one journal entry for pre-intervention of the intervention of the gradual release of responsibility framework and one entry post-intervention.

Observer Work Time Journal

Reflection and Observation on the implementation of the intervention strategies:

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***Data Source 6- Student Journal and Reflection***

Selected students completed this and will be delivered in paper form.

Student Work Time Journal

What was my work time like and how did I do on the assigned task?

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***Data Source 7- Productivity Chart***

This chart was used during the implementation of the intervention to make note of student productivity during work time.

**Productivity Chart**

<b>Date:</b>	<b>Lesson:</b>		
<b>Student Number</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>Notes (conversations/ observations)</b>
1.			
2.			
3.			
4.			
5.			
6.			
7.			

8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			

***Data Source 8- Educator Survey***

These were completed by all Educator participants and were delivered and completed by the use of google form. The questions of this survey focused on the preparation and approach of collaborative work time in their respective educational setting.

1. Collaborative work time is well planned and carefully explained before implementation in my educational setting
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
2. Collaborative work time is best implemented when it is carefully planned
  - a. Scale of 1 (Not at All) to 5 (Very Much So)

3. Are students productive during collaborative work time experiences
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
4. Are conversations pertinent to the assigned task
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
5. Expectations for work time are essential for student productivity
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
6. Work time is a time for students to interact with one another
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
7. It is okay for students to work by themselves during work time
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
8. It is okay if a student is not completely finished with the assigned task
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
9. It is important for students to problem solve with peers other than their teacher
  - a. Scale of 1 (Not at All) to 5 (Very Much So)
10. All students know what they are supposed to do during work time
  - a. Scale of 1 (Not at All) to 5 (Very Much So)

### **Instruction**

The essence of this research was to implement a gradual release of responsibility model for instruction to determine its affects on participant metacognition. In this intervention, students were essentially told instructions prior to work time and were allowed to work on assigned tasks. With the intervening framework, it will allow participants to experience scaffolding and have examples modeled for them to allow for understanding of the work they will be doing. For the

implementation of this framework, it was planned to teach students how lessons will be implemented and what we will be doing for the assigned tasks.

This intervention is taking place in a Southeastern Minnesota 5<sup>th</sup> grade classroom. The focus of this will be during science instruction in which a robotics unit is being taught for students. This unit allows students to use robotics kits to build robots with the utilization of instructions accessible through various technology. Each participant has their own iPad issued to them to use for academic purposes. When technology use is permitted, the iPad will be the primary device being used. Within this unit, participants were tasked with a unit project to create their own robot to use to clean up waste. This represents a simulation of the incident in Fukushima, Japan, where nuclear waste endangered human life and robots were needed for cleanup. Within this unit, participants are instructed to build an initial chassis bed of the robot, they are able to make improvements following a simulation run, and they would make a final product based on their prior simulations and modifications. For each robotics kit, there are two participants, or partners, assigned to them. This unit fared to be more of a student- oriented unit, with additional time for exploration and delving into the research process.

At the start of the unit, the observer would present the learning target, provide instructions on the task for today, then send participants to work time. This period of instruction was referred to as pre- intervention. This is largely due to the fact that the gradual release of responsibility model was not yet implemented to the class. This work time was implemented for two days in order to collect and receive data relevant to the pre-intervention period. This pre-intervention took place on May 3<sup>rd</sup>, 2021 and May 4<sup>th</sup>, 2021.

The post- intervention period took place after the gradual release of responsibility framework was presented to participants of the classroom. In this phase of data collection, the

observer informed students of direct instruction, guided instruction, scaffolding, interdependency, and work times. This allowed participants to become more familiar with the process of intervention that will be taking place in the current educational setting. Instruction for the next two weeks implemented the gradual release of responsibility within the current science unit to promote delivery of instruction and academic examples to the participants of the classroom. Each instructional period would start with the presentation of learning targets, a recap and review of the previous day, a discussion, a time for guided instruction where participants are involved with problem solving or learning, a presentation of instructions and expectations, a collaborative work time to express the expectations and instructions, and a wrap up at the end of the work time to review time spent on academic work. The period of post- intervention took place on May 5<sup>th</sup>, 2021 to May 21<sup>st</sup>, 2021. Following the end of this period represented the end of the unit, as well as data collection on the intervening framework and collaborative work time.

## Results

The results of the intervention have been compiled into four sections in order to address each of the four sub-questions: How does a structured collaborative work time affect the level and nature of student interactions? How does the implementation of a theoretical framework for collaborative work time affect student engagement? How does the implementation of a theoretical framework for collaborative work time affect student productivity? How does the implementation of a theoretical framework for collaborative work time affect the role of the educator? In each section of the findings, the data have been presented to include various student perspectives, including subjects with high growth, average growth, and low growth over the course of the intervention. Outliers that exist in the data are addressed in the corresponding results section for each table. Overall, the results showed student achievement, student efficacy, and student engagement increased as a result of using the graphic organizer.

### **How does a structured collaborative work time affect the level and nature of student interactions?**

#### *Participant interview*

This data tool is expressed by participant responses in the pre-intervention and post-intervention stages of the implementation of the gradual release of responsibility framework. Participants A-E were interviewed twice in accordance to the implementation of the framework. To display and explain data collected, each student will be individually considered.

In the pre-intervention stage of the implementation of the framework, Participant A explained that they were willing to “have fun” and “joke around”, but ultimately felt that to work with others meant that their partner needed to work just as hard as they should. The main

objective of any assigned work should be to complete the task together according to Participant A. For the post-intervention stage of the framework, student A felt similarly to initial answers, but noticed that more partners were willing to work on the task and had less distractions around them. Participant A felt supported by partners more often when they were willing to stay in their seats and show they were trying to work on the assigned task.

Participant B expressed that “it is easy to get off task and chitchat with friends if tasks are not clear”. Participant B also expressed that it is frustrating to try and work with others that are not willing to work with you in a collaborative partnership. It is so easy to get distracted if partners are distracted. Participant B answers that they want to be on task, but it is very easy to get off task, and sometimes, they do not realize they are off task. For the post- intervention, participant B claims that they felt they were able to get more work done efficiently. Noticing their surroundings, participant B claimed that more peers were “listening to the teacher and doing what they were supposed to do”.

Participant C concentrated on having the right partner in the pre-intervention stages of the framework. Participant C felt like their initial partner said and displayed “negative and mean things” whenever they tried to get their partner back on track. Participant C felt like it was more of a challenge to work with the partner than it was to complete the assigned work independently. Post- Intervention, participant C said that their partner seemed more willing to work with them, but still showed signs of disengagement. Participant C credits the higher level of engagement due to “a quieter classroom”.

Participant D explained in the pre-intervention stages that they would have rather worked independently than collaboratively in any climate, but especially if the environment is “too loud”. Participant D says that they generally felt “nervous and stupid” when they had to ask for

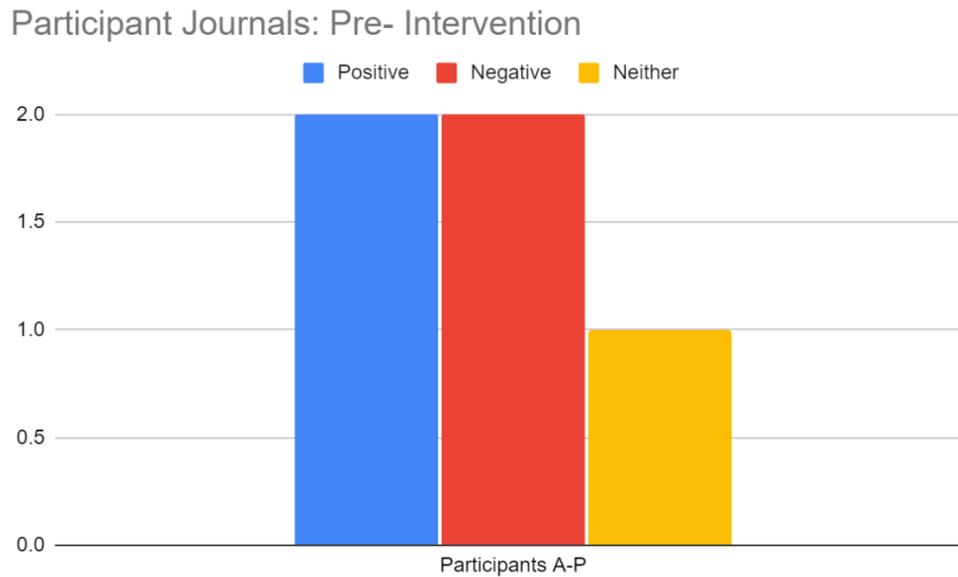
help because of the social pressures attached to that. Post- Intervention presented similar results for Participant D. They exclaimed that independent work is preferable and that “music” helps them tune out any possible distractions.

