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## Mathematical Discourse: Impacts on Seventh Grade Student Learning and Feelings About Mathematics

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Mathematical Discourse: Impacts on Seventh Grade  
Student Learning and Feelings About Mathematics

A Project Presented to the Graduate Faculty of  
Minnesota University Moorhead

By

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In Partial Fulfillment of the Requirement for the  
Degree of Master of Science in Curriculum and  
Instruction

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### Abstract

The original purpose of this study was to investigate the impacts mathematical discourse has on instruction and students' feelings about mathematics. The research would have focused on the impacts mathematical discourse has on 40 students in a 7<sup>th</sup> grade math classroom. Students would have been provided with tasks that foster and encourage discourse during instruction. Student surveys, work samples, and a Discourse Rubric would have been used to determine the impacts mathematical discourse has on instruction and students' feelings about mathematics. Plans for this study changed due to the Coronavirus pandemic. Due to COVID-19, the research was shifted to an autoethnography. The researcher wrote about their distance learning teaching experiences for eight weeks. The journals then underwent content analysis to find reoccurring themes. The five reoccurring themes found throughout the journals were: communication with students, expressing emotions about distance learning, student work completion, work/home balance, and collaboration. From the autoethnography the researcher determined communication with students and collaboration with staff members were vital aspects of teaching during a pandemic. Communication with students allows relationships to form and increases student work completion. Collaboration with fellow staff members allows teachers to learn from each other's ideas and challenges. They are then able to use their peers' experiences to impact their own instruction.

Keywords: Mathematical Discourse, COVID-19, Coronavirus Pandemic

### Dedication

I would like to thank my parents for always pushing me to be someone I am proud of. They have shown me what true strength and determination looks like. I would also like to thank my partner, Mark, for his constant support throughout this process.

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## Chapter One

### Introduction

#### General Problem/Issue

In mathematics, students are often so focused on getting the ‘correct answer.’ In their journey to find the ‘correct answer,’ students become so focused on the process that they are not able to explain their thinking or reasoning behind why this process works. Because of this, there is a need for mathematical discourse in the classroom. According to Lynch and Bolyard (2012), mathematical discourse is “the written and spoken mathematical communication that occurs in a classroom” (p. 488). In a classroom where mathematical discourse is present, students are able to explain their reasoning, agree or disagree with peers, ask questions, and discuss their thinking to develop their understanding of mathematics (Stein, 2007). Engaging in mathematical discourse is not something that students naturally partake in. Because of this, teachers need to explicitly teach mathematical discourse techniques and set clear classroom expectations about discourse (Nguyen Batista and Chapin, 2019, p. 299-300). Before I expect my students to partake in mathematical discourse, I would first need to explicitly teach my students what mathematical discourse will look like in our classroom.

Throughout this study, I would have been evaluating how mathematical discourse impacts my students’ learning and feelings about mathematics. In order for this to take place, I would have needed to create multiple opportunities for my students to partake in discourse. This would have occurred with intentionally selecting, ‘open tasks’ as suggested by Liao Hodge and Walther (2017, p. 432). These tasks would have required my “students to evaluate and interpret perspectives, ideas, and mathematical arguments of others as well as construct valid arguments of their own” (Bennett, 2014, p. 20). The goal of these tasks would have been to engage my



students in mathematics while also deepening their learning and understanding of mathematics concepts.

Mathematical discourse provides students with engaging opportunities to explain, justify, and clarify their mathematical thought process. The purpose of this study was to determine the impact mathematical discourse has on students' learning and feelings about mathematics. This study had the potential to positively impact my instruction. Throughout this study, I would have hoped to determine if mathematical discourse would deepen my students' understanding and confidence about math.

### **Subjects and Settings**

**Description of setting.** Students who would have been involved in this study would have been 7<sup>th</sup> graders in the school year 2019-2020. The students lived and attended school on a Native American Reservation in rural Minnesota. In the district there are two buildings – elementary (pre-k – 4<sup>th</sup> grade) and secondary (5<sup>th</sup> – 12<sup>th</sup> grade). The district had a total of 720 students. 67% of the students in the district qualified for free or reduced lunch. The race/ethnicity of the school was as follows:

- American Indian or Alaskan Native 55.3%
- Two or more races 26.8%
- White 15.7%
- Hispanic or Latino 1.9%
- Asian 0.1%
- Hawaiian or Pacific Islander 0.1%

**Student description and selection criteria.** In this study, I would have followed all 40 7<sup>th</sup> graders enrolled in my math classes. Students were split into two sections. One section had 17

students and the other had 23 students. Of the 40 students, 20 of them were boys and 20 of them were girls. Two of the students had an IEP and two of the students had 504 accommodations. On their 6<sup>th</sup> grade Minnesota Comprehensive Assessment (MCA) for math, 23% of the students scored a Meet or Exceeds, 34% of the students scored a Partially Meets, and 43% of the students scored a Does Not Meet.

### **Informed Consent**

In order to conduct this study, permission would have been obtained from the Institutional Review Board at Minnesota State University Moorhead. Protocol from the Institutional Review Board would have been followed strictly. Permission for this study also would have been obtained by administration at the school district. Historical data would have been used for this study. Because of this, consent would not have been required from student participants or parents. The subjects of the study would have been at no more than minimal risk because the research would have been within the norms of regular classroom instruction. Confidentiality would have been maintained by using pseudonyms when necessary on student work samples.

