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Action Research: Reflective Journaling within Middle Grades Mathematics Classroom

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Abstract

Reflective journaling within a middle grades mathematics classroom offers great potential as a practice for both educators and students. This paper examines the previous work that has been completed while also exploring the effectiveness of the practice in a fifth grade math classroom. The research shows that while implementing reflective journaling in a math classroom is time consuming, the benefits of opening lines of communication between pupil and teacher and improving the student learning experience outweigh the negatives. This study focuses on a fifth grade math class composed of 26 students who wrote daily in their journals. The data discussed includes qualitative and quantitative information about the journal entries, a post-study survey, and the results of personal interviews with three students. This action research supports that reflective math journaling positively impacts the teacher and students within the classroom.

Introduction

Writing opportunities within a math classroom are rare. However, over the last few decades there has been a push to implement writing within math instruction. The idea of “Writing Across the Curriculum” is to have content areas outside of Language Arts utilize writing within instructional practices. As it is, students typically associate math with numbers rather than writing practices. So, application of literacy within the math classroom would broaden student understanding of the relationship between writing and the mathematics study.

While the idea of writing in mathematics is highly interesting, the concept of students reflectively writing about mathematics interests me even more. While enrolled in “MATH 4150: Advanced Math for Elementary Teachers” at Bowling Green State University, my professor Dr. David Meel assigned weekly journal entries in which students summarized material covered throughout the week, identified areas of confusion or difficulty, and outlined an action plan for improving upon these specified areas. This marked the first instance in which I had been required to reflect upon my mathematical understanding in a formal text medium. I found my own reaction to this weekly reflection quite positive. Summarizing each week’s material forced students to review what had been learned, while the identification of weak areas caused students to analyze their own understanding. By picking apart my understanding of concepts, I was able to see my own gaps in understanding and communicate those areas of confusion to the teacher. Forming an action plan placed the responsibility of learning in my own hands, causing me to take proactive steps to improve my education. While I was able to see personal benefits, I wonder how reflective journaling impacts other students and the instructor. Thus, I seek to study the benefits of reflective journaling within a middle level math classroom for students as well as the instructor.

Potential benefits reach beyond personal gain. Results found through this action research may have further impact on general mathematics education. The Common Core State Standards for Mathematics (2010) presents “Standards for Mathematical Practice” which outlines “processes and proficiencies” that students are supposed to become experts with. Through reflective journaling, students focus on areas in need of improvement, allowing students and teachers alike to identify mathematical processes that students need more practice with, showing reflective journaling as another avenue to which educators can meet state standards.

Along the same lines, mathematics education always has room for improvement. Outside of bettering students’ “Mathematical Practices” as outlined in the Common Core State Standards for Mathematics (2010), reflective journaling may also increase student comprehension or encourage a greater depth of understanding of mathematics. The potential benefits for general mathematics instruction is vast.

Therefore, if reflective journaling influences students in a manner similar to my experience, it would be of great benefit to students for instructors to infuse this practice within the math curriculum. Similarly, if the practice is found to benefit educators, this writing practice would improve the educational experience for both pupils and instructors.

Literature Review

Specific research on the use of reflective journaling within middle level mathematics classrooms is highly limited. Rather, much of the current work on this subject comes from informal teacher observations and descriptions of journaling within a single classroom. Thus, much of the primary research that applies to this topic is from the 1980s and based off of studies conducted in secondary and collegiate mathematics courses.

The concept of journaling or writing in general within a mathematics classroom stems from the movement started in the 1970s called “Writing Across the Curriculum.” The Michigan Department of Higher Education drafted documents outlining the purpose and practice of implementing writing within each content area. The idea behind this practice developed from the belief that learning results from writing as students record their questions and thoughts (Michigan.gov, n.d., p. 3). This promotes the reinforcement of content, student self-reflection, critical thinking, and student metacognition (understanding of one’s own thought processes). While students write, they must also sort through their previous understandings and evaluate new material to build connections between the information (Michigan.gov, n.d., p. 3). Similarly, it encourages students to think like mathematicians for they must learn how to effectively communicate their thoughts and ideas to others, a practice required of all professionals in the math field. The National Council of Teachers of Mathematics also supports the integration of literature and written communication in their *Principles and Standards for School Mathematics* (2000), showing the national movement toward the concept of writing in math classrooms. Thus, incorporating general writing practices within the mathematics classroom should improve student learning in a multitude of aspects.

While writing alone is seen as beneficial within the classroom setting, writing can be taken further by making it reflective. Reflective journaling, the working definition within this action research, means that students write down their thoughts and questions pertaining to their personal understanding of the subject matter or course (in this case mathematics). Before reflection can occur, an experience must be had. Theorist John Dewey published many works regarding the importance of experience in student learning within the classroom environment. In Dewey’s publication *Experience and Education* (1938), he states that one must pull as much

meaning as possible from the present experience for that is the only information that will be useful in the future (p. 51). Dewey later says that it is the mark of a disciplined and intelligent mind to reflect and summarize the meanings pulled from experience so that they may be properly employed in later educational ventures (p. 110). Dewey goes even further by asserting that people do not learn through experience but through the reflection on the experience (p. 13). By implementing reflective journals within the mathematics classroom, students will be forced to pull meaning from activities and lessons. This information can then be used in their math practices later in their education, aiding students in the development of a disciplined and intelligent mind. Therefore, the theory behind the practice encourages more research in this area.

Previous research supports the implementation of reflective journaling within the classroom. David Meel (1999) implemented reflective journal writing within his Linear Algebra course at Bowling Green State University. Meel (1999) required his students to respond via journal writings about what had been learned in class, what they were having difficulty with, and what they were going to do to improve their understanding (p. 207). While analyzing the results of his practice, Meel (1999) found that one of the greatest benefits resulting from reflective journaling could be found in the opening of lines of communication between teacher and student (p. 215). Through the act of journal writing and the resulting teacher feedback, students were able to communicate more clearly with the instructor. Mary Linn's findings (1987) published in her dissertation "Effects of Journal Writing on Thinking Skills of High School Geometry Students" support this finding as well. She found that through the use of journal writing, her students were able to convey their level of understanding and any questions they had and in turn, Linn could then provide feedback relating to the students' comments (p. 16). While open lines of communication resulted from journaling within these secondary and collegiate courses, similar

feedback from both the teacher and student would be expected in middle grade classrooms; the depth of discussion might just be lessened.