Participant E in the pre-intervention stages claimed that they would become “frustrated” if instructions were not clear to them and would make them harder to work with as a partner. Because of this, participant E prefers to work “independently in a quiet area” to avoid further frustrations or embarrassment. Post-Intervention did not drastically change how participant E felt about collaborative work. Their preference was to “work alone while listening to music to have a better time focusing.”

For participants A-C, it was apparent that the intervening framework made a positive impact on their collaborative experiences with peers. Students D and E reflected that they would still rather work alone. For this data tool, there was no mention of participants personally showing positivity or negativity through their actions, behaviors, or words. However, many students considered the educational environment to be more productive by the behaviors of their peers and in, some cases, showed that engagement was present.

### *Participant Journal*

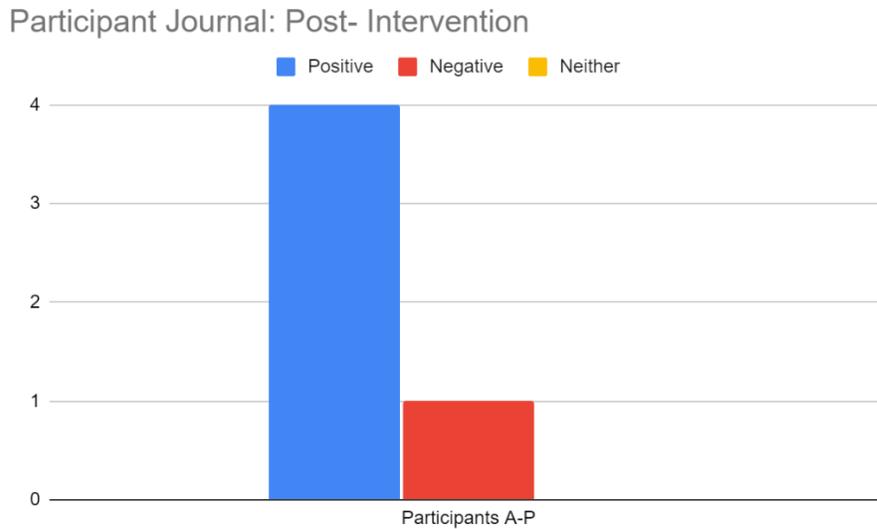
In this data tool, participants wrote about their experiences in a journal before and after the implementation of the gradual release of responsibility framework. These periods will be referred to as pre-intervention and post-intervention in the explanation and analysis of data. Below, there are two charts represent both periods of intervention. It expresses participant journal responses and will determine whether they experienced positive or negative interactions during collaborative work times.

**Chart 1***Participant Journal Pre- Intervention*

Participant journals for pre-intervention suggest that negative and positive experiences were present in collaborative worktime. One participant selected neither, suggesting that they were not able to determine whether the work time was positive or negative based on their journal reflection. Some entries explain that the environment was not conducive to a learning environment, while others appreciated the partners they had. Before the intervention, it is clear that there were mixed results on the nature of the educational climate and peer interactions.

**Chart 2**

*Participant Journal: Post- Intervention*



For the post-intervention of the framework, participants recognized the atmosphere as more positive than before the intervention by writing these experiences in their journal entries. Entries contained phrases such as, “It was great to be able to work well with my friend” and “We were able to finish the work without getting frustrated with one another”. The negative selection wrote that they would rather be working independently than working in partnerships. They felt like working in collaboration made the experience negative. Based on the differences of data presented, the nature of conversations improved drastically between interventions. This meant that participants felt like conversations were relevant and mostly positive.

*Participant Survey*

**Figure 1**

*Participant Survey Questions #7 & #8*

Survey Question #7: My partner or group mates helped me	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)

complete the assigned task			
Not at All	2	1	-1
Not as much	3	2	-1
Undecided	2	1	-1
Well	6	5	-1
Very Well	3	7	+4
Survey Question #8: Talks with my partner or group mate were positive or productive at all times	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	6	2	-4
Not as much	3	3	0
Undecided	3	2	-1
Well	3	6	+3
Very Well	1	3	+2

Data for the table above is centered around the nature of participant interactions to use as evidence in determining participant metacognition. This research question, in correlation to the participant survey, focuses on two specific questions to use in understanding the nature of participant interactions. Survey Question #7: My partner or group mates helped me complete the assigned task. Survey Question #8: Talks with my partner or group mate were positive or productive at all times. For each survey question, data will be explained in terms of how it was delivered, pre-intervention, post-intervention, and recognizing the change between the two interventions. Data presented based on intervention will be sorted based on answers on the

participant survey. Answers are sorted by numbers, 1-5, and translated into the words, not at all, not as much, undecided, well, or very much.

Survey Question #7: My partner or group mates helped me complete the assigned task. The pre-intervention of the survey question presented the following data. Two participants selected “Not very much”, three participants selected “Not as much”, two participant selected “Undecided”, six participants selected “Well”, and three participants selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. One participant selected “Not very much, two participants selected “Not as much”, one participant selected “undecided”, five participants selected “well”, and seven participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -1 for “Not very much”, -1 for “Not as much”, -1 for “Undecided”, -1 for “Well”, and +4 for “Very Much”.

Survey Question #8: Talks with my partner or group mate were positive or productive at all times. The pre-intervention of the survey question presented the following data. Six participants selected “Not very much”, three participants selected “Not as much”, three participants selected “Undecided”, three participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Two participants selected “Not very much”, three participants selected “Not as much”, two participants selected “undecided”, six participants selected “well”, and three participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both

survey implementations. The data presented in the Change column was -4 for “Not very much”, 0 for “Not as much”, -1 for “Undecided”, +3 for “Well”, and +2 for “Very Much”.

Survey question #7 has the participant evaluate whether their partner or group mate assisted in their work to complete the assigned task. The participants may also be providing their answer based on pre-determined relationships with their group mate or partner. The results from the metacognition participant survey suggest that participants were able to credit their work completion based on their assigned partners. This is suggested through the changes in between the intervention for the category “Very well”. This category increased by four participants. What this means is that the nature of the interactions between participants were affected by the intervening framework in a positive way.

Survey question #8 focuses on positive interactions amongst peers. According to the metacognition participant survey, participants were affected by the intervening framework based on the survey question. The changes that occurred were in the “Well” and “Very Well” categories. This suggests that participants were positive during work time, especially after the intervention of the gradual release of responsibility framework. For this survey question, data may have been altered based on changes in specific partnerships. Participants G and M as well as B and C were in newer partnerships. With this being considered, answers may have been changed based on partnership interaction.

## **How does the implementation of a theoretical framework for collaborative work time affect student engagement?**

*Participant Survey*

### **Figure 2**

*Participant Survey Questions #1, #4, & #5*

Survey Question #1: How interested were you in this work time?	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	6	8	+2
Not as much	4	5	+1
Undecided	2	0	-2
Well	3	2	-1
Very Much	1	1	0
Survey Question #4: My level of work was because of my partner or group mate.	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	4	2	-2
Not as much	5	4	-1
Undecided	3	4	+1
Well	2	5	+3
Very Much	2	1	-1
Survey Question #5: My level of work was due to the atmosphere I was working in.	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	1	3	+2
Not as much	6	5	-1
Undecided	5	5	0
Well	3	1	-2
Very Much	1	2	+1

Data for the table above is centered around participant engagement to use evidence in determining participant metacognition. This research question, in correlation to the participant survey, focuses on three specific questions to use in determining engagement. Survey Question #1: How interested were you in this work time? Survey Question #4: My level of work was because of my partner or group mate. Survey Question #5: My level of work was due to the atmosphere I was working in. For each survey question, data will be explained in terms of how it was delivered, pre-intervention, post-intervention, and recognizing the change between the two. Data presented based on intervention will be sorted based on answers on the participant survey. Answers are sorted by numbers, 1-5, and translated into the words, not at all, not as much, undecided, well, or very much.