## **Chapter Two**

### **Review of Literature**

The purpose of this study was going to see how incorporating mathematical discourse into the classroom impacts instruction, student learning and feelings about math. Before I would have been able to incorporate mathematical discourse into my instruction, I first needed to study the current research about mathematical discourse.

#### **Mathematical Discourse**

Mathematical discourse is “the written and spoken mathematical communication that occurs in a classroom” (Lynch & Bolyard, 2012, p. 488). According to Buchheister et al. (2019) mathematical discourse “enhances mathematical thinking and reasoning” (p. 204). This idea of deepening students’ thinking through mathematical discourse is echoed by Bennett (2014). Bennett (2014) states, “Discourse requires students to evaluate and interpret the perspectives, ideas, and mathematical arguments of others as well as construct valid arguments of their own” (p. 20). To encourage higher order thinking and discourse, teachers should implement open ended, delicately chosen tasks. Through these tasks, “students learn they can make sense of mathematics in their own ways, make mathematically convincing arguments, and critique and build on ideas of their peers” (Humphreys & Parker, 2015, p. 5).

#### **Creating a Classroom with Mathematical Discourse**

Hufferd-Ackles, Fuson and Sherin (2004) stated, “Opening up one’s classroom to students’ ideas is the critical first step in achieving a discourse community” (p. 113). This idea of incorporating students’ ideas into the classroom is echoed by Nguyen Batista and Chapin (2019). Nguyen Batista and Chapin (2019) prioritize creating a classroom with norms of respect towards peers that allow students to take academic risks (p. 299). Through these academic risks, students

are able to learn from mistakes and peers while developing their own understanding of mathematics. According to Stein (2007), teachers who provided opportunities of discourse “set expectations that all students would learn, and established classroom relationships and management systems based on respect” (p. 286). By creating a classroom where students have a sense of security, students feel encouraged to take risks and participate in discourse. Without these set expectations, not all students will feel safe to participate in discourse, thus not all students will fully embrace the mathematical discourse process.

**Student voice.** Student voice is a major component for mathematical discourse. When selecting and structuring tasks for mathematical discourse, it is important for teachers to design tasks that allow students to share their voice (Buchheister et al., 2019, p. 206). “Without explicitly and purposefully attending to whose voice is represented in classroom conversations or valuing the out of school knowledge that students bring, teachers are not giving students the support, confidence, or opportunities necessary to reach their highest levels of mathematical success” (Buchheister et al., 2019, p. 206). The idea of creating tasks that encourage discussion from all students ties back to setting up the classroom with norms of respect. Without setting the classroom expectations of a safe environment for all learners to express their thoughts, student voice will not be present. All students need to be given the opportunity to share their voice. When given the opportunity for all students to share their voice, diverse conversations will be cultivated. During these diverse conversations, students will be given the opportunity to argue their ideas, stretch their understanding of mathematical concepts, and question their peers in a safe environment. Buchheister et al. (2019), states “Developing this culture of learning enhances sense making and motivates each and every student to remain engaged in creative brainstorming while discussing similarities, differences, and relationships among the observations” (p. 207).

This type of engagement as discussed by Buchheister et al. (2019) is a major reason for the reform in math instruction and the incorporation of mathematical discourse into the classroom.

**Teacher's facilitation of learning.** In a classroom where mathematical discourse is valued, the teacher's main role is to act as a facilitator to learning. Walshaw and Anthony (2008) agree with Buchheister et al. (2019) that student voice is a pivotal part of mathematical discourse. However, unlike Buchheister, they did highlight the need for teachers to also be a part of the conversation. Walshaw and Anthony (2008) stated, "The most effective settings provide balance between opportunities for students to benefit from teacher telling and students' involvement in discussion and debate" (p. 539). This addition of balance between teacher instruction and student discussion is important for the mathematical classroom.

According to Nathan and Knuth (2003), "Teachers also need to continually monitor where the discourse is going, and have some criteria for deciding how they know when the class has arrived" (p. 204). By continually monitoring progress, teachers are able to determine when they need to intervene and when they can encourage productive struggle. While monitoring progress, educators should require students to explain their thinking. Gresham and Shannon (2017) found "Pressing students to clarify their own thinking during classroom discourse was crucial as students developed ideas and improved their reasoning when asked to conjecture, explain, and justify their solutions to others" (p. 365). Explaining their thinking not only encourages students to partake in the mathematical discourse process, but also encourages the deeper levels of thinking sought after by teachers. Teachers should also be flexible and responsive to student discourse. This means they "should be deliberate about what topics to pursue with the group as a whole and which to assign as individual work, thoughtful about when

to ‘tell’ students and when to let them struggle, and conscious of how to address both short-and long- term curricular goals” (Manouchehri, 2007, p. 299)

### **Tasks That Promote Mathematical Discourse**

When creating and selecting tasks that promote mathematical discourse, teachers need to be intentional about their selection. Teachers should select ‘quality task’ for their students. “Quality tasks spark curiosity and foster engagement... connect and extend content” (Krall, 2018, p. 70). By creating tasks that spark curiosity and engagement while connecting and extending content, students are able to expand on their mathematical knowledge with excitement.

When incorporating mathematical discourse into instruction, it is important for teachers to remember they do not have to reinvent all of their lessons. Liao Hodge and Walther (2017) suggest teachers revise their current or existing tasks to create more ‘open tasks’. In these open tasks, teachers should provide students with choice, remove too much teacher support, encourage students to find more than one solution, require justification of answers, and provide real-world context (432).