By opening the lines of communication, another benefit of reflective journaling within the mathematics classroom is revealed. Through his study, Meel (1999) found that through the journaling, both the students and the teacher were able to identify student misconceptions and areas of difficulties (p. 212). Misconceptions within mathematics refer to the incorrect understanding of a subject due to faulty thinking established through previous experience. Arthur Powell and Jose Lopez (1988) found similar experiences with their study of journal usage within a university level algebra course (p. 170). However, their findings went even further than that of Meel's. Powell and Lopez (1988) found that gaps in student understanding were also revealed to both the educator and the pupil through journaling (p. 170). Gaps in understanding differs from misconceptions in that gaps refer to areas in which there is simply a lack of knowledge, not faulty understanding. By identifying these key weaknesses in student knowledge, educators can then utilize the information taken from the formative assessment to alter and improve their instructional practices. Meel (1999) states in his findings that this identification allows teachers to discuss with their students the confusion the class is having in a particular subject (p. 212). Teachers can take this even further by identifying areas that need to be recovered or clarified in order to prevent future misconceptions and confusion (Meel, 1999, p. 212). Powell and Lopez's (1988) discoveries similarly identify the benefits of journaling as a formative assessment; comments made in journals tell the teacher what works and does not work, influencing the educator's pedagogy in order to enhance student understanding (p. 173). Hence, identification of misconceptions and gaps in knowledge benefit both the educator and the students. These results

can be expected throughout grade levels rather than it being an isolated outcome in upper-level math courses.

To increase the impact of education on students, learning must be personalized (Michigan.gov, n.d., p. 4). By making learning more individualized, students can build more personal connections to material. According to Linn (1987), utilizing the practice of “Writing Across the Curriculum” reveals each student’s learning style to the teacher (p. 15). The teacher can then take the information gained about each student via the journals and implement learning strategies and practices to play towards the learning styles of the students, in turn individualizing instruction. Through journaling, students can also see where their individual strengths and weaknesses lie so that can take the constructive steps to improve their understanding, acting as another way to personalize the learning for each student.

Within most educational courses, instructors emphasize the importance of enabling students to take charge of their own learning. As students begin to do this, their investment in their education increases and they become more focused on actual learning. Julie McGough (2013) implemented nature journaling within her elementary science classroom. In the nature journals students recorded observations about nature and their reflections upon what they have learned. While her journals were based on scientific material, the thought processes and level of reflection involved mirror what would be expected in a mathematics classroom containing students in the same age range. McGough (2013) found that while students were communicating their educational experiences through their journals, students were taking more ownership in their learning (p. 66). Meel (1999) observed similar results in his study; students mentioned that the practice of writing in the journals made them feel more responsible for their learning (p.

222). Reflective journaling within the classroom assists with the development of responsibility and ownership of learning for students, enhancing their education.

While there are several advantages of incorporating reflective journaling within the classroom, research shows that there are drawbacks to implementing this practice. Kathleen Lynch-Davis sought to shed light on the difficulties that mathematics teachers face with including writing in their curriculum in her article *Responding to Journal Writing in the Middle Grades Mathematics Classroom* (2009). One major drawback of the implementation of writing in a math classroom is the large amount of time necessary for providing feedback on student responses (p. 1). Meel's and Linn's research also found the time commitment of responding to journal writing a drawback in this practice (Meel, 1999, p. 213)(Linn, 1987, p.67). Such a large time commitment to feedback on student writing on a regular basis takes away time from planning lessons and assessing other student work. To alleviate this negative aspect of reflective journaling, Meel (1999) suggests that rather than providing individual feedback every time a journal is submitted, teachers can discuss the feedback during class to assure that students still get the feedback they need without it consuming too much of the teacher's time (p. 213). If individual feedback is necessary, it can be limited to students who are struggling more with the content than their peers, also taking less time to provide feedback (Meel, 1999, p.213). Thus, while time constraints certainly pose a problem for implementing writing within the classroom, it can be managed by carefully choosing when to provide individualized feedback and when to give group feedback.

Another weakness in reflective journaling that Ruth Crampton (2013) points out regarding reflective practices is that when students write, they may feel pressure to please the teacher (p. 89). This would lead to students tailoring their responses and writing toward gaining

positive feedback from the teacher rather than being honest in their work. However, because this practice is designed for students to be honest in their reflections, less fabrication in the responses would be expected. By establishing an environment in which students are encouraged to seek answers, this problem will also be alleviated. This issue should still be monitored and discouraged. After all, the journaling should benefit the student on an individual level of understanding.

The final aspect of reflective journaling that should be considered is what the practice should look like within a classroom setting. Lynch-Davis (2009) suggests that the general outline of student reflection and writing within a mathematics classroom should follow a format of prompt→student response→teacher response (p.93). So, teachers begin by providing students with a specific writing prompt which students respond to and teachers then provide feedback on. These responses may either be embedded within the school day or assigned outside of class time. It can also occur across various media (i.e. email or pencil and paper). Meel (1999) utilized email as a form of communication for convenience, but the same outline and approach described by Lynch-Davis (2009) was applied. Grading must also be taken into consideration. Meel (1999) chose not to grade based off of content of reflections but to award points for completion to keep the focus of the task on the learning aspect and not on the grade (p. 215). He believed that students would be more willing to share their opinions and comments through their journals if the entries would not negatively impact their grade (p.215). However, teachers like McGough (2013) chose to use a rubric for grading in order provide students with a sense of structure (p. 65). So, while there exist various forms of reflective journaling and grading techniques, the goal is to simply alter the practice to best fit the learning environment and goal of the educator.