Survey question #1 focuses on participant interest in worktime. The pre-intervention of the survey question presented the following data. Six participants selected “Not very much”, four participants selected “Not as much”, two participants selected “Undecided”, three participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Eight participants selected “Not very much”, five participants selected “Not as much”, zero participants selected “undecided”, two participants selected “well”, and one participant selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was +2 for “Not very much”, +1 for “Not as much”, -2 for “Undecided”, -1 for “Well”, and 0 for “Very Much”.

Survey Question #4: My level of work was because of my partner or group mate. The pre-intervention of the survey question presented the following data. Four participants selected

“Not very much”, five participants selected “Not as much”, three participants selected “Undecided”, two participants selected “Well”, and two participants selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Two participants selected “Not very much”, four participants selected “Not as much”, four participants selected “undecided”, five participants selected “well”, and one participant selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -2 for “Not very much”, -1 for “Not as much”, +1 for “Undecided”, +3 for “Well”, and -1 for “Very Much”.

Survey Question #5: My level of work was due to the atmosphere I was working in. The pre-intervention of the survey question presented the following data. One participant selected “Not very much”, six participants selected “Not as much”, five participants selected “Undecided”, three participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Three participants selected “Not very much”, five participants selected “Not as much”, five participants selected “undecided”, one participant selected “well”, and two participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was +2 for “Not very much”, -1 for “Not as much”, 0 for “Undecided”, -2 for “Well”, and +1 for “Very Much”.

Looking at the data presented from survey question #1, based on the change of survey results, more participants stated that they showed less interest in the intervening task. This was evident through the change of “Not very much” and “Not as Much” having an increase of

selections. The data table also suggests that students who showed interests in the intervening task did not experience much change. However, very few participants chose “Well” or “Very Well” in the pre-intervention survey to begin with. Between the two selections, only one participant changed their initial selection after the pre-intervention survey. Overall, the data presented for section suggests that the intervening framework did not suggest a higher engagement for involved participants.

The data from survey question #4 suggests that the change between survey selections showed change in participant engagement. This was apparent in the “well” column where a change of +3 participants took place. This suggests that participants were finding more value in their group or partner work, as well as remaining engaged with members of the group or partnership throughout the lesson. Seeing the negative change in “Not Very Much” and “Not As Much” supports this interpretation in addition to the positive change stated before.

The data from survey question #5 suggests that the working environment provided mixed results towards student engagement based on the survey data. Both of the extreme selections in “Not Very Much” and “Very Much” produced the most change. Considering this provided data allows the reader and researcher to determine that participants are becoming more certain of their answer from the experience of intervention.

With this survey, and connecting all data from the three data points, it could be determined that student engagement was affected from intervention through mixed results. Research Question #1 suggested that participant interest went down based on survey selections. Survey Question #4 suggests that participants were more engaged based on their group mates or partners in the intervening tasks. Survey Question #5 suggests that participants were more decisive in their decisions in regard to the work environment. Based on the selections provided,

half of the participants did not think that the environment significantly hindered their engagement on the assigned task.

*Notes and Observation*

**Figure 3**

*Notes and Observations*

<b>Participant Letter</b>	<b>Participant Observation and Note</b>
A.	"Working on task; independently"
B.	"Working well with partner"
C.	"Off task; roaming the room"
D.	"Relative conversations; added meaningful discussions"
E.	"Conversations off topic; positive with peers"
F.	"Off task-sat quietly and drew"
G.	"Took leadership role by splitting up work without suggestion"
H.	"Spent a majority of time talking with a peer in another group"
I.	"Offered meaningful discussion when observer was nearby. Went to an off-topic task when proximity changed"
J.	"Raised voice to talk across the classroom for a pencil during work time. This disrupted other students"
K.	"Positive interactions and laughing with peers. Seemed on task"
L.	"Showed excitement upon assignment completion. Presented completed product to observer and peers"
M.	"Fell asleep at the start of work time. Observer attempted to wake participant up. Participant fell asleep again"
N.	"Worked well and efficiently with peers"
O.	"Showed leadership and willingness to work with others and completed assigned task"
P.	"Working well with partner"

Average of engaged participants	56.25%
Average of disengaged students	43.75%

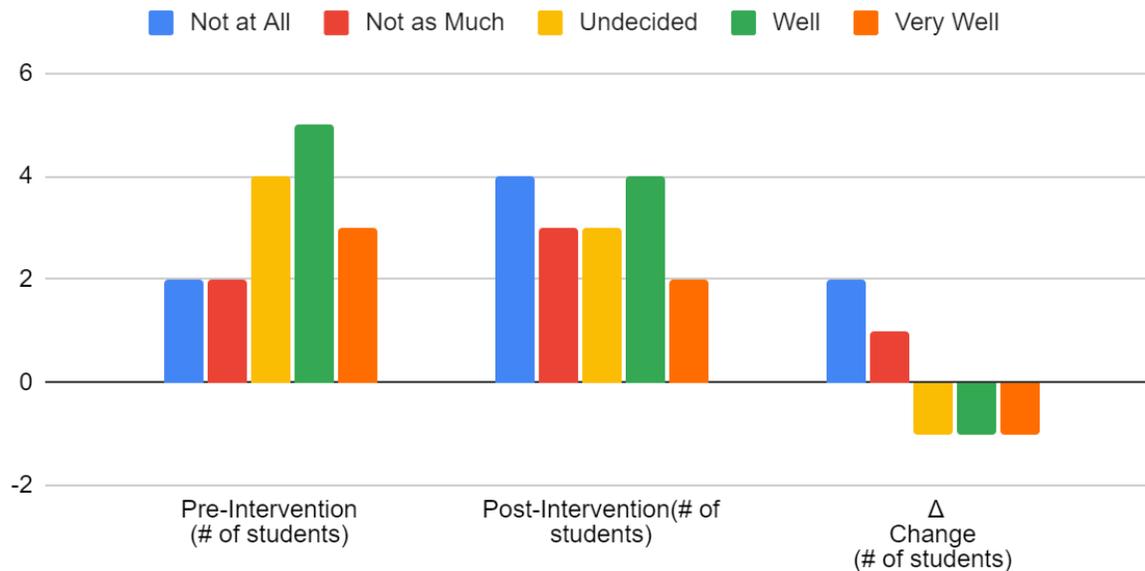
The notes provided were noted during the implementation of the intervening framework. These notes were completed in accordance with the completion of the productivity chart during collaborative work time. The essence of this data tool was to consider the perspective of the observer, and how they saw student engagement over the course of the intervening framework and its implementation. Based on the data recorder for participants A-P, averages were recorder to determine students who were generally engaged or disengaged based on the notes recorded for their engagement during collaborative work time. The average of participants who were on task during observations were 56.25% of the total participants. Some notes that reflected these results were student G, “Took leadership role by splitting up work without suggestion”. Another participant who reflects an engaged participant would be Student L, “Showed excitement upon assignment completion. Presented completed product to observer and peers”. The average of participants who appeared disengaged during collaborative work time was 43.75%. Participants who reflected this were Participant M, “Fell asleep at the start of work time. Observer attempted to wake participant up. Participant fell asleep again”, or participant H, “Spent a majority of time talking with a peer in another group”.

The data presented in this data tool suggests that more students are engaged with the lesson than students who are not. However, it could be argued that 56.25% is not a comfortable statistic for student engagement to other teachers implementing the framework. With low levels

of engagement, behaviors such as roaming or talking about this irrelevant to the assigned task could become more prevalent based on the evidence collected from this data tool.

### *Participant Self-Assessment*

Data for the charts below are centered around participant engagement to use evidence in determining participant metacognition. This research question, in correlation to the participant self-assessment, focuses on two specific questions to use in determining engagement. Survey Question #2: I was interested in the lesson and Survey Question # 3: I did an equal amount of work compared to my group/ partners. Participants who answered the questions in the self-assessment has a selection of responses from 1 to 5. 1 being “Not at all”. 2 being “Not as much”, 3 being “undecided”, 4 being “well”, and 5 being “Very Well”. The self- assessment was given to all participants to complete before the intervention of the gradual release of responsibility framework and after the intervention. These are listed in the charts as pre-intervention and post intervention. The last area of measurement on the graph is the change of response selections between both interventions of the self-assessment.