Newell and Orton (2018) encourage teachers to incorporate routines into their instruction that promote discourse. The routines suggested by Newell and Orton (2018) present students with an image or visual prompt and then ask students to “engage in authentic discourse that moves the learning of the whole class forward while the teacher records thinking and supports students as they make connections between ideas” (p. 95). Humphreys and Parker (2015) also suggested using visual prompts to spark discourse. These visual prompts allow both teachers and students “to embrace confusion, knowing that it can be the beginning of new understandings” (Humphreys & Parker, 2015, p. 29).

Finally, Lynch and Bolyard (2012) encourage teachers to provide opportunities for students to take part in written discourse stating written discourse “creates a record of students’ work, allowing educators to assess strengths and weaknesses in students’ metacognitive and mathematical problem-solving skills” (p. 488). Allowing students to write down and justify their thinking truly embraces the process of implementing mathematical discourse into the classroom.

### **Conclusion**

Mathematical discourse is found in classrooms that strive for deeper mathematical understanding. In order for this deeper understanding through discourse to occur, teachers must first set their classrooms up for mathematical discourse. The teacher must set clear expectations and create a welcoming environment that encourages students to take safe, educational risks. Teachers need to be thoughtful in their task selection if they want to incorporate mathematical discourse in their classroom. These tasks should “spark curiosity and foster engagement” (Krall, 2018, p. 70). By promoting and incorporating opportunities for mathematical discourse, teachers will encourage students to deepen their understanding of mathematical concepts, develop arguments, and respect peers’ perspectives.

### **Definition of Terms**

For the purpose of this study the following term is defined:

*Mathematical discourse*: the oral or written communication about mathematical concepts that occurs in a classroom.

### **Hypothesis**

As previously stated, the purpose of this study would have been to see how incorporating mathematical discourse into the classroom impacts instruction, student learning and feelings about math. After analyzing the current research about mathematical discourse, I hypothesis

incorporating mathematical discourse into my classroom would have positively impacted my instruction, and student's learning and feelings about math. Incorporating mathematical discourse into my instruction would have shifted my role from the main person talking in the classroom to more of a facilitator that would have encouraged my students to be the main people talking in the classroom. By giving my students the opportunity to talk about math, I think their feelings about math would have also improved. They would have felt as though they had more responsibility in their learning rather than being passive participants in their education.



## Chapter Three

### Data Collection

#### Research Question

After teaching 7<sup>th</sup> and 8<sup>th</sup> grade math for five years, I have continued to watch my students focus on being ‘correct’ rather than truly understanding mathematics. Over the last year, I have found interest in how increasing mathematical discourse will impact my students’ understanding and mathematical reasoning. This has led me to my original research question: How does the incorporation of mathematical discourse impact student learning and instruction. I had three sub questions 1) To what extent are students able to apply discourse? 2) To what extent is the teacher (myself) able to promote discourse? 3) How does mathematical discourse impact students’ feelings about math?

#### Methods

**Instruction and modeling.** Before my students would have been able to partake in mathematical discourse, I would have needed to first teach them what mathematical discourse is and how it looks. In order to do this, I would have begun by modeling mathematical discourse to my students. We then would have created an anchor chart explaining what mathematical discourse would have sounded and looked like in our classroom (Nguyen Batista & Chapin, 2019, p. 300). Next, students would have been provided with opportunities to practice using discourse in our classroom. I would have begun by using activities that all students would have found success. This would have allowed all students the opportunity to practice this skill. During these activities, we would have referred back to our anchor chart to assess our discourse efforts. After I knew my students understood mathematical discourse, I would have continued

fostering the development of this skill through purposefully chosen tasks that would have provided opportunities for discourse (Liao Hodge & Walther 2017, p. 432).

**Data collection.** Prior to teaching my students about mathematical discourse I would have taken baseline data. I would have collected student work samples that provided examples of students explaining their ideas about mathematical concepts. I also would have had students complete the survey in Appendix B. This survey would have asked students about their feelings of mathematics. Finally, I would have had my administrator who was going to help with observations come in and complete the Discourse Rubric found in Appendix A. This rubric was adapted from Hufferd-Ackles, Fuson & Gamoran Sherin (2004).

After students would have been taught and modeled mathematical discourse, I would have incorporated mathematical discourse into my instruction for six weeks. Throughout the six weeks, I would have collected student work samples weekly. These work samples would have provided examples of students justifying and explaining their mathematical ideas. I would have used these work samples to see how students' explanations changed throughout the action research. I would have had an administrator come into my classroom twice a week to complete the Discourse Rubric (Appendix A). The Discourse Rubric would have allowed me to see the levels of discourse my students and I would have been participating in. I would have used the biweekly-completed rubrics to assess if mathematical discourse was occurring and to what extent. At the end of the six weeks, I would have had the students complete the student survey again to see how their feelings about mathematics have changed (Appendix B).

**Data analysis.** Student surveys (Appendix B) would have been analyzed at the six weeks. I would have used the pre and post surveys to analyze changes in students' feelings about math after implementing mathematical discourse into my instruction. Discussion Rubrics

(Appendix A) would have been analyzed at the end of each week. I would have used the rubric completed by administration to determine my students' needs for discourse intervention and to gauge my own facilitation of discourse in the classroom. These rubrics would have been pivotal in monitoring if and to what extent mathematical discourse was being implemented throughout the action research. Finally, I would have analyzed weekly student work samples to determine if growth in explaining mathematical ideas was occurring.