Both past and present educational practices encourage writing within the classroom. Reflection also plays a key role in the learning process as explained in Dewey's educational theory. Thus, the implementation of reflective journaling within middle grades mathematics classroom instruction will effectively incorporate each of these aspects into teacher practices. While this exercise demands a large quantity of time from the teacher to provide helpful feedback and could lead to student fabrication of information to gain favor by the teacher, the educational benefits far outweigh the negative aspects. Through reflective journaling, pathways for teacher-student communication are opened, improved instructional methods are discovered along with errors in student understanding, and personalization and responsibility of student learning are increased. So, while there are a variety of approaches to incorporating reflective journaling within the mathematics classroom, its practice holds high potential for improving the educational experiences for educators and students alike.

Methodology

The purpose of conducting this study was to reveal the impact of reflective math journaling in a fifth grade math classroom. The participants in this study include one fifth grade math class comprised of 26 students. Of the 26 students, 14 were female and 12 were male. All of the students were subjected to the same instruction and were given the same reflective journaling prompts.

This study took place over a two week time frame, starting at the beginning of a new math unit focusing on geometry. Each student was given their own reflective journal for math on the first day of the unit (see Appendix A for the reflective math journal). The journal was composed of two main parts, their daily reflection and their action plan which occurred every two to three days. The daily reflection included three components. First, students were required

to write a two sentence summary of what they had learned during math class that day. The second prompt asked them to rank how they felt about their mastery of the lesson using a four tiered smiley face system. The final portion of the daily reflection had students record any questions they had regarding the day's content, questions they had about math in general, areas in which they thought they needed additional support, or topics relating to the day's lesson that they wanted to learn more about. Students were given five to ten minutes to complete these daily reflective journals after the lesson was completed. Students completed a total of six entries for this portion of the reflective journaling. Journaling did not occur on test days due to a lack of new information being presented.

Students were asked to complete an action plan entry every two to three days in addition to their daily reflective journaling. The action plan required students to reflect upon what they were struggling with during the last few days of instruction and come up with a plan to improve their understanding. Students were given the sentence starter of, "In order to get better at what we are learning, I will:" which they would then complete with their plan. Students were provided with example answers at the bottom of their action plan pages in order to prompt student thinking. The students completed two action plans during this study.

Students had never participated in math journaling prior to this experience. Before students began writing their first entry I explained that the purpose of the reflective journaling was to see if they benefitted mathematically or personally from reflecting on what they learned in their journals. In order to motivate the students to participate in this study they were told that they would earn ten participation points if they completed each section of the journal on a daily basis. I then walked the students through the questions, explaining what was expected from them

at each part while also answering questions. Once students completed the journal entries, I would personally collect each journal to assure that they would not get misplaced.

After two weeks of partaking in the journaling process students were given an exit survey to assess their overall opinion of the process of using the reflective math journals. The exit survey was composed of three main sections (see Appendix B for survey template). The first question asks students to use the four smiley faces to rank whether students thought that the journaling helped them better understand the math content we were covering, followed with a question prompting why they felt this way. The second question asked about students' feelings toward reflective math journaling, whether or not they liked it. Students were to rank their feelings using the smiley face ranking system, followed with prompts asking what they liked and did not like about the process. The final question asked for suggestions on ways to improve the journaling experience in the future. The students were asked to complete this survey on the final day of the study.

The final portion of the study included an interview with three specifically chosen students. The students were chosen based on their math OAA scores from the previous year as well as their progress in the class. One student was chosen from the Advanced group, one from the Accelerated group, and one from the Proficient group. These one-on-one interviews took place on the final day of the study. During these one-on-one interviews the students were asked a variety of questions about how they felt about the journaling, what they think could improve the journaling, whether they found it beneficial, how they could have personally improved their journaling, whether they followed through with their action plans or not, as well as why they wrote specific items in their journals. These three students were given a school-based reward of "Flyer Bucks" for compensation for their time.

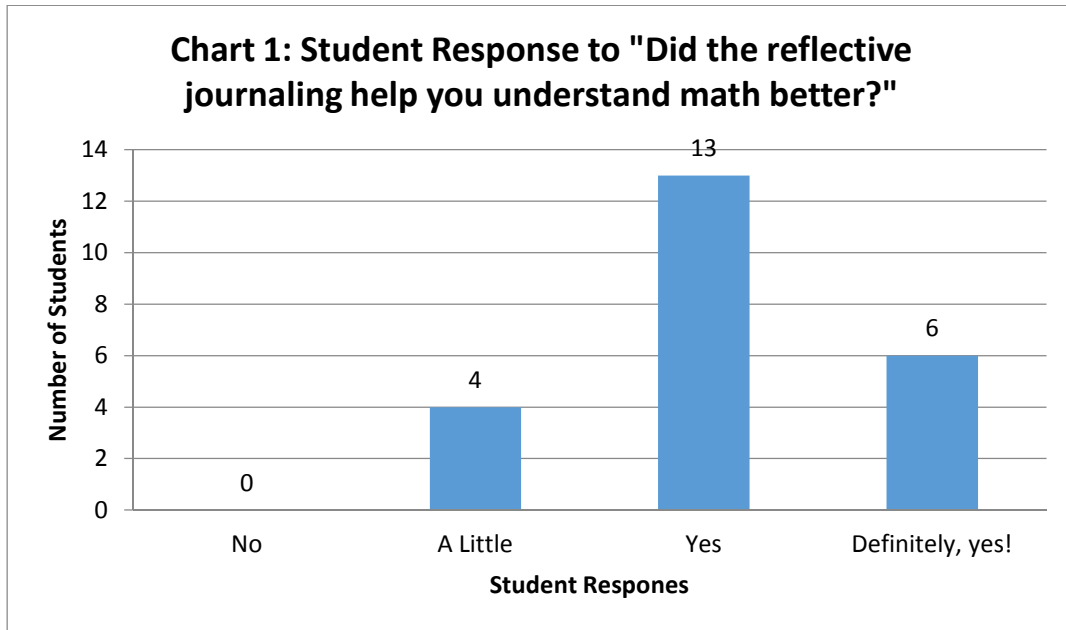
The majority of the data collected through this action research project was qualitative. Student responses for the daily math reflective journaling were ranked on a three point scale for the summary portion, as well as the self-assessment portion of the journaling (see Appendix C for the scoring rubrics). This point system was used to determine the strength and quality of their responses. A one point summary would be a summary without complete sentences, was low quality in response, or had inaccurate information. A two point summary included at least one complete sentence of acceptable quality with mostly accurate information. To earn all three points for the summary, the student response must have been two complete sentences of high quality, accurate information. The self-assessment portion was analyzed on a three point scale ranging from having no reflection (one point) to having a reflection about what they know (two points) and was specific (three points). These points provided a method of assessing quality of answers within the journaling. A record was also kept each day about how students ranked their feeling about the content. The action plan responses were recorded and a tally system was used to determine how many of each type of response was recorded throughout the journaling process.