**Chart 3***Metacognition Participant Self- Assessment Question #2***Metacognition Participant Self-Assessment**

Survey Question # 2: I was interested in the lesson

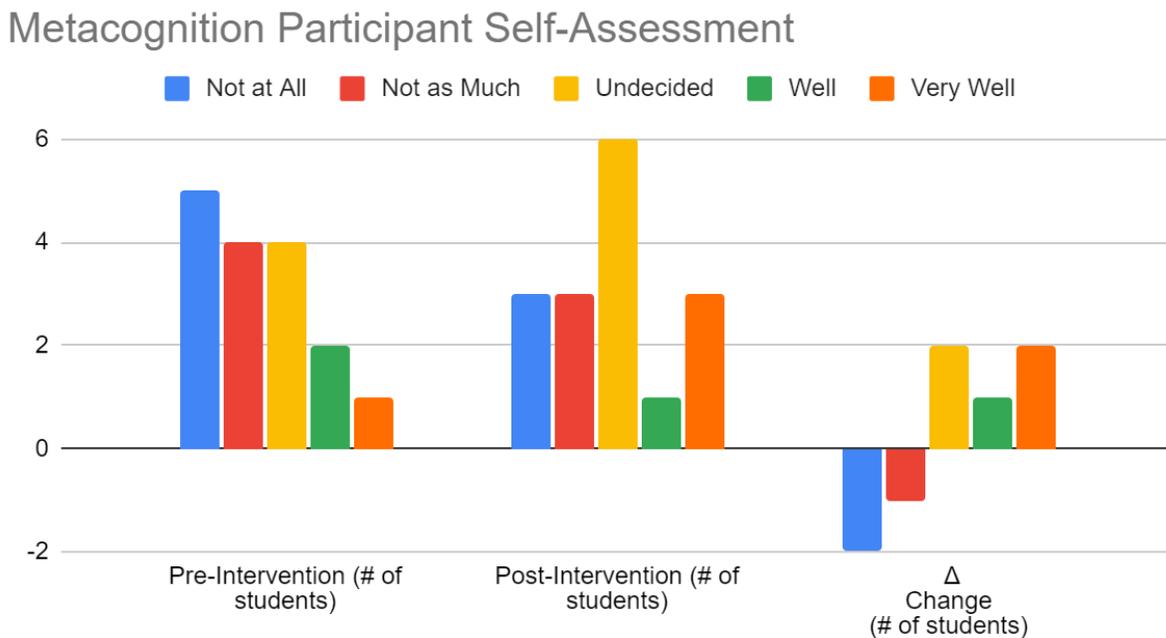
Assessment question #2: I was interested in the lesson. The pre-intervention of the survey question presented the following data. Two participants selected “Not very much”, two participants selected “Not as much”, four participants selected “Undecided”, five participants selected “Well”, and three participants selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Four participants selected “Not very much, three participants selected “Not as much”, three participants selected “undecided”, four participants selected “well”, and two participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the

Change column was +2 for “Not very much”, +1 for “Not as much”, -1 for “Undecided”, -1 for “Well”, and -1 for “Very Much”.

Based on the data presented from assessment question #2 from the self- assessment, it could be determined that there was a negative change in participant engagement when focusing on lesson interest. This could be determined by looking at the change for categories “undecided”, “Well”, and “Very Well”. These three categories had one less participant choose them in order to select “Not at All” or “Not Very Much”. Based on the data from this self-assessment question, engagement is negatively affected by the intervening framework.

**Chart 4**

*Metacognition Participant Self- Assessment Question #3*



Survey Question #3: I did an equal amount of work compared to my group/ partners

Assessment Question #3: I did an equal amount of work compared to my group/ partner.

The pre-intervention of the survey question presented the following data. Five participants

selected “Not very much”, four participants selected “Not as much”, four participants selected “Undecided”, two participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Three participants selected “Not very much”, three participants selected “Not as much”, six participants selected “undecided”, one participant selected “well”, and three participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -2 for “Not very much”, -1 for “Not as much”, +2 for “Undecided”, +1 for “Well”, and +2 for “Very Much”.

Based on assessment question #3, this suggests that participants are positively affected by the intervening framework considering participant engagement. This is evident by the rise of participant selections in between interventions for the categories “Well” and “Very Well”. This determines that participants were more engaged in the activity based on the work they would be able to accomplish with their group mates or partners.

Assessment questions 2 and 3 presented conflicting data regarding the intervening framework and its affects on student engagement. Student interest showed evidence of a negative change whereas engagement through group work rose. In the interpretation of this data, the nature of relationships should be considered. Some participants were close friends with their group mates while others were not. Based on the various personalities in the educational setting, assessment questions may have reflected the partnership or group rather than the individual engagement.

**How does the implementation of a theoretical framework for collaborative work time affect student productivity?**

*Participant Survey*

**Figure 4**

*Participant Survey Questions #2, #3, & #6*

Survey Question #2: How well were you able to complete the assigned task?	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	5	4	-1
Not as much	6	2	-4
Undecided	1	2	+1
Well	2	5	+3
Very Much	2	3	+1
Survey Question #3: How productive do you think you were during the work time?	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change (# of students)
Not at All	1	1	0
Not as much	4	2	-2
Undecided	8	3	-5
Well	2	6	+4
Very Much	1	4	+3
Survey Question #6: The Instructions for the assignment were	Pre-Intervention (# of students)	Post-Intervention (# of students)	$\Delta$ Change

clear and I knew what to do.			(# of students)
Not at All	3	1	-2
Not as much	7	2	-5
Undecided	2	3	+1
Well	3	5	+2
Very Much	1	5	+4

Data for the table above is centered around participant productivity to use as evidence in determining participant metacognition. This research question, in correlation to the participant survey, focuses on three specific questions to use in determining productivity. Survey Question #2: How well were you able to complete the assigned task? Survey Question #3: How productive do you think you were during the work time? Survey Question #6: The Instructions for the assignment were clear and I knew what to do. For each survey question, data will be explained in terms of how it was delivered, pre-intervention, post-intervention, and recognizing the change between the two interventions. Data presented based on intervention will be sorted based on answers on the participant survey. Answers are sorted by numbers, 1-5, and translated into the words, not at all, not as much, undecided, well, or very much.

Survey Question #2: How well were you able to complete the assigned task? The pre-intervention of the survey question presented the following data. Five participants selected “Not very much”, six participants selected “Not as much”, one participant selected “Undecided”, two participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Four participants selected “Not very much, two participants selected

“Not as much”, two participants selected “undecided”, five participants selected “well”, and three participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -1 for “Not very much”, -4 for “Not as much”, +1 for “Undecided”, +3 for “Well”, and +1 for “Very Much”.

Survey Question #3: How productive do you think you were during the work time? The pre-intervention of the survey question presented the following data. One participant selected “Not very much”, four participants selected “Not as much”, eight participants selected “Undecided”, two participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. One participant selected “Not very much”, two participants selected “Not as much”, three participants selected “undecided”, six participants selected “well”, and four participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was 0 for “Not very much”, -2 for “Not as much”, -5 for “Undecided”, +4 for “Well”, and +3 for “Very Much”.

Survey Question #6: The Instructions for the assignment were clear and I knew what to do. The pre-intervention of the survey question presented the following data. Three participants selected “Not very much”, seven participants selected “Not as much”, two participants selected “Undecided”, three participants selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. One participant selected “Not very much”, two participants selected “Not as much”, three participants selected “undecided”, five participants

selected “well”, and five participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -2 for “Not very much”, -5 for “Not as much”, +1 for “Undecided”, +2 for “Well”, and +4 for “Very Much”.

Data for survey question #2 suggests that students were more productive in assignment completion based on the selections provided by participants. The change in the data table above shows that the selection “Well” had a significant increase of +3 between interventions which supports the initial claim for this survey question. What also supports the claim is the negative change in the selections “Not very much” and “Not as much”. This suggests that the intervening framework allowed students to show a higher level of productivity through assignment completion based on the participant survey.

Data for survey question #3 presents positive change for the selection categories “Well” and “Very Well”. This suggests that participants implied or believed that they were more productive after the implementation of the intervening framework for collaborative work time. This is also supported by the negative change for the categories “Not Very Much” and “Not as Much”. Based on the results of both survey submissions, participants claimed to be more productive and on task with the assigned work.