### **Ethical Issues**

To protect the subjects of this action research, my students, I would have used pseudonyms. I also would have ensured no identifying characteristics would be shared. To prevent researcher bias, I would have had an administrator complete the Discourse Rubric twice a week. This would have provided an outsider's perspective in regards to discourse in my classroom. I would have chosen the administrator because he is knowledgeable about mathematical discourse and would have provided an unbiased completion of the rubric biweekly.

### **Autoethnography Due To Coronavirus**

The content in Chapter 3 was my initial plan for my Action Research project; however, due to the Coronavirus pandemic I needed to change my research into an autoethnography approach.

### **Autoethnography**

For the purposes of this study an autoethnographic approach was used to follow my, the researcher, experiences and responses to teaching during the Coronavirus Pandemic.

“Autoethnography is an approach to research and writing that seeks to describe and systematically analyze (graphy) personal experiences (auto) in order to understand cultural

experience (ethno)” (Ellis, Adams, & Bochner, 2011, p. 273). Journal entries were collected throughout the school closure describing my experiences as a teacher during a global pandemic. The journal entries were daily between March 30<sup>th</sup> and April 28<sup>th</sup>. Between April 29<sup>th</sup> and May 22<sup>nd</sup>, the journal entries occurred three times a week. In these eight weeks of journaling I discussed how I adjusted to Distance Learning, my struggles, my successes, and my thoughts. These journal entries were then reviewed using content analysis for common themes.

### **Content Analysis**

In order to transform my journal entries into an autoethnography I had to first perform content analysis. “The objective in qualitative content analysis is to systematically transform a large amount of text into a highly organized and concise summary of key results” (Erlingsson & Brysiewicz, 2017, p. 94). I began by coding each line of my journal entries. These codes described each individual line of the journal entries. After coding, common themes were found. The reoccurring themes found throughout my journal entries were: communication with students, expressing emotions about distance learning, student work completion, work/home balance, and collaboration. These themes are analyzed in Chapter Four.

## Chapter Four

### Results

The Coronavirus Pandemic of 2020 impacted the education world. Beginning March 18<sup>th</sup>, 2020 in accordance with Governor Tim Walz's orders, Minnesota schools were shutdown to protect our communities. Distance learning was replaced with traditional classroom learning. Teachers were tasked with planning, preparing, and executing equitable education without in person interactions with students. Due to the global pandemic, my original action research was not feasible. My research transformed into an autoethnography with the research question, "what has been my experience during the COVID-19 school closure crisis?"

#### Data Collection

On March 30<sup>th</sup>, 2020 I began to write journal entries explaining my personal experiences as a teacher during COVID-19. These journal entries started on my first official day of distance learning. I maintained a daily journal for the first five weeks of distance learning (until April 29<sup>th</sup>, 2020). After April 29<sup>th</sup>, I began to write in the journal three times a week until the end of the school year on May 22<sup>nd</sup>, 2020. In total, the journal entries spanned eight weeks of distance learning.

After collecting my journals, I then analyzed the daily entries for common themes using content analysis. The five reoccurring themes in my journal entries were: communication with students, expressing emotions about distance learning, student work completion, work/home balance, and collaboration.

**Data Analysis**

**Common Themes**

Table 1  
Common themes found throughout journal entries

<b>Theme</b>	<b>Situational Occurrences Throughout Study</b>
Communication with students	60
Expressing emotions about distance learning	48
Student work completion	42
Work/home balance	37
Collaboration	23

**Communication with students.** Communication with students was the theme that occurred most often throughout my journal entries. Nearly everyday I discussed communicating with students in some fashion. This included one-on-one student meetings, using technology for communication, class meetings, taking attendance, and working to build relationships. Communication was one of my main priorities when setting out into distance learning. I wanted my students to feel supported in any way they needed. Without open, timely, and frequent communication this would not be possible.

Table 2  
Examples of communication with students found throughout journal entries

<b>Communication with Students</b>	<b>Situational Occurrences Throughout Study</b>
One-on-one student meetings	19
Building relationships	15
Using technology for communication	10
Class meetings	8
Attendance	8

***Instances of one-on-one student meetings.***

*This morning I had a zoom meeting with her. We worked together to get her assignments organized for the week.*

*Today I had another Zoom meeting with the student that reached out on Sunday saying they were struggling with distance learning. They said it was going much better for them. We decided to make this a twice a week deal. We will have a Zoom meeting two days each week to ensure they are staying caught up on assignments and understanding material. In our short 30 minute meeting we were able to complete three of their assignments that were giving them trouble.*

*I was able to set up a Zoom meeting with a student that reached out expressing they are overwhelmed. We met for about an hour and completed 5 assignments for my class and their science class.*

*I have been able to set up Zoom meetings with three of my students for tomorrow.*

*I was able to work with a student on Google Meets today to complete all of their assignments...I was able to take the day today to work with them on not just math, but all of their classes. After about 3 hours of work we are almost caught up. They only have 1 more week of assignments to complete. We plan to meet up again on Monday to finish these and finish their assignments for next week.*

*I only met with one student to work on an assignment and it was a quick five minute meeting.*

***Instances of building relationships.***

*I am going to scale back on my expectations and focus on making relationships with my students.*