The final survey data consisted of both qualitative and quantitative data. A numerical count was taken for each smiley face ranking to reveal overall student perception of the use of the reflective math journals. The qualitative data collected from the student responses regarding what they liked and did not like in the journaling was arranged into a list. Another list was created to reflect the students' recommendations for future journaling. A tally system was implemented for each of the qualitative lists. The tallies showed how many students wrote each individual response. After completing the data collection, the next step in the action research was to analyze the data to reveal the impact of reflective math journaling on the students and the teacher.

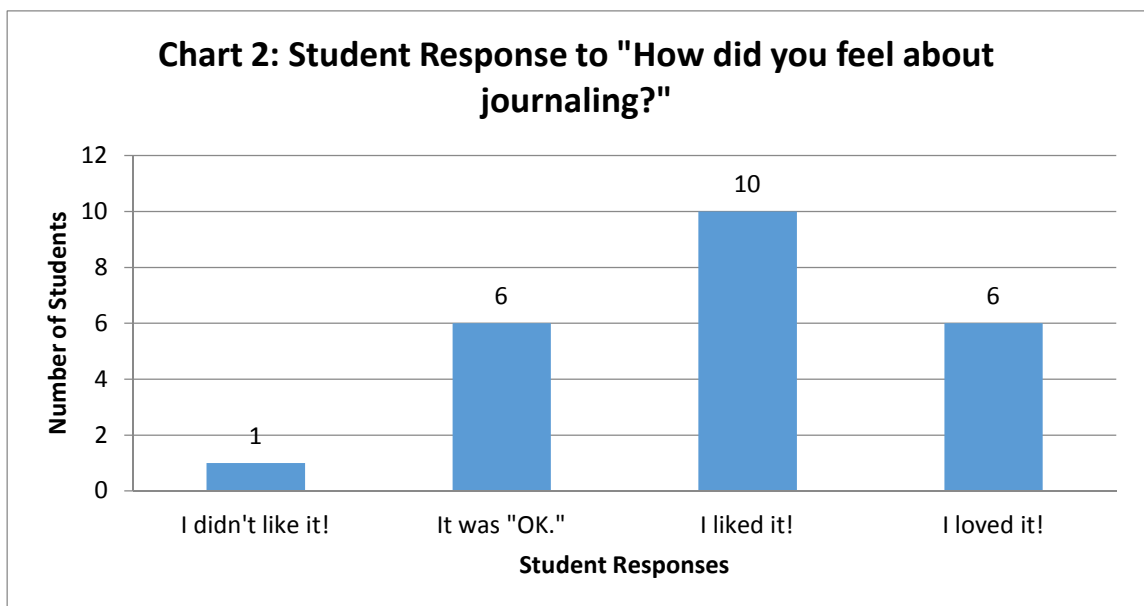
Data and Analysis

The data collected throughout this action research project proves to be educational in regards to teaching and student practices. The following data analysis will begin with the post-study survey given to the students at the end of the two week period. The analysis of this data will aid in the interpretation of the data collected about the journaling practice, which follows. A brief summary of the research findings will provide a final connection between the post-study survey and the data about the reflective math journaling practice.

The post-study survey contains the most revealing data. In Chart 1 below, the data shows students' responses to whether or not they thought that writing in their reflective math journals improved their understanding of the math content. The data shows that everyone who completed the survey found the journaling to at least be "a little" helpful in building a better understanding of math. Out of the 23 students who completed the survey, 13 said "Yes" it did help and six students said, "Definitely, yes!" This reveals that 82.5% of the students felt that the journaling helped improve their understanding of the math content. This supports my initial belief that the reflective math journaling would be beneficial for students' math comprehension. When asked why students felt this way, a majority of the responses focused on the idea that they were able to ask the teacher questions (56.5% of students). This aligns with Meel's (1999) findings that reflective journaling opened the lines of communication between the teacher and the students. As the educator, I found it beneficial to be able to read through the students' journals to see what they were struggling with or what they were interested in. If there were multiple students who said they were confused about a topic, I made sure to devote a portion of the next day's lesson to re-teaching that segment.



Students were also asked on the post- survey whether or not they liked partaking in reflective math journaling. Chart 2 shows their responses. Overall, students tend to have a positive feeling toward the practice of reflective journaling. Based on the results 69.5% of the students have a positive feeling (rating I liked it! or I loved it!) toward the journaling. Of the 23 students surveyed, only one student did not like it. This encourages me to continue to incorporate reflective journaling within my math classroom.



When asked about what they liked and did not like about the journaling students provided an array of answers. Some of the most popular answers regarding the positive aspects of journaling relate to opening lines of communication between the students and me, as aforementioned. Of the students who participated in the study, 30.4% of them recorded that they appreciated getting to tell me the questions that they had, as well as how they felt about the lesson. Carrie-Ann, a student I interviewed for the study, stated that she liked getting to write her questions so that “you didn’t have to say it in front of the class, ‘cause they knew it all and maybe you didn’t.” This reveals that some students can use this journaling as an avenue of avoiding embarrassment in front of the class, a benefit that I had not thought of prior to the start of the study. Students also reacted positively to the summarization portion of the reflective journaling since it allowed them to tell “what we did in class” (21.7 % of students) and helped them “remember what I learned in class” (26.1% of students). Only five of the students specifically stated that they liked the journaling since it helped them better understand the math that we were learning.