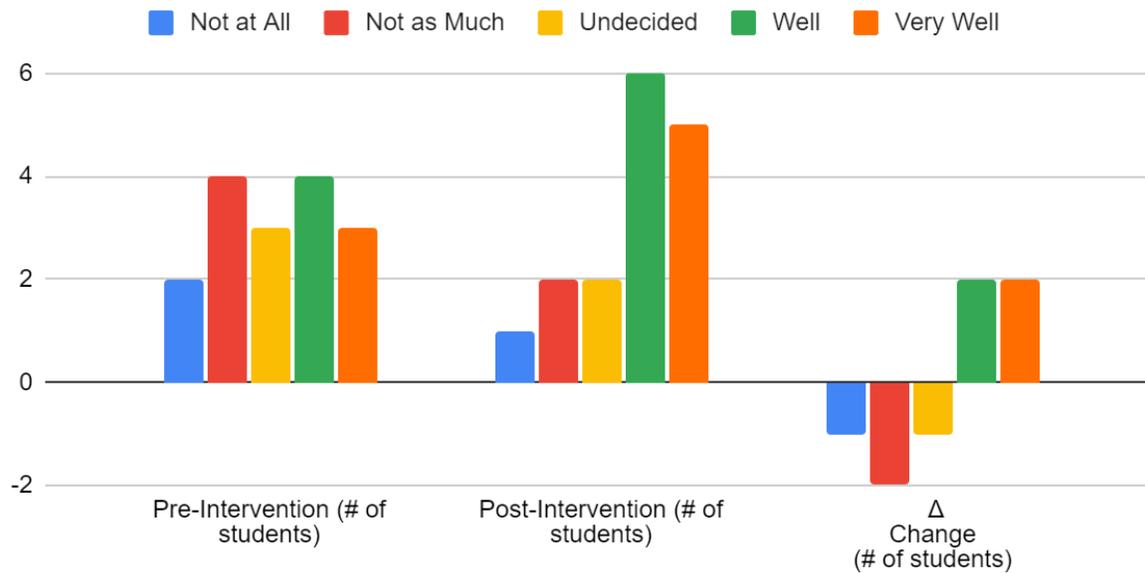
Data for survey question #6 suggests that participants felt a significant change in the instructions that were provided with the intervening activity. This question delves into participant understanding of the intervening task and also determines if participants do not understand what to do with the provided task. Based on the changes from the data table above, ten of sixteen participants selected “Well” or “Very Well” in the post-intervention of the

framework. The significant change suggests that participants showed productivity by understanding instructions through the use of this gradual release of responsibility framework.

After analyzing the data from the three mentioned survey questions, it could be determined that productivity has seen a positive change from the implementation of the gradual release of responsibility framework. Based on participant selections in the metacognition participant survey, the data has suggested that participants were able to complete the assigned task to a higher level, participants claimed to be more on task with the assigned work, and lastly, participants claimed to better understand instructions through the implementation of the gradual release of responsibility framework

### *Participant Self-Assessment*

Data for the charts below are centered around participant engagement to use evidence in determining participant metacognition. This research question, in correlation to the participant self-assessment, focuses on two specific questions to use in determining engagement. Survey Question #2: I was interested in the lesson and Survey Question # 3: I did an equal amount of work compared to my group/ partners. Participants who answered the questions in the self-assessment has a selection of responses from 1 to 5. 1 being “Not at all”. 2 being “Not as much”, 3 being “undecided”, 4 being “well”, and 5 being “Very Well”. The self- assessment was given to all participants to complete before the intervention of the gradual release of responsibility framework and after the intervention. These are listed in the charts as pre-intervention and post intervention. The last area of measurement on the graph is the change of response selections between both interventions of the self-assessment.

**Chart 5***Metacognition Participant Self- Assessment Question #1***Metacognition Participant Self- Assessment**

Survey Question #1: I was on task during the entire lesson

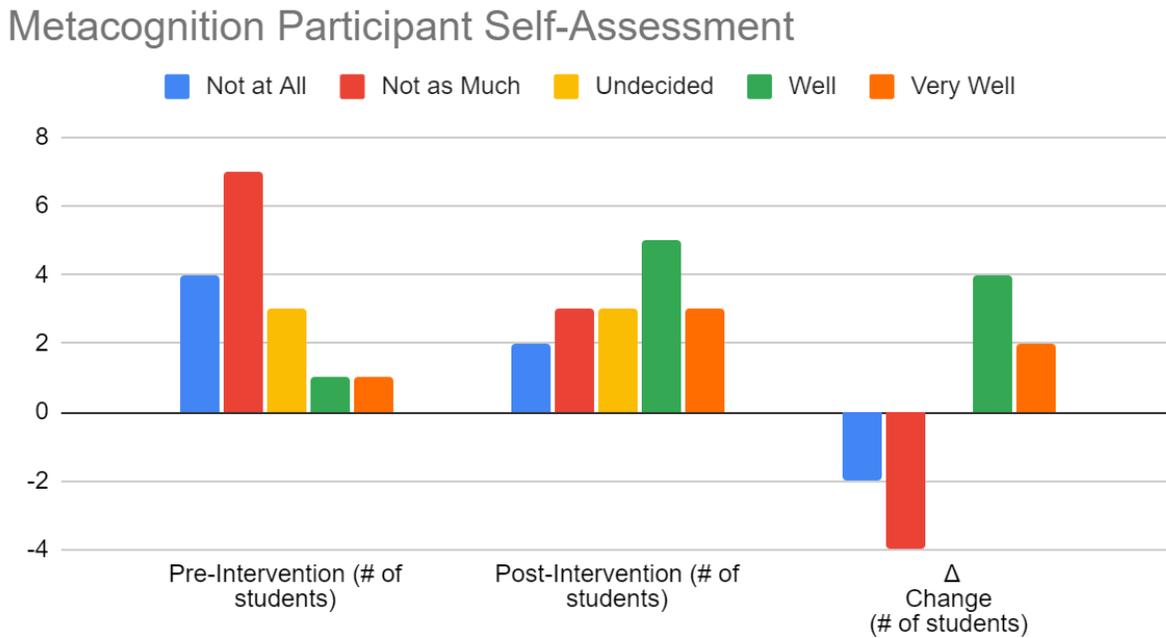
Assessment question #1: I was on task the entire lesson. The pre-intervention of the survey question presented the following data. Two participants selected “Not very much”, four participants selected “Not as much”, three participants selected “Undecided”, four participants selected “Well”, and three participants selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. One participant selected “Not very much, two participants selected “Not as much”, two participants selected “undecided”, six participants selected “well”, and five participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the

Change column was -1 for “Not very much”, -2 for “Not as much”, -1 for “Undecided”, +2 for “Well”, and +2 for “Very Much”.

Based on the data presented from assessment question #1 from the self- assessment, it could be determined that there was a positive change in participant engagement when focusing on participant belief of being productive or being on task. This could be determined by looking at the change for categories “Well” and “Very Well”. These two categories expressed positive change by having more participants select them between interventions. This expresses that more participants felt like they were on task and working productively on the assigned work.

**Chart 6**

*Metacognition Participant Self- Assessment*



Survey Question #4: I spent more time working than talking during the lesson

Assessment Question #4: I spent more time working than talking during the lesson. The pre-intervention of the survey question presented the following data. Four participants selected “Not very much”, seven participants selected “Not as much”, three participants selected “Undecided”, one participant selected “Well”, and one participant selected “Very Much”. After the intervention period of this research, participants completed the survey again. This data is presented in the post-intervention column. Two participants selected “Not very much”, three participants selected “Not as much”, three participants selected “undecided”, five participants selected “well”, and three participants selected “very well”. The last column of data for this survey question displays the change in participant answers over both survey implementations. The data presented in the Change column was -2 for “Not very much”, -4 for “Not as much”, 0 for “Undecided”, +4 for “Well”, and +2 for “Very Much”.

Based on the data presented from assessment question #4 from the self- assessment, it could be determined that there was a positive change in participant productivity when focusing on the self-evaluation of being productive by working or being off task by talking. The argument for these results could be that productivity could be present while you are talking. The positive change from the collection of data determined by looking at the change for categories “Well” and “Very Well”, as well as the changes for “Not as Much”. The categories “Well” and “Very Well” expressed positive change by having more participants select them between interventions. The category “Well” expressed the most positive change and had the most selections by participants in the post-intervention self- assessment. The category “Not as Much” had four less selections in the post-intervention self-assessment, which meant that participants selected the categories that expressed that they were being productive by working on the assigned task.