*I want to focus on building relationships and helping to ease the stress for my students and their families.*

*I feel like I was able to make an impact and connection with certain students that I do not typically make connections with. I think distance learning has helped to build relationships with students.*

*As I work to continue building relationships with my students, I was able to have a great conversation with a student today that typically struggles with school. We talked about how things are going for them and what type of support they need.*

*I have increased my interactions with students. I hope this will help with building these relationships. This is such a different way to build relationships, but it is working.*

***Instances of using technology for communication.***

*For our daily communication with our students, we are using Remind, Google Classroom, email, and phone calls.*

*She was also able to get these students set up on the Remind App. In just the one day these students have already used the app to ask questions and get some help on assignments.*

*I started my morning by emailing and making connections with all students that have missing assignments out.*

*I also spent my time messaging and emailing students with missing assignments. I do not want them to fall behind! I have encouraged these students to meet with me on Zoom or Google Meets to complete the assignments. I had a few students interested in this. I hope this will help them be successful. I plan to call students that do not have the internet tomorrow and see how I can help them. Hopefully I can get them caught up as well!*

***Instances of class meetings.***

*I posted on Friday asking my students if they would like to have a Zoom meeting. I told them it would not need to be academic, just an opportunity for us to say “hi” and for them to see their classmates. I had a lot of students that were interested in this. I will be working this week to be setting this up. I am excited for this.*

*Today I set up our class Zoom meetings. They will be set for tomorrow and will be 30 minutes each. I am excited to see my students and hope they will join!*

*I had Zoom meetings with my 7th and 8th graders. They were each 30 minutes long. Only 5 7th graders and 4 8th graders joined; however, the ones that joined loved it! We decided to do a weekly meeting to just touch base. I am hoping this will also encourage more kids to reach out if necessary.*

*As for today, I hosted my classwide Zoom with my 7th and 8th graders today. I always love these. I had two students join this week that do not typically join. This was fun! My students have said they really enjoy these unstructured Zoom meetings. It gives them a chance to see their classmates and just hangout.*

***Instances of attendance.***

*Checking in 71 students was quite a bit of work. I created a Remind App Account for all of the Junior High teachers to use. The thought was this would help centralize communication. When a student checks in all of us would be able to see it. In theory this would be great, but it did not work well today!*



*Students were definitely getting the hang of the assignments and checking in. The Remind App was way easier today. Students were able to ‘check in’ and other teachers were able to use this for attendance. As for students, we had 11 of our 71 7th and 8th graders not check in yesterday.*

*By the end of the day we were only unable to get in contact with 1 of our 71 students. We will try again tomorrow.*

*Still struggling to connect with a couple of students. Hope to have this figured out by next week. I do not want to see these students fall behind.*

Transitioning from communicating with students in the classroom and hallways to communicating with students through distance learning can be difficult. In the classroom you are able to use a student’s body language to determine their needs. Over the Internet or through paper packets, this is not an option. Creativity and flexibility with communication is necessary for distance learning. This type of communication allows students to continue to build relationships and obtain academic support.

**Expressing emotions about distance learning.** The second common theme identified throughout the journal entries was expressing emotions about distance learning. Being thrown into distance learning, I expressed a variety of emotions some positive and some negative. Throughout my journals, I shared my emotions freely and often. I also relayed the emotions of my students after meeting with them. Writing my emotions throughout distance learning allowed me to process the unprecedented time and reflect on my student’s and my needs.

Table 3  
Examples of expressing emotions about distance learning found throughout journal entries

<b>Expressing Emotions About Distance Learning</b>	<b>Situational Occurrences Throughout Study</b>
Positive emotions	16
Relaying student emotions	14
Missing students	10
Negative emotions (worry, stress, frustration, etc.)	8

***Instances of expressing positive emotions.***

*Overall, I think the day went as expected. There were hiccups, but I think that was to be expected. I am excited to see how this will work out.*

*I feel like all of our hard work is paying off! If it wasn't for Distance Learning I don't know if I would have realized this. I needed this today.*

*What a unique experience distance learning has brought us! Overall, today was positive.*

*I am excited to see them and help them feel success.*

*I think this week went well. I have ironed out the kinks of distance learning.*

*I cannot believe we are almost at our last week of school! This has been a crazy experience. I am so thankful for this opportunity to grow.*

***Instances of relaying student emotions.***

*I have asked a few if they are starting to miss school and they have said "kind of."*

*We also talked about her struggles to complete assignments due to having 6 other siblings in the home. She explained how hard it was to focus.*

*They were very proud of themselves and I could tell they were not used to the positive reinforcement from school.*

*The students are missing school. They have said they never thought they would miss school like they are now. They are missing the social interactions.*

*A few students talked about how they were struggling to stay motivated*

***Instances of missing students.***

*I miss having my students roam the halls and greet me in the morning. I miss having a classroom full of laughter and thinking. I miss seeing all of my students each day. I am still hopeful we will return to school before the end of the school year.*

*I am also missing this. I miss talking with my students and getting to know them.*

*I am really missing the interaction with other staff members and my students. I feel like I am struggling to stay positive today. I want to be wrapping up the school year with my students. I miss being able to do the "fun" end of the year activities with them. I miss seeing the excitement about how much they have grown as mathematicians throughout the year. I am hopeful we will be able to go to school in the fall.*

*I am really going to miss each of them, but I do not think I will miss Distance Learning.*