When asked what they did not like, students did not have as large of a variety of answers. Most of the negative aspects of the journaling that the students picked out related to the amount of writing that was required from them on a daily basis. I found during this study that it is difficult to get students to write in complete sentences so getting them to write multiple sentences each day was a struggle. Carrie-Ann stated that she would have preferred writing one long sentence instead of writing two sentences. This aligns with the 21.7% of students who thought that there was too much writing. When asked how to make sure the students wrote enough material, Carrie-Ann suggested that I specify that students “need to include at least one supporting detail” similar to what they do in their language arts class. Students also stated that

they did not like doing the same thing every day. I thought that asking them the same questions on a daily basis would provide them with consistency but students found that answering the same three prompts each day became boring. Consistency might be a good way to begin the reflection process so that students can learn how to write effectively. However, once their reflection skills improve, altering the prompts would be an option to keep students engaged in the reflection process.

Within the post survey, students were also asked to share their suggestions about ways in which the reflective math journaling could be improved. A popular answer among 26.1% of the students was that there needed to be more questions in each day's reflection, particularly practice problems about what they learned so that the students could show me their skills. Adding questions to check for their understanding was written specifically by five students. This may appeal to students because it would decrease the amount of actual writing that they are expected to complete. During my one-on-one interview with Jackson he stated that he wanted practice problems included because "it would help me get better at it [math lesson]." He also stated that it would make the journaling more interesting because they would not have to write the same thing down every day. However, because the journal was built prior to the unit, this would have to be something that is added in the day of the lesson, perhaps providing a workspace in the journal entry for them to complete their work. This would mimic an exit ticket if done in this manner. The benefits of it would be rather interesting to see. Three students suggested giving the journaling as homework so that they would have more time to work on it. While I initially played with this idea, I think it is best if they do it during class so that it occurs directly after the learning has taken place. It also assures me that they will complete it. If it is assigned for homework, the number of students who would complete it nightly would significantly decrease. The last popular

response for ways to improve it would be to write in the journals less frequently. This could mean that instead of having daily reflections, I could have weekly reflections, or reflections every other day. Samantha also suggested this in her interview. She said that she sometimes “didn’t know what to write because we had just learned it and I couldn’t figure out what to write. There was not enough to pick from.” By spreading out the time intervals in which I use the journals, students would still have the opportunity to reflect on what they had learned just over a larger stretch of time.

By utilizing the feedback from the students, I can better interpret and analyze the data collected during the process of reflective journaling in the math classroom. The reflective journaling was composed of two parts as mentioned, the daily reflective journaling and the action plan that occurred every two to three days. Chart 3 shows the students' self ratings about how they felt after each lesson using the smiley face ranking system. According to the data, students overall felt positive about the material each day, with only a few people feeling uncomfortable with the content. On average there were 1.2% of students who felt "Yuck!," 8.3% who felt "meh," 46.8% who felt "Good," and 43.4% who felt "Awesome" about the lesson each day. This shows a positive student reaction to each day's lesson.

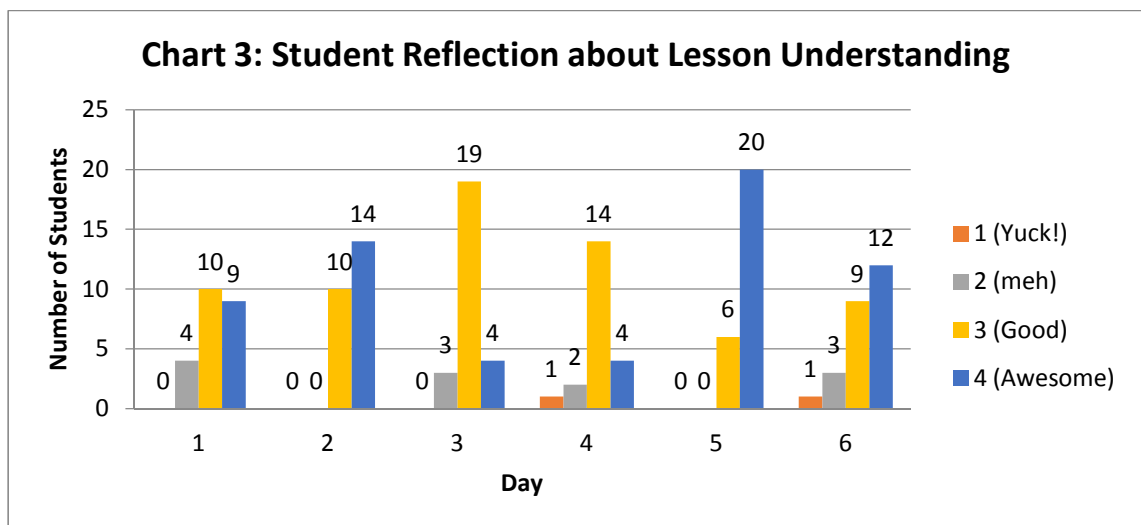


Table 1 includes students' reflective journaling scores based on the aforementioned rubric. Both scoring rubrics were measured on a three point scale. For the summary portion of the reflection, the scoring ranged from including inaccurate, low quality sentence fragments to two sentences of high quality and accurate information. The self-assessment was rated in a similar manner but based on whether there was a reflection and how specific the self-reflection was. The numbers following each name in the table below reveal how many of their entries earned a 1-3 in each section (summary writing and self-assessment). For example, Lexus has a six under the three column in the Summary portion. This means that six of her entries earned a rating of three. As can be seen in Table 1, student summaries of the lessons were of medium to high in quality of content, with more of the summaries being of medium quality. This is reflected in the averages listed at the bottom of the table. On average students had 0.19 entries with a rating of one, 3.08 entries with a rating of two, and 2.31 entries with a rating of a three. This means that an average of 95.5% of the journal summaries earned a two or three. The only low scores were given due to the fact that some students only wrote lists of items that they learned rather than formulating complete sentences. The large number of students who did write two complete sentences is not surprising since according to the post-study survey results, many students thought that there was too much writing.