*Productivity Chart*

To determine participant productivity during the intervening work time, the observer made notes and observations to record whether participants were on task or whether they completed the assigned task. During this data recording, only sixteen participants are being observed of the initial twenty-one due to absences from any prior point to data collection. These participants were labeled in the letters A-P to recognize their individual accomplishments during a collaborative work time. After all of the data was gathered and collected, the amount of on task participants and completed tasks were averaged to quantify the results of this particular area of research. This observation and chart were used for data collection over three weeks and nine total observations. This was implemented when the intervening framework was being implemented to record any possible changes to participant productivity as a result to the intervention.

**Figure 5***Productivity Chart #1*

<b>Week 1: 5/3-5/7</b>	<b>Observation 1</b>		<b>Observation 2</b>		<b>Observation 3</b>	
<b>Participant Letter</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>
A.	On	Y	On	Y	On	Y
B.	On	Y	On	Y	On	Y
C.	Off	Y	Off	N	Off	N
D.	On	Y	On	Y	On	Y
E.	Off	N	On	Y	On	Y
F.	Off	N	Off	N	Off	Y
G.	On	Y	On	Y	Off	N
H.	Off	Y	Off	N	Off	N

I.	Off	N	On	Y	On	Y
J.	Off	N	Off	Y	Off	Y
K.	On	Y	Off	N	On	Y
L.	On	N	On	Y	On	Y
M.	Off	N	On	N	Off	N
N.	On	Y	On	Y	On	Y
O.	On	Y	On	Y	On	Y
P.	On	Y	On	Y	On	Y
Average On Task and Work Completed	56.25%	62.5%	68.75%	68.75%	62.5%	75%

Week 1 of the observation begins on May 3<sup>rd</sup>, 2021 and ends on May 7<sup>th</sup>, 2021. This observation represents what production was like before the implementation of the gradual release of responsibility framework, so it will be considered a pre-intervention observation. Based on the three observations of the week, some of the participants were able to remain on task and some were able to complete the assigned task. In the first observation, 56.25% of participants were on task during this period. On the second day, 68.75% of participants were on task, and on the last day 62.5% of participants remained on task during work time. Completion of the assigned task was reported as 62.5% for day 1, 68.75% on day 2, and 75% on day 3. The difference in results between on task and assignment completion was suggestive that some students who were on task, did not necessarily complete the assigned task. Some students did not stay on task during the observed lesson but were still able to complete the assigned task.

**Figure 6***Productivity Chart #2*

<b>Week 2: 5/10-5/14</b>	<b>Observation 4</b>		<b>Observation 5</b>		<b>Observation 6</b>	
<b>Participant Letter</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>
A.	On	Y	On	Y	On	Y
B.	On	Y	On	Y	On	Y
C.	On	Y	On	Y	On	Y
D.	On	Y	On	Y	On	Y
E.	Off	N	On	Y	On	Y
F.	Off	N	Off	N	On	Y
G.	On	Y	On	Y	Off	N
H.	Off	Y	Off	N	Off	N
I.	On	Y	On	Y	On	Y
J.	Off	N	Off	Y	Off	Y
K.	On	Y	On	Y	On	Y
L.	On	N	On	Y	On	Y
M.	On	Y	On	N	Off	N
N.	On	Y	On	Y	On	Y
O.	On	Y	On	Y	On	Y
P.	On	Y	On	Y	On	Y
<b>Average On Task and Work Completed</b>	75%	75%	81.25%	81.25%	75%	81.25%

Week 2 of the observation begins on May 10<sup>th</sup>, 2021 and ends on May 14<sup>th</sup>, 2021. This observation represents what production was like during the implementation of the gradual release of responsibility framework. Based on the three observations of the week, some of the participants were able to remain on task and some were able to complete the assigned task. In the fourth observation, 75% of participants were on task during this period. On the fifth observation, 81.25% of participants were on task, and on the sixth observation 75% of participants remained on task during work time. Completion of the assigned task was reported as 75% for observation four, 81.25% on observation five, and 81.25% on observation six. The difference in results between on task and assignment completion was suggestive that some students who were on task, did not necessarily complete the assigned task. Some students did not stay on task during the observed lesson but were still able to complete the assigned task. These differences were evident in observation six. However, the percentages for on task participants and participants who completed the assigned tasks were the same on observations four and five. Some noticeable changes to be aware of would be the growth of productivity since the week 1 observations. Participants that were on task reported averages as high as 81.25% whereas the previous week had a maximum average of 75%. This suggests that productivity is growing during the implementation of the intervening framework.

### Figure 7

*Productivity Chart #3*

<b>Week 3: 5/17-5/21</b>	<b>Observation 7</b>		<b>Observation 8</b>		<b>Observation 9</b>	
<b>Participant Letter</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>	<b>On or Off task</b>	<b>Work Completed (Y/N)</b>
A.	On	Y	On	Y	On	Y

B.	On	Y	On	Y	On	Y
C.	On	Y	Off	N	On	Y
D.	On	Y	On	Y	On	Y
E.	Off	N	Off	N	On	Y
F.	On	Y	Off	N	On	Y
G.	On	Y	On	Y	On	Y
H.	Off	Y	Off	N	Off	N
I.	On	Y	On	Y	On	Y
J.	On	N	Off	Y	Off	Y
K.	On	Y	On	Y	On	Y
L.	On	N	On	Y	On	Y
M.	On	Y	On	Y	On	Y
N.	On	Y	On	Y	On	Y
O.	On	Y	On	Y	On	Y
P.	On	Y	On	Y	On	Y
Average On Task and Work Completed	87.5%	81.25%	68.75%	75%	81.25%	93.75%

Week 3 of the observation begins on May 17<sup>th</sup>, 2021 and ends on May 21<sup>st</sup>, 2021. This observation represents what production was like during the implementation of the gradual release of responsibility framework. Based on the three observations of the week, some of the participants were able to remain on task and some were able to complete the assigned task. In the seventh observation, 87.5% of participants were on task during this period. On the eighth observation, 68.75% of participants were on task, and on the ninth observation 81.25% of participants remained on task during work time. Completion of the assigned task was reported as

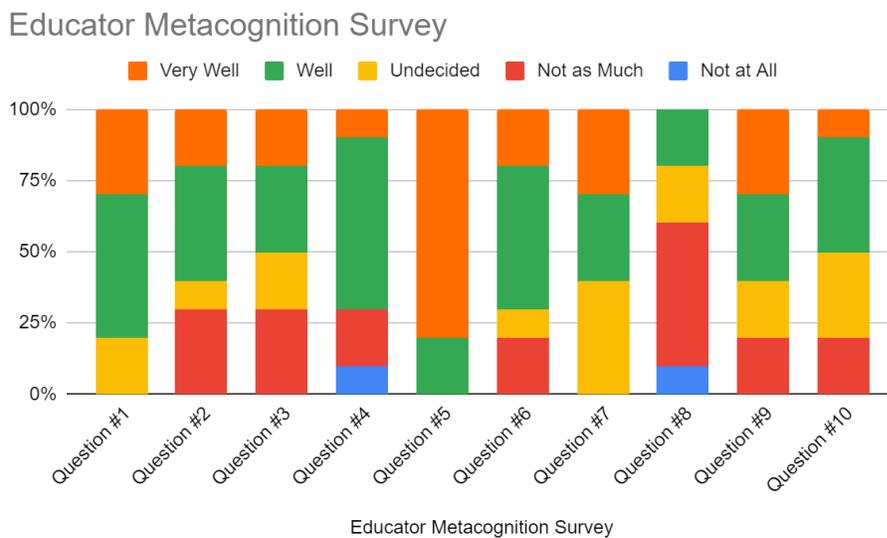
81.25% for observation seven, 75% on observation eight, and 93.75% on observation nine. This week of observation provided the largest range of averages presented so far. On observation eight, only 68.75% of participants were on task for the intervening work time. But days seven and nine suggested that a majority of the class was on task and productive with the assigned task. In consideration of assigned tasks being complete, the averages were still higher than previous weeks, even with a less productive eighth observation. The results from the productivity chart provide evidence to suggest that a gradual release of responsibility framework does have a positive affect on student productivity during collaborative work time.

**How does the implementation of a theoretical framework for collaborative work time affect the role of the educator?**

*Educator Survey*

**Chart 7**

*Educator Metacognition Survey*



For this data tool, ten educators in the Southeastern Minnesota region answered survey questions based on their experiences of collaborative or interactive work times. The chart explains the educator selections in the survey based on the answers “Very Well”, “Well”, “Undecided”, “Not as Much”, and “Not at All”. Each question presents the percentages of choices selected. Data will be explained by each question of the survey.