***Instances of expressing negative emotions (worry, stress, frustration, etc.).***

*I feel like I am able to support my students with internet way more than I am able to support my students without internet. This has been something I am struggling greatly with. I do not like this.*

*I am worried, sad, anxious for them. I want them to feel safe, confident, and happy in their education. How can I do this for them? I know how overwhelming online education is for me as an adult who is enrolled in a few classes at a time. I can only imagine how overwhelming it is for a 7th or 8th grader that is trying to manage 8 classes.*

*We also discussed the equity piece of distance learning. As I have mentioned, this is something I struggle with greatly. I do not know what my students are enduring and I know some students lack the resources necessary for online distance learning.*

*I am hopeful we will be able to go to school in the fall. Some people are saying they do not think we will be back to school in the fall. This scares me. It has been one thing to have distance learning after you already know your students, but having distance learning at the beginning of the year without any knowledge of who your students are will be extremely difficult. How will I be able to build relationships? I guess this is something to worry about later. No need in spending my energy worrying about it now.*

Distance learning while living through a global pandemic can evoke many emotions as an educator. There are feelings of pride and joy when contact is made with students or when a student finds success. However, there are also feelings of stress and worry when these experiences do not happen for another student. Distance learning brought out a multitude of emotions for both teachers and students.

**Student Work Completion.** The third common theme throughout the journal entries was student work completion. Due to a lack of resources for some students, student work completion was found through online assignments and paper packets. While maneuvering through distance learning, I tried to be very cognizant of the type of work and workload I was expecting of my students. Through this experience, I felt proud of my students because of the work they produced.

Table 4  
Examples of student work completion found throughout journal entries

Student Work Completion	Situational Occurrences Throughout Study
Work completion for students using online platforms	14
Work completion for students completing paper packets	14
Type of assignments and workload for students	8
Proud of students' work completion	6

***Instances of work completion for students using online platforms.***

*Overall, students seem to be responding positively to the online assignments.*

*Today my focus was on making sure students were not only checking in, but also completing their assignments. Myself and another teacher noticed yesterday that students would “check in” but not complete any of their assignments. To do this, I made extra contact with each of the students that did not do yesterday or Monday’s assignments. I think this was helpful because most of them then completed the assignments.*

*She was able to bring them Chromebooks and make sure they were set up on and understanding their Google Classrooms. I noticed such a positive response from this from my students. Students who have struggled to turn in work turned in all of their work from the last two weeks of distance learning.*

*I have noticed quite a few of my students were able to get all of this week's assignments completed already and it is only Tuesday!*

***Instances of work completion for students completing paper packets.***

*Today I had to go into school to get the packets ready for next week and collect assignments from the previous week. As this was our first week doing this exchange, it was a bit of a mess. Some students did not return their folders and work. This meant we did not have anywhere to put their work for next week and we did not have anything to grade for them... As for grading work, this seemed to go pretty smoothly. The students that turned in their work did very well!*

*I went into school today to collect and organize packets. I was pleasantly surprised by the number of students who completed their packets.*

*I went into school today to pick up and grade student packets. I have noticed work completion is getting less and less. I am struggling to find ways to motivate the students that do not have Internet access. It is difficult because I am not able to Zoom with them to get their assignments*

*completed. I am able to call some, but not all have working phone numbers. I will continue working with the cultural liaison to increase student work completion.*

***Instances of types of assignments and workload for students.***

*I think my first week of assignments was probably a little too much. I am going to scale back on my expectations and focus on making relationships with my students. I want them to feel success.*

*Everything I plan to provide my students with for distance learning material is all review. I did this because I want my students to hopefully feel success in this.*

*During my class wide Zoom I asked my students if they thought the assignments for my class were too much to handle. They said no. I was very happy to hear this as this has been something I have been trying to be cognizant of.*

*I am happy that I chose to do all review assignments with my students. I think this has helped them to feel successful and helped them to prepare for next year.*

***Instances of being proud of students' work completion.***

*I am honestly happy and proud of how my students did on the quiz. My focus this year has been on mathematical discourse... For a majority of students this went really well! Talking or writing about math was a huge struggle for us at the beginning of the year, so it was so great to see the growth.*

*I was so proud of her, and let her know this.*

*WOW! I had a student that struggled to get any assignments completed during non-distance learning submit all of their distance learning assignments yesterday.*

*I was impressed with the number of students that completed their assignments this week. Work completion has been even better than it is during non-distance learning. I was very surprised by this.*

Throughout distance learning, work completion was the main way to gauge student understanding. Work completion was found in multiple ways including the use of online platforms and paper packets. As a teacher, it was necessary to be cognizant of student needs and home life when creating assignments and determining workload. Throughout my journal entries I expressed pride of my students work samples multiple times. Seeing my students being successful brought forth many positive emotions.

**Work/home balance.** The fourth common theme found throughout my journal entries was finding a work/home balance. With distance learning, my home also became my work zone. Throughout my entries, I talked about my struggles and success to find a balance between my personal time and my time as an educator.