The scores for the students' self- assessments are similar in spread to that of the student summaries. The averages reveal that students averaged 0.27 entries without a reflection, 2.73 with a vague reflection, and 2.38 entries with a specific reflection about their learning. This shows that most of the student self-assessments were of medium-high quality in content. Within the vague reflections, students would say something indistinct like, "I want to learn more about quadrilaterals." This does not specifically point out where the student was struggling or what

they wanted to learn about. Students struggled with being specific about their learning. This could be attributed to their limited experience with self-reflection. I believe that with more practice with self-reflection and more teacher-modeling, student responses for this would improve in quality. Providing students with practice problems within their journaling, as the students suggested in the post-study survey, might encourage more specific reflections. The problems would provide students with the opportunity to specifically test their skills in order to see if they are confused about anything. I also found that it is difficult for my students to put down on paper what it is that they are struggling with. I was able to learn more about their questions when they would verbally ask me them while writing their journal entries. This realization shows that completing the reflective journals, while beneficial, does not reveal in totality student understanding. Oral modes of reflection are needed in order to gain a deeper level of assessment of student comprehension.

Table 1: Reflective Journal Summary and Self-Assessment Results

	Summary			Self-Assessment		
	1	2	3	1	2	3
Lexus	0	0	6	1	1	4
Mercedes	0	1	5	0	2	4
Berlynn	0	1	5	0	3	3
Nate	0	5	1	0	3	3
Autumn	0	1	4	0	1	4
Jackson	0	5	1	0	3	3
Jaden	0	2	4	0	4	2
Samantha	0	3	3	0	2	4
Caroline	3	2	1	0	4	2
Breanna	0	5	1	1	4	1
David	0	5	0	1	4	0
Braden	0	5	1	0	4	2
Narquis	0	3	3	0	3	3
Sabrina	0	3	2	2	1	2

Carrie-Ann	0	3	3	0	2	4
Jeremiah	0	4	0	1	2	1
Karlee	0	3	3	0	4	2
Nathan	0	5	0	0	2	0
Jessica	0	2	3	0	1	4
Bret	0	2	3	0	2	3
Aspen	0	3	2	0	4	1
Dillon	0	1	5	0	2	4
Electra	0	5	1	0	4	2
Destiny	0	3	1	0	0	2
Brock	0	5	1	0	6	0
Gavin	2	3	1	1	3	2
Averages	0.19	3.08	2.31	0.27	2.73	2.38

The remaining portion of the reflective math journaling process that needs to be addressed is the writing of the action plan. Table 2 below contains a list of all of the recorded action plans from the students' reflective math journals. The total number of times that a particular action plan was recorded in a journal is recorded in the column to the right. For example, "Ask more questions" was recorded as a response 21 times. Some students wrote multiple steps in one action plan, accounting for the large number of responses throughout the two action plans that were completed.

Table 2: Action Plan Responses

Action Plan Answers	Number of Responses
Ask more questions	21
Practice problems	15
Do homework every night	10
Pay more attention	6
Study	5
Come in for recess	4
Play games	4
Get help from friend/family	3
Participate more	1
Work Harder	1

As can be seen by the large number of recorded responses, the most popular responses were asking more questions, doing practice problems, and doing homework every night in order to help students gain a stronger understanding of the math content. During the geometry unit that this study took place, students were assigned little homework since the focus of the instruction was on in-class activities. This means that students who recorded doing homework as a part of their action plan had little opportunity to follow-through with their plan. As I reflected upon the class time during which this study took place, I have realized that few students actually posed questions, showing that many of the students did not follow-through with their action plans. However, there were a large number of students who volunteered answers during this learning segment which would benefit student understanding. It was difficult to monitor student fulfillment of action plans which makes it challenging to analyze this data. Had I made a system which held students accountable for completing their action plans, I would have been better able to track action plan fulfillments.

Based on my observations and the three personal interviews, I found that few students actually used their action plan as a way to improve their mathematics understanding, a disappointing realization. However, Samantha, one of the students I interviewed, specifically followed through with her action plan to come in at recess to ask questions. We set up a time during our lunch period for her to come in and sit down one-on-one with me to review the material we were learning about, answer questions, and complete practice problems. She stated in our interview that she found that session very helpful. This shows that the action plan can be a beneficial aspect of reflective journaling as long as students capitalize on the opportunities offered to them through the action plan.

The resulting data and data analysis of this action research project provide a deeper look into the reflective journaling process. The results of the post-study survey support the findings of the journaling process. Students commented that they thought that the journaling required too much writing. Therefore, students struggled to write two complete sentences. Similarly, students suggested including practice problems to model their learning. This could potentially improve upon their self-reflection since their current scores show that 55.8% of student responses either did not include a reflection or were vague in meaning. These supporting segments of data can be used to improve upon the journaling process, as seen in the next segment.

Conclusions/Implications

After analyzing my data and reflection upon the study as a whole, I have concluded that incorporating reflective math journaling within my classroom was beneficial for both me and my students, making it a worthwhile practice. Students reacted positively toward the journaling; on many days students would vocalize their excitement for it by saying, “Yes!” as I started passing out their booklets. The students that were interviewed all found the journaling beneficial in some way. They all also suggested that I continue with the practice in my future classroom. When asked what students liked and did not like about the journaling, there were far more items listed that they enjoyed than ones they did not. While student responses to the journal prompts were not ideal, they show great room for improvement, meaning that with more practice they would get better. As the teacher implementing this practice, I found it to be helpful since I was able to better gauge my students’ comprehension of the material. All of this evidence points to the conclusion that both the teacher’s experience and the students’ learning experience was heightened with the inclusion of reflective math journaling.