Survey Question 1: Collaborative work time is well planned and carefully explained before implementation in my educational setting. Responses for this question suggest that planning and work time explanations equate to a more successful work time. 80% of participating educators provided responses that reflect this, 20% of participating educators were undecided. There were no responses that disagreed with planning and explaining collaborative work time before implementation.

Survey Question 2: Collaborative work time is best implemented when it is carefully planned. 30% of participants selected “Not Very Much”. Around 60% suggest that planning makes the best work times. Considering these responses can bring the discussion of how work time is implemented or what is classified as work time. Spontaneous discussions could be considered a work time by some which could have been a reason to choose a reflective response.

Survey Question 3: Are students productive during collaborative work time experiences? 50% of the responses claim that students are productive with collaborative work time. 30% of educators claimed that students are not productive during collaborative work time.

Survey Question 4: Are conversations pertinent to the assigned task. 70% of the responses suggested that student conversations are pertinent to the assigned work or class

discussions. 30% of responses suggest that conversations are off task or not pertinent to the topic of focus.

Survey Question 5: Expectations for work time are essential for student productivity. For this question, 100% of participants agreed that expectations are essential for a productive work time.

Survey Question 6: Work time is a time for students to interact with one another. Presented data for this question presents that 70% of participating educators believe that collaborative work time is for students to interact with one another. The other 30% chose the opposite of the majority selections. With that being said, the 30% could be considering that collaborative work time is meant for focusing on assigned work or that students are not confined to talking.

Survey Question 7: It is okay for students to work by themselves during work time. In this problem, 70% of responses suggested that it is okay for students to work independently. No participating educator selected “Not as Much” or “Not at All”.

Survey Question 8: It is okay if a student is not completely finished with the assigned task. For this question, 60 % of participating educators chose “Not as Much” or “Not at All”, suggesting that students completing assigned work is an important aspect to lesson and instruction implementation. Only 20% of participating educators selected the opposing choices.

Survey Question 9: It is important for students to problem solve with peers other than their teacher. For this question, over 60% of participating educators selecting “Well” or “Very Well”. This suggests that they believe that students should be able to problem solve with peers other than the teacher. Those who opposed this choice were less than 25% of participants.

Survey Question 10: All students know what they are supposed to do during work time. For this question, over 50% of responses were in the categories “Well” or “Very Well” meaning that half of the participating educators believed that students were aware of what they were supposed to do. Around 25% of responses were “Undecided”. This meant that participating educators who selected this were not sure if students were aware of instructions during work times. The rest of participants believed that students were not aware of instructions during work time. Based on the data for this question, most educators believe that students are aware of the provided assignment or instructions for work time.

The interpretation of the responses from the participating educators shows that collaborative work time is valued by most educators. It could also be said that instructions and directions should be present based on the participating educators and their response. Collaborative work time should be a time where students are able to collaborate with one another and be productive. This can be accomplished by creating an efficient foundation of expectations for students and developing clear instructions through trial and error. Overall, collaborative worktime is a necessary addition to any lesson and should be implemented to promote student engagement, productivity, and positive interaction.

### *Observer Journal and Reflection*

For this data tool, the observer wrote down personal observations and reflected on implemented lessons after they occurred. This allows readers and the observer to consider the experiences of the intervening framework and the response of participants in the academic setting. This journaling also reflects what the observer considers collaborative work time to be like based on their perspective.

For pre-intervention of the gradual release of responsibility framework, the observer considers participants to be “off task” and “disengaged” as a whole group. Before the intervention of the framework, it could be determined that instructions may not have been as clear according to the instructions and corresponding tasks with the lessons.

*Before the implementation of the intervening framework, it was apparent that students were off task by roaming around the room, holding conversations that were not pertinent to the assigned activity, and provided evidence of disrespect through communication. As a teacher, it was frustrating emotionally to feel and see that participants were not willing to be engaged with the activity. I also found myself trying to consider what the lesson was like in their shoes. What could I do to make it more engaging and how could I structure the lesson to make it so participants are consistently busy? With these in consideration, finding a solution could suggest a change in negativity, disengagement, and productivity.*

Post-Intervention shows the change over the course of intervention and change of instructional approaches and strategies. Previously, the observer asked the question “What could I do to make it more engaging and how could I structure the lesson to make it, so participants are consistently busy?” As instructions began to be clearer and more interactive with the participants, change was obvious in the eyes of the observer. Based on the journal below,

participants were evidently “paying more attention” and “interacting more positively with one another.” Even students who were off task seemed to get their work turned in.

*For post-implementation of the gradual release of responsibility framework, it was apparent that students were more interactive with discussions and during collaborative work time. Some things that I noticed during the intervening lesson is that students were generally paying more attention to what I had to say, as well as what their peers had to say in accordance with the lesson and assigned task. During the work time, it seemed like a more positive atmosphere than what was suggested before. This\ showed through students interacting more positively with one another and through engagement and productivity with the assigned task. The emotions I felt as a teacher changed drastically between pre-intervention and post-intervention. This suggests that a foundation of clear instructions and task orientation could be the difference in altering the classroom climate. What I experienced was not perfect, since specific students still chose to remain off task, but an improvement is a great trend in the right direction.*

Based on the experiences of the observer, changes are not only evident in participant action and behaviors, but also the teacher and their emotional perspective. It was apparent that

when participants were more engaged with activity, more productive, and showed positive interactions, then the observer felt better about their teaching.

### **Discussion**

The focus of this action research was to determine if a gradual release of responsibility framework would have any affect on student metacognition. To do this, the definition and application of metacognition was broken down into three categories to determine the effects of the intervening framework. According to Lynch (2019) “Metacognition is the ability to evaluate one’s own thinking. It is central to the development of other important skills, like critical thinking and problem-solving. It is an extremely useful tool to enhance student learning and help them master and internalize information and subject matter. “The three categories are the nature of conversations, engagement, and productivity. These three categories were expressed by observing the results of the applied data tools in a Southeastern Minnesota 5<sup>th</sup> grade classroom.

Based on the research provided for the nature of student conversations, I have determined that student conversations have been affected by the intervening framework. Students showed a higher sense of positive interactions, and this connected immensely with productivity during an assigned work time. Part of the problem determined in the classroom setting was that participants were visibly off task due to the negative interactions expressed between one another. With the changes considered, getting the participants on track, and talking relevantly and respectfully to one another was something to strongly consider from this action research. Based on the data tools for this specific research question, participants were the focus of the data collection tools. Among the three, participant interviews, participant journals, and participant survey were the tools utilized. Between them, a connection could be made that there was a relationship of

positive change when the intervening framework was applied. It could be determined that with more structure and clearer expectations, participants would be able to shift from the negativity in order to have the accountability of following the rules, expectations, and being respectful to peers.

Student engagement considers when participants are drawn into a specific instructional or work time. Showing a general interest can allow a participant to become more engaged with what they are doing. If participants do not have an interest in something, then teaching engagement to those in the classroom could potentially require more challenges, obstacles, and things to consider as a teacher. Based on the data tools, participant self-assessment, notes and observations, and the participant survey, it could be concluded that engagement was negatively affected by the intervening framework. To consider engagement and intervening instructional strategies, some participants may not be interested in the material that is being taught but can still be productive based on the foundation of expectations and instructions that have been provided. In addition, I would also consider adding some interaction and relevancy to the learning if participants need to be more interested in the topic. Generally, from this instructional intervention, some participants seemed to enjoy the content, but the majority of participants did not feel like this content applied to their life in any way. My belief is that the disengagement was due to this line of thinking. According to Blazar (2015), teaching experience and characteristics also have a difference on the learning environment for those involved. With that being said, my presence and implementation alone could have hindered participant engagement in this action research.

Productivity determines whether participants are actively working towards assigned tasks in a relevant manner. To determine that participants are productive shows that they are actively

thinking about the process of thinking of how to think or showing metacognition. To determine and measure productivity in this action research, productivity charts, participant survey, and participant self-assessments were used to collect necessary evidence pertinent to the research question. Based on the three data tools, it was evident that there was a strong, positive relationship between the intervention and productivity. In all three data tools, participants showed that they were actively more productive with their work because of the regulated learning environment. According to Carrell, Hoekstra, and Kuka (2018), students who provide a distracting environment could have an effect on every involved peer within the setting with their personal learning. Their study showed that there were affects of student learning ten years forward. With that being said, if intervening frameworks like the gradual release of responsibility, are not implemented when participants are showing disengagement or signs of being unproductive, then you are taking away from the learning of other participants in the setting. As a teacher, it is essential that you determine the instructional strategy that benefits your classroom and your students.