Table 5  
Examples of work/home balance found throughout journal entries

<b>Work/Home Balance</b>	<b>Situational Occurrences Throughout Study</b>
Personal time	10
Working outside of school hours	9
Overall experience	9
Relaying students' experiences with work/home balance	9

***Instances of personal time.***

*Today I did a much better job removing myself from the stress of distance learning. I was able to focus on my grad school work. After that, I was able to take some time for myself. I worked out and went on a nice long walk. I need to remember to take some time for myself during this. This is so hard to remember when my work and home is now one place.*

*Today was Easter, so I did not spend any of my time today as a teacher. I unplugged myself from my devices and took time for my family and myself. This was so nice. I needed this break. As I discussed last week, I need to remember to take time for myself. I feel as though I am rejuvenated and ready to tackle another week!*

*Today I was able to step away from work and get outside. Going on walks outside are one of the most refreshing and renewing activities that I can do. So, this was just what I needed. I am hopeful this week I will be able to continue taking time for myself and keeping work/home boundaries.*

***Instances of working outside of school hours.***

*I find it hard to separate work and home during Distance Learning. I found myself working until about 5pm.*

*Although today was not a contracted school day, I decided to take the time to focus on grading and emailing students. I thought if I did this I would be less likely to worry about these things over the weekend*

*At around 6 pm, I began preparing for the week. I wish I wouldn't have procrastinated this.*

*The only problem with this is they do not wake up until around 4 pm. This means we are not able to meet until after dinnertime. This makes it hard for me to keep work/home boundaries like I have discussed; however, I am more than willing to do what it takes to help my students be successful.*

***Instances of overall experiences with work/home balance.***

*Today I was able to work from home. We are currently required to work at school two days a week (Tuesday and Wednesday). It is nice working from home; however, I do not think I am nearly as productive as I am when I work at school.*

*Before Distance Learning, I worked hard to not do 'school work' at home. I set up this guideline for myself because I am someone who easily overworks and obsesses about school. However, now working from home I am struggling to keep this guideline. To help with this I decided to set a daily alarm clock for 4 pm each day. Hopefully this will help me to separate work and school.*

*It was nice to go into school today. I feel like going into school helps me to separate work and home. When I got home, I was able to focus on myself and relax.*

***Instances of relaying students' experiences with work/home balance.***

*I have talked to a few students and they are struggling to keep a routine. They are going to bed too late and having trouble waking up and completing their work. I have talked with them about creating a schedule and sticking to this schedule.*

*All of the students that met said they work between 1 to 4 hours a day on homework.*

Distance learning disturbed the daily routine of educators, students, and families.

Throughout my journal entries, I found myself trying to figure out a healthy balance of work and personal time. Throughout my experiences, I found setting an alarm and sticking to a schedule to be helpful. However, due to my students' own schedules, I was not always able to stick to this routine.

**Collaboration.** The final reoccurring theme throughout my journal entries was collaboration. Throughout distance learning I was able to work with my fellow teachers and our districts cultural liaison to meet the needs of my students. I used staff meetings as a time to learn

from my peers’ experiences and to share my own success and struggles. Finally, I worked with my building principal for future planning purposes.

Table 6  
Examples of collaboration found throughout journal entries

<b>Collaboration</b>	<b>Situational Occurrences Throughout Study</b>
Fellow teachers	9
Cultural liaison	6
Staff meetings	4
Principal	4

***Instances of collaboration with fellow teachers.***

*Up to this point, I have been working with my fellow Junior High teachers to find the best ways to communicate and deliver instruction to our students.*

*I also connected with the two other math teachers in my district. We were able to discuss our triumphs and struggles as well as share resources. This was so helpful! One of the teachers suggested a website called GoFormative for assessments.*

*I need to think of more ways to reach out to the students that do not have access to the internet. I have asked my coworkers what they are doing for these students, and they are also struggling with communication with these students.*

***Instances of collaboration with cultural liaison.***

*So, today I worked with our cultural liaison and Indian Ed Coordinator to get in contact with these students and their families. They were so helpful! They had connections to the students that helped us get in contact with them. Without these two, we would have not been able to get in contact with these 11 students due to lack of internet or disconnected phones.*

*I will continue working with the cultural liaison to increase student work completion.*

***Instances of staff meetings.***

*We had an optional staff zoom meeting today that I attended. It was nice to see my coworkers and hear about their success/stresses. I was able to get a few ideas from them. For example, cleaning up my Google Classroom to make it a little easier for my students to manage.*

*This morning we had an all staff meeting to discuss Governor Walz’s announcement and what the rest of the year will look like.*



***Instances of collaboration with principal.***

*I have also been working with my principal to get something set up for our Seniors. This senior class holds a special place in my heart because they were my first group of 8th graders. We decided to get a parade going for our Seniors. We are going to send out a Google Sheet tomorrow to see who would be interested in joining our parade for our Seniors.*

Distance learning encouraged collaboration amongst my coworkers and myself.

Throughout my journal entries, I found myself asking for ideas and opinions from my peers. I was able to lean on them for support. The collaboration from my peers always brought on positive emotions and hope for distance learning.

**Conclusions**

As COVID-19 began spreading, teachers were forced to rebuild their curriculum and provide an equitable learning experience for their students through distance learning. Journaling throughout the pandemic provided a personal insight of the experiences teachers were having throughout this time. Collaboration amongst fellow teachers and staff members created a community of support during this unprecedented time. Exchanging ideas and sharing tribulations allowed staff to grow with one another. Communication during this time was essential. Communication with staff, families, and students allowed for connections to be made outside of the traditional classroom. Communication with students helped increase work completion and helped students find academic success. COVID-19 disrupted the daily routine of students and teachers; however, despite the pandemic with flexibility and creativity relationships could still be fostered.