Many benefits emerged from this study that mirror results from previous studies as outlined in the literature review. Powell and Lopez (1988) and Meel (1999) recognized that implementing journaling practices opened the door for further communication between the students and the teacher. I found this to also be the case. By reading their journal entries I was able to adjust my instruction in the following days in order to address any areas of confusion. This not only improved my teaching practices, but it also aided the students in comprehending the material. Students also stated in their surveys that they valued their ability to ask me questions and share what they were learning with me. Journaling positively impacted the class in this manner. Along similar lines, Powell and Lopez (1988) said that while they implemented reflective journaling within their setting, they found that it told the instructor what was working and what was not working (p. 173). As aforementioned, I used what the students recorded in their journaling to improve upon my own teaching, verifying the same findings as Powell and Lopez.

However, the journaling was not a completely positive experience. While completing the research prior to this study, I learned that researchers like Lynch-Davis (2009) and Meel (1999) found that journaling was highly time-consuming. I had hoped to avoid this during my implementation of the journaling but I was unable to do so. It was difficult to set aside five to ten minutes each day for students to write in their journals. Usually during this time I have instructional material planned to further advance student learning. It was challenging to still get everything done within the class period while also providing adequate time for journaling. It was also highly time consuming on my end. Trying to read 26 journals each night was next to impossible. I found myself skimming student responses just so I could get through them all.

Again, this shows that my study produced some similar results to those done previously by others.

While I received the positive results that I was looking for, my research was far from ideal. When beginning the research I had planned on incorporating ten daily reflective journal entries and two additional action plans. However, due to time constraints and needs for additional days of assessment, I was unable to extend my research for a longer time period. Had I been able to lengthen the time frame for data collection, I would have been able to gather more conclusive data about the journaling practice since it would have allotted students more time to become acquainted with the practice. It would have also allotted me more time to observe students' use of the journaling. An additional aspect of this study that I think would provide an even more beneficial experience would be to spread out the times at which students write in their journals. Students' responses in the post-survey stated that they did not like writing the same thing every day and that they would have liked for the writings to be less frequent. Spreading out when they complete the reflections would decrease the amount of time spent journaling while also appealing more to the students. Within the journaling I would have also liked to have included a section where students could share with me aspects of the lesson that they found helpful and aspects that they did not like. This would be solely for my benefit but it would have provided me with feedback on my teaching practices directly from the students. I could then use this information to shape how I approach future lessons. Another way in which I could have improved this study would have been to include my own reflective journal. As an educator it is essential to continuously reflect upon my teaching practices. While I do this mentally on a regular basis I never record my thoughts. I think that including a similar journal to what the students utilized but for myself would have been both interesting and helpful.

This study has enlightened me about myself as well as my students. I realized during the implementation of this study that I dream far bigger than I can reasonably act. I have so much that I want to do with my students that I cannot possibly get it all completed. This was seen in my inability to have students complete more entries. However, this same idea brought me to the realization that I am a flexible teacher. I was able to manipulate my instructional time and re-plan lessons based on the responses within the reflective journals. When I read that many students were struggling with classifying quadrilaterals I made sure to include additional instructional time in the upcoming lessons to alleviate this issue, showing flexibility in my teaching. This experience also reminded me of how wonderful my students are. When asked to begin doing something brand new like writing every single day in math class, I was met with little opposition. In fact, my students were supportive of me trying something new in the classroom, something that I found to be pleasantly surprising. A majority of my students also worked hard and put forth the effort to try their best in this new journaling practice. While some of their reflections were of low quality, many of the students were honest and thoughtful in their reflections. This study brought out favorable characteristics of both me and my students.

Considering the encouraging results of this study of the implementation of reflective journaling in the math classroom, I plan to incorporate this practice in my future classroom. Through this study, I found that incorporating writing in the math classroom is certainly doable. While this was strictly reflective writing, I think that utilizing more writing activities in general would enhance the mathematics learning experience. Therefore, in my future classroom, I will provide more opportunities for my students to showcase their learning through the form of writing. I also think that having students reflect upon their learning would help them better

monitor their own learning. Ideally, I would like to continue this action research project with some adjustment in the upcoming years as I gain control of my own classroom.

References

Crampton, R. (2013). Reflective practice. Prezi. 89. Retrieved from

<http://prezi.com/dt7ygc4o5jgd/reflective-practice/>

This Prezi presentation includes the ins-and-outs of reflective practices. It covers the philosophical principles that support the practice, showing why one would want to implement reflection into a curriculum. It discusses the various reflective methods that are available. It even goes into the educational implications of using reflection in school, providing suggestions as well as warnings toward the practice.

Dewey, J. (1938). *Education as Experience*. (p. 13, 51, 110). New York, NY: The Macmillan Company.

Within this book, Dewey asserts his many beliefs about effective teaching and educational practices. One of his beliefs focuses on the importance of not only experiencing something, but the necessity to reflect upon that experience. He states that learning can only occur when an experience is had and it is reflected upon. The reflection allows students to summarize and make meaning from their experiences. Thus, the concept of reflective journaling in the math classroom aligns with Dewey's beliefs. The reflection allows students to grasp the knowledge in a way in which they will be able to use it in future situations.

Linn, M. M. (1987). Effects of Journal Writing on Thinking Skills of High School Geometry Students. *UNF Theses and Dissertations*. Paper 38. Retrieved from

<http://digitalcommons.unf.edu/etd/38>

This dissertation looks at using journaling within a high school geometry classroom. This document provides insights into the large time commitment needed to use journaling as

well as other negative aspects. Conversely, it also provides the positive aspects of journaling which include revealing learning styles and increasing the communication between the students and the teacher. The concepts from this dissertation reinforce the practice of using reflective journaling within a math classroom.

Lynch-Davis, K. (2011). Responding to Journal Writing in the Middle Grades Classroom.

National Teacher Education Journal. 4(2). Retrieved from

<http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=b486d439-ca6c-4bb7-9be6-cd3a3d973d25%40sessionmgr115&vid=1&hid=108>

The purpose of this document was to discuss the process of providing feedback to students' journal entries within the middle grades. Lynch-Davis discusses the proper format of student journal writing and the feedback that follows. She also provides insight into the difficulties of proper journal writing in the classroom. These include the amount of time spent providing feedback as well as the difficulty of providing quality and meaningful feedback. She tries to provide a realistic view of implementing journal writing.

McGough, J. (2013). Journaling: A bridge between home and school. *NSTA*. Retrieved from

http://learningcenter.nsta.org/files/sc1308_62.pdf

This document discusses the implementation of nature journaling within an elementary grades classroom. McGough found that through the journaling, her students were not only reflecting upon what they were learning, but they were also taking more ownership over their schoolwork. Through this article, she discusses the process she used to implement the nature journals, including her methods of grading them. The cognitive

processes of the students within this research provide insight into those processes that will be expected from students in a math classroom in a similar grade range.

Meel, D. E. (1999). Journal Writing: Enlivening Elementary Linear Algebra. *PRIMUS*, 9(3), 207, 212, 213, 215,222.

This research article focuses on the impact of reflective journaling within a college level Linear Algebra course. Meel implemented reflective journaling in which his students had to summarize their learning, identify weaknesses in understanding, and outline an action plan to improve their understanding. He analyzed the impact of this practice within his classroom. He found that this practice opened lines of communication between the teacher and students, identified misconceptions, and positively influenced pedagogical practices. He explained the negative aspects of the journaling while also providing suggestions as to how to minimize these drawbacks. Meel's work inspired the implementation of similar reflective journaling within middle grades math classes.

Michigan.gov. (n.d.). *Writing Across the Curriculum: Mathematics*. Retrieved from

http://www.michigan.gov/documents/mde/Writing_to_Learn_Mathematics_306722_7.pdf

The state of Michigan drafted a series of documents that provide teachers with resources and activities that encourage writing within content areas outside of language arts. This document was formed as part of the attempt to incorporate the practice of “Writing Across the Curriculum” with the various content areas. This document in particular focuses on how to use writing within the math classroom. It discusses the importance of writing in a math classroom. It also provides teachers a list of activities to use in their classroom with a full explanation as to why the activities are beneficial to the students.

The content within this document supports the overall purpose of incorporating reflective journaling in a middle grades mathematics classroom. The document states that writing allows students the opportunity to reflect upon what they have learned, which in turn reinforces the material and improves student understanding. Thus, its explanation of the importance of writing validates the implementation of journaling in the math class.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.

The National Council of Teachers of Mathematics drafted this document to outline and explain the various principles and standards that should be upheld within math classes across America. Within this document, the organization supports the practice of writing within the math classroom in order to get students to reflect upon their work while also reinforcing the content. This helps support the idea of using reflective journaling within the math classroom.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics*. Washington, D.C.: Authors.

The Common Core State Standards outline the various standards that must be covered each year in mathematics. These standards are broken down into grade levels as well as content topics. The Mathematical Practices lay out eight different processes and proficiencies that students must develop as they learn mathematics. This document includes the standards and practices that teachers must use to guide their instructional practices. So, by utilizing teaching and assessment methods, such as reflective journaling,

with these practices, teachers will be able to reinforce the practices and standards to successfully teach students the content.

Powell, A. B., Lopez, J. A. (1988). Writing as a Vehicle to Learn Mathematics: A case study.

Classroom Applications: What Works and How. Retrieved from



[http://andromeda.rutgers.edu/~powellab/docs/chapters/PowellLopez\(1989\).pdf](http://andromeda.rutgers.edu/~powellab/docs/chapters/PowellLopez(1989).pdf)

This research article looks at the use of journaling in a college algebra class. The findings show that gaps in understanding along with misconceptions are revealed to both the instructor and students through journaling. This in turn positively impacts the instructor's educational practices. Thus, journaling acts as an effective means of formative assessment, reinforcing the practice of reflective journaling.

Appendix A

**Reflective
Math Journal**

NAME: _____

<p>Date: _____ Topic: _____</p> <p>1. Summarize what you learned today. Write <u>at least</u> TWO sentences. You may also include a picture/example.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>2. Rate how well you understood today's lesson by circling the face that best represents how you feel:</p> <p style="text-align: center;"></p> <p style="text-align: center;">YUCK! MEH GOOD AWESOME!</p> <p>3. What is something that you are confused about? <u>OR</u> What questions do you have about what we learned today? If you do not have a question, what do you want to learn more about?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Date: _____ Topic: _____</p> <p>1. Summarize what you learned today. Write <u>at least</u> TWO sentences. You may also include a picture/example.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>2. Rate how well you understood today's lesson by circling the face that best represents how you feel:</p> <p style="text-align: center;"></p> <p style="text-align: center;">YUCK! MEH GOOD AWESOME!</p> <p>3. What is something that you are confused about? <u>OR</u> What questions do you have about what we learned today? If you do not have a question, what do you want to learn more about?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
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Date: _____	Date: _____
<u>ACTION PLAN</u>	<u>ACTION PLAN</u>
In order to get better at what we are learning, I will:	In order to get better at what we are learning, I will:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Example answers:	Example answers:
<ul style="list-style-type: none">• Ask more questions in class.• Come in at recess or during free time and ask Miss Van Der Molen for help.• Do practice problems.• Do my homework every night.	<ul style="list-style-type: none">• Ask more questions in class.• Come in at recess or during free time and ask Miss Van Der Molen for help.• Do practice problems.• Do my homework every night.

Appendix B

Name: _____

Reflective Math Journaling Survey

1. a. Did the reflective journaling help you understand math better?



No



A little



Yes



Definitely,
yes!

b. Why do you think this?

2. a. How did you feel about journaling?



I didn't
like it!



It was
"OK."



I liked it!



I loved it!

b. What did you like about it?

c. What did you not like about it?

3. What would make journaling better in the future? (Suggestions to improve it)

Appendix C

Summary

1	Not 2 complete sentences and content is low quality, inaccurate information
2	At least one complete sentence, medium quality, mostly accurate information
3	2 complete sentences, well-written, accurate information

Self-Assessment

1	No reflection
2	Reflects on what they know
3	Reflects on what they know and is specific