In this action research, observing what other teachers are doing for their instructional work time is something to consider and compare with future curricular implementations. Based on this research question, educator surveys and the observer journal were the tools used to collect data. I determined that other educators implement planned instruction by producing firm expectations and finding necessary times to allow students to interact with each other in relevant ways. According to Fuchs, L., Fuchs, D, Karzdan, Karns, Calhoun, Hamlett, and Hewitt (2000), It is not surprising, therefore, that teachers typically conduct cooperative learning in unstructured ways that do not incorporate features that promote the constructive interactional styles research has identified. This means that if set rules and expectations are set in place and practiced, then

finding more opportunities for unstructured learning opportunities could be possible. Educators expressed that planning work times is beneficial to the topic and the learning of the students. However, there are moments that challenge what the definition of unstructured work is. At times, it is important to stop and have discussions about the topic being taught so students can express their current understanding. In many ways, structure is what builds a positive and efficient learning environment to eventually allow flexibility in future curricular adaptations or instructional strategies being used.

### **Conclusion**

In conclusion, connecting all research questions together, the general findings of the study show that student metacognition is affected by the intervention of the gradual release of responsibility framework in collaborative work times. Based on the evidence, I believe that metacognition is affected by the significant positive change in productivity and the nature of interactions. Engagement was not improved from the implementation and suggested that participants involved could show a lack of interest in the topic and still be productive with the assigned work. For future research regarding this topic, I suggest conducting research on specific aspects of the gradual release of responsibility in metacognition. I would also suggest producing and implementing action research of a different framework to use to determine its effects on metacognition. Lastly, research could also be conducted in larger samples to produce more evidence to suggest the implemented strategy has a similar affect.

### References

- Amato-Zech, N., Hoff, K., & Doepke, K. (2006). Increasing on-task behavior in the classroom: Extension of self-monitoring strategies. *Psychology in the Schools, 43*(2), 211–221. <https://doi.org/10.1002/pits.20137>
- Blazar, D. (2015). Effective teaching in elementary mathematics: Identifying classroom practices that support student achievement. *Economics of Education Review, 48*, 16–29. <https://doi.org/10.1016/j.econedurev.2015.05.005>
- Cáceres, M., Nussbaum, M., Marroquín, M., Gleisner, S., & Marquínez, J. (2018). Building arguments: key to collaborative scaffolding. *Interactive Learning Environments, 26*(3), 355–371. <https://doi.org/10.1080/10494820.2017.1333010>
- Carrell, S. E., Hoekstra, M., & Kuka, E. (2018). The Long-Run Effects of Disruptive Peers. *The American Economic Review, 108*(11), 3377–3415. <https://doi.org/10.1257/aer.20160763>
- Fuchs, L. S., Fuchs, D., Kazdan, S., Karns, K., Calhoun, M. B., Hamlett, C. L., & Hewlett, S. (2000). Effects of Workgroup Structure and Size on Student Productivity during Collaborative Work on Complex Tasks. *The Elementary School Journal, 100*(3), 183–212. <https://doi.org/10.1086/499639>
- Gu, X., Chen, S., Zhu, W., & Lin, L. (2015). An intervention framework designed to develop the collaborative problem-solving skills of primary school students. *Educational Technology Research and Development, 63*(1), 143–159. <https://doi.org/10.1007/s11423-014-9365-2>
- Kaendler, C., Wiedmann, M., Rummel, N., & Spada, H. (2015). Teacher competencies for the implementation of collaborative learning in the classroom: A framework and research

- review. *Educational Psychology Review*, 27(3), 505–536. <https://doi.org/10.1007/s10648-014-9288-9>
- Kapur, M., & Bielaczyc, K. (2012). Designing for Productive Failure. *The Journal of the Learning Sciences*, 21(1), 45–83. <https://doi.org/10.1080/10508406.2011.591717>
- Le, J. (2018). Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration. *Cambridge Journal of Education*, 48(1), 103–122. <https://doi.org/10.1080/0305764X.2016.1259389>
- Lin, T., Ha, S., Li, W., Chiu, Y., Hong, Y., & Tsai, C. (2019). Effects of collaborative small-group discussions on early adolescents' social reasoning. *Reading & Writing*, 32(9), 2223–2249. <https://doi.org/10.1007/s11145-019-09946-7>
- Loes, C., Culver, K., & Trolan, T. (2018). How Collaborative Learning Enhances Students' Openness to Diversity. *The Journal of Higher Education (Columbus)*, 89(6), 935–960. <https://doi.org/10.1080/00221546.2018.1442638>
- Lynch, M. (2019). Science of Learning: Metacognition In Education. *The Edvocate*. <https://www.theedadvocate.org/science-of-learning-metacognition-in-education/>
- Metcalfe, J., & Shimamura, A. (1994). Metacognition: Knowing About Knowing. *A Bradford Book*. [http://wsuproxy.mnpals.net/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1765&site=ehost-live&ebv=EB&ppid=pp\\_Cover](http://wsuproxy.mnpals.net/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1765&site=ehost-live&ebv=EB&ppid=pp_Cover)
- Molenaar, I., & Chiu, M. (2014). Dissecting sequences of regulation and cognition: Statistical discourse analysis of primary school children's collaborative learning. *Metacognition and Learning*, 9(2), 137–160. <https://doi.org/10.1007/s11409-013-9105-8>

- Molenaar, I., Slegers, P., & Boxtel, C. (2014). Metacognitive scaffolding during collaborative learning: A promising combination. *Metacognition and Learning*, 9(3), 309–332. <https://doi.org/10.1007/s11409-014-9118-y>
- Obikwelu, C., & Read, J. (2012). The Serious Game Constructivist Framework for Children's Learning. *Procedia Computer Science*, 15, 32–37.
- Qureshi, M., Khaskheli, A., Qureshi, J., Raza, S., & Yousufi, S. (2021). Factors affecting students' learning performance through collaborative learning and engagement. *Interactive Learning Environments*, 1–21. <https://doi.org/10.1080/10494820.2021.1884886>
- Razfar, A. (2013). Dewey and Vygotsky: Incommensurability, Intersections, and the Empirical Possibilities of Metaphysical Consciousness: Commentary on Clarà. *Human Development*, 56(2), 128–133. [https://www.jstor-org.wsuproxy.mnpals.net/stable/26764654?sid=primo&seq=1#metadata\\_info\\_tab\\_contents](https://www.jstor.org.wsuproxy.mnpals.net/stable/26764654?sid=primo&seq=1#metadata_info_tab_contents)
- Reznitskaya, A., Kuo, L., Clark, A., Miller, B., Jadallah, M., Anderson, R., & Nguyen-Jahiel, K. (2009). Collaborative reasoning: a dialogic approach to group discussions. *Cambridge Journal of Education*, 39(1), 29–48. <https://doi.org/10.1080/03057640802701952>
- Smagorinsky, P. (2007). Vygotsky and the Social Dynamics of Classrooms. *English Journal*, 97(2), 61–66.
- Song, Y. (2018). Improving primary students' collaborative problem solving competency in project-based science learning with productive failure instructional design in a seamless learning environment. *Educational Technology Research and Development*, 66(4), 979–1008. <https://doi.org/10.1007/s11423-018-9600-3>

- Traver, J. J. & Matera, B. D. (2021). (re)Visioning the gradual release of responsibility: Building a student interdependency model. *Journal of Education and Human Development*, 10 (2).
- Watson, J. (2001). Social constructivism in the classroom. *Support for Learning*, 16(3), 140–147. <https://doi.org/10.1111/1467-9604.00206>
- Watson, E. & Foster-Fishman, P. (2013). The Exchange Boundary Framework: Understanding the Evolution of Power within Collaborative Decision-Making Settings. *American Journal of Community Psychology*, 51(1), 151–163. <https://doi.org/10.1007/s10464-012-9540-8>,
- Weinberger, A., Stegmann, K., & Fischer, F. (2007). Knowledge convergence in collaborative learning: Concepts and assessment. *Learning and Instruction*, 17(4), 416–426. <https://doi.org/10.1016/j.learninstruc.2007.03.007>