## Chapter 5

### Implications for Practice

#### Action Plan

**Mathematical discourse.** Although I was not able to implement mathematical discourse into my classroom, I do plan to incorporate it into my classroom during the 2020-2021 school year. In my future instruction I will follow the guidelines for introducing mathematical discourse I found in my literature review.

To begin, I will set the expectations of mathematical discourse for my students. We will build a culture of respect that allows each student to take academic risks (Nguyen Batista & Chapin, 2019, p. 299). Next, I will model what mathematical looks and sounds like. After modeling mathematical discourse, we will create an anchor chart as a class setting the expectations for discourse in our classroom. Then I will carefully select “open tasks” that allow my students to engage and participate in mathematical discourse with their peers.

The reason I plan to follow through on my original goal of incorporating discourse into my classroom is because I believe it to be best practice for my students. My students will become the leaders of their instruction and will learn how to engage in conversation about mathematics with their peers. As I take on the role of facilitator, my students will deepen their understanding of mathematics. They will no longer be memorizing steps or formulas to solve a problem. Rather they will be justifying steps and formulas to solve problems. They will be able to test their theories and learn from their peers.

I believe mathematical discourse will truly change my students' feelings about mathematics. By incorporating discourse into my classroom my students will become more engaged and less frustrated with the monotony of what my math instruction once was.

**Pandemic instruction.** In the case our school year does not return to “normal” in the Fall, I will use the information I obtain from my autoethnography to better guide my distance learning instruction. If the 2020-2021 school year returns to the traditional format, I will also be able to use my experiences of teaching during a pandemic to best meet the needs of my students.

The Coronavirus Pandemic forced educators to reimagine teaching. We were forced to recreate lessons, be creative about instruction delivery, and build relationships in unique ways. Throughout my journal entries from COVID-19 teaching, I focused on student communication. This can be focused on with or without distance learning. In my future, I plan to continue fostering relationships with my students. These relationships will also help when incorporating mathematical discourse into my classroom. By having open communication with my students I will be able to gauge their level of understanding to determine my instruction. I will use my students' voice to create flexible and personalized learning experiences.

In my journals I discussed collaborating with the other staff members in my building. I savored the moments when I could share ideas and learn from my peers. As I continue teaching, I will also continue collaborating with other members of my learning community. This will help me to continue growing as a professional. Prior to pandemic instruction, I thought I was collaborating with my coworkers. We would share ideas in passing during meetings or lunch; however, these interactions often did not have follow through. Pandemic instruction showed me how truly valuable follow through is during collaboration. I was able to use my peers' success

and mistakes to tweak my instruction. As I continue teaching, I plan to continue opening up opportunities for collaboration with my peers so I can become better for my students and myself.

### **Plan for Sharing**

**Mathematical discourse.** I plan to share my findings about mathematical discourse with my department Professional Learning Community (PLC). Each year we pick a topic to focus on for lesson studies, and this was one of the topics we have recently discussed. I hope to bring the conversation about mathematical discourse back to the table in hopes of starting lesson studies for the topic. This would allow us as a department to fully implement mathematical discourse into our classes. If my fellow teachers were also incorporating mathematical discourse into their classroom I would be able to share the research I found while writing my literature review. I would also share the rubrics for mathematical discourse I adapted from Hufferd-Ackles, Fuson & Gamoran Sherin (2004). We would be able to use these rubrics throughout our lesson study process.

**Pandemic instruction.** Due to the uncertainty of the 2020-2021 school year, I am unsure of how and to what extent I will be able to share my findings of pandemic instruction. If we are going to continue distance learning I hope to share my findings with my peers during our staff meetings. Due to staff changes, I will likely be asked to be a mentor this year. If this is the case, I will use my experiences of teaching during the COVID-19 pandemic to help guide my mentee through distance learning. I will encourage them to find unique ways to build and foster relationships with students and families. I will also help my mentee to create flexible curriculum that students will be able to do with minimal support if necessary (for students without access to internet or devices). Finally, I will help my mentee to create lessons that are engaging despite the untraditional manner in which we will be teaching.

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Appendix A

**Discourse Rubric<sup>1</sup>**

**Facilitation of Mathematical Discourse from the teacher**

Level	0	1	2	3
Description	Teacher is the only one asking questions and responds yes or no.	Teacher focuses on student thinking rather than answers. Teacher is only person asking questions.	Teacher asks questions that require students to expand on their ideas. Some students ask questions.	Students are the main source of questions. Teacher acts as a facilitator to conversation.

**Mathematical Discourse from the students when explaining their thinking**

Level	0	1	2	3
Description	Students provide answers rather than explanations.	Students share brief explanations of their thinking when teacher asks for it. Students listen to their peers' answers.	Students are able to explain their thought process with detail and reasoning. Students are able to defend and explain their thinking. Students listen to and respond with a statement or question when prompted by the teacher.	Students are able to defend their thought process and answer questions in regards to their explanations.

**Mathematical Discourse from the students as a peer learner**

Level	0	1	2	3
Description	Students do not listen to their peers' explanations.	Students actively listen to their peers and are able to repeat back their peers' explanations.	Students are able to summarize their peers' explanations.	Students are able to explain their peers' explanations and correct peers' misconceptions.

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<sup>1</sup> Adapted from Hufferd-Ackles, Fuson & Gamoran Sherin (2004)



Appendix B

**Student Survey**

I enjoy math class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

I feel comfortable explaining my thought process in math class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

I feel comfortable questioning my peers in math class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree