How can using Interactive Math Journals in the classroom increase engagement, motivation and achievement in student learners?

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How can using math journals in the classroom increase engagement, motivation and achievement in student learners?

As a classroom teacher for the past eight and a half years, three of those teaching in the content area of math only, I found myself searching for ways to engage the students in math activities. In my present classroom, I have an Enoboard, which is similar to a smart board, but only interact with a stylus pen as opposed to touch. It's almost like a large projector because it connects to the PC and projects what's on the screen for the whole class to see clearly. The current series the district uses is "Go Math". This series provides many interactive features such as: smart board lessons for every lesson in the text, online games featuring Carmen Sandiego, online assignments and activities, Itools, and animated math models. Resources such as these are great to access and do promote engagement and participation, but they can become stale at times. After a few weeks, they begin to lose their spark, and without the ease of a true smart board, the lesson becomes more teacher centered than student.

My state test scores have always been above average, and I feel the need to challenge my current teaching style. It's become too routine. I want to engage my students more. I want students to feel excited and confident when completing math assignments and participating in activities. I want learners to be motivated to do math and take responsibility for their own learning. I don't want my students to complete the math solely because I told them to; I want them to want to complete the math because they understand it and enjoy it. Interactive math journals seemed like a perfect way to increase motivation and engage students in activities and reflections.

I am able to incorporate interactive math journals within the classroom setting this year. The first time I used the interactive journals, I saw such excitement in my student's eyes. The

feedback I received was very positive and the students seemed generally excited to participate in the activities that are part of the journals. In the past, I have had the most success and growth with students whose confidence in their abilities increased. Any type of hands on activity seems to create a more enthusiastic learning environment. Multiple students were voicing their enjoyment and wondering when we would be able to do another journal activity.

Setting

The current fifth grade is departmentalized with three sections, so the students have three eighty minute blocks daily. Students also have a special and a lunch. A unique opportunity has been given to me this year because I am able to have another departmental math teacher push-in for four out of the ten math periods each week to co-teach and help give class, as well as, individualized help. This makes the teacher to student ratio about 9:1 and allows for so much extra help within the classroom environment. For example, this teacher will circulate the room and keep students on task and focused on the lesson, making sure examples are correctly copied and solved. At times, we will switch roles, and I will circulate while this teacher leads the group instruction. During the journal activities, we co-teach to set up the activity. Then, this teacher will question the students to illicit insight into the lesson. This portion of the lesson is very beneficial for me. I learn many valuable questioning strategies from her. Additionally, the students are becoming very familiar with this teacher, who will be their sixth grade math teacher next year.

I have three sections grouped by homerooms. The first has 13 students, four classified students get pulled for resource room math. A one on one aid is in the room for two children: one with Asperger Syndrome and a child with emotional issues. The remaining two sections both

have 18 students. The first group of 18 students is my actual homeroom and seems to work very well. The second group of 18 students has a much harder time focusing and is behaviorally the worst section. I see these children directly after lunch and there seems to be many issues on the playground, and in the lunchroom. Students also come to class late because they didn't finish eating in the allotted time. A one on one aid is present in this class for a student who is autistic. This is the student's first year remaining in our building for the entire school day.

This class will be the focus of my research mainly because of the academic readiness. A broad spectrum of learners allows for an accurate range of learning abilities. A few students within this group are below level and need much basic skill reinforcement on a daily basis. I would like to see them interested and engaged in math activities. This is the best group to research for increased engagement, motivation and achievement. I see each fifth grade section for eighty minutes of math instruction per day. Typically this consists of a review of homework, continuation or introduction and practice of new lesson. The eighty minutes may include group work, individual work, completing problems at the board, using small white boards to display answers, completing the Problem Of the Day on index cards, centers and journals.

In my present classroom, I have an Enoboard, which is similar to a smart board, but only interact with a stylus pen as opposed to touch. The current series the district uses is "Go Math". This series provides many interactive features such as: smart board lessons for every lesson in the text, online games, online assignments and activities, itools, and animated Math models

Resources such as these are great to access and do promote engagement and participation, but they can become stale at times. After a few weeks, they begin to lose their spark, and without the ease of a true smart board, the lesson becomes more teacher centered than student. I can't stand to teach in a classroom where the students are simply lectured and given rote practice

problems. I want my students to be actively learning and participating. In teacher centered classrooms, students seem bored and are disconnected from the content. By making students a real part of the process, they will genuinely enjoy class more and retain the information. I've read countless examples of open ended problems where students missed the mark all together or are only able to produce a correct answer with no why or how. The interactive math journal provides opportunities for hands on activities that promote learning because they allow for questioning from the teacher and students and provide a variety of ways to explore the concept. Each journal also asks for previous knowledge, learned knowledge, proof of application and a reflection component.

This class will be the focus of my research mainly because of the academic readiness. Many of the females within this group are below level and need much basic skill reinforcement on a daily basis. I would like to see them interested and engaged in math activities. I believe said increased motivation and engagement will lead to achievement. This is the best group to research for increased engagement, motivation and achievement.

Research Question(s):

The overlaying research question is: How can the use of interactive math journals increase engagement, motivation and achievement in student learners? A very large research question lends itself to many smaller research questions that I plan to explore throughout my study. How will I monitor and measure engagement? Will I enlist my co-teacher to help me gather the data during data collection times? What will work best for this type of measurement (survey, interview, focus group discussion, actual journal entries)? What will be examples of disengagement? How will I measure motivation? What would be the best type of data to collect?

Should I use interviews and focus group discussions? Will an exit card with a rating system of how they felt about the lesson/activity work for accurate assessment? What type of achievement am I looking for? Is it an increase in actual grades/points for the marking period? Does developing self-confidence in a topic serve as achievement? Will the achievement be specific to the journal topic for the week? For example, if the weekly journal is on decimal place value, will I look only for an increase in that concept? How will I assess this growth? Will verbal understanding be enough evidence for achievement?

Literature Review

A. Summary of articles

Searching for a fun, interactive way to teach math can provide a teacher with many different avenues to pursue. Incorporating math games, math songs, cooperative learning, learning centers and portfolios are a just a few of the ways teachers can alter traditional teaching methods. One method I wanted to look into was incorporating interactive math journals into weekly lessons. Not only would I be able to include a fun hands-on component, but I would be able to get a better in-depth understanding of whether or not they were grasping the concept. The research that I found confirms my choice.

In today's educational field, understanding and applying mathematical skills isn't only important, it is a necessity. As educators, it is our job to make sure that our students are academically ready for a twenty first century world. These students need to possess the skills to be successful in a global environment.

Writing to Learn Mathematics

Joan Countryman, an assistant head for academic planning at Germantown Friends School in Philadelphia, discusses the importance of including writing in math and includes many suggestions for how to get started within a classroom. She stresses the importance of students viewing themselves as mathematicians and engaging in understanding and communication. The math journals help students to deeper explore math concepts by making connections and giving explanations of their thinking process. I was interested in the idea that Countryman believes that

good writing, even in math, stems from personal writing, thus suggesting independent free writing in the beginning or end of class. Countryman uses verbs such as :describe, explain, discuss, define, compare, contrast and provide insight as valuable verbs to be included in journal lessons. Countryman also suggests using math autobiographies to help students see and make math connections amongst their triumphs and disasters in their lives. This activity can also help students identify their learning styles and acknowledge that "math does engender feeling" (Countryman, 1993, p.53). Lastly, she offers suggestions to view journals based on three characteristics: language features, cognition and document features.

I really enjoyed this article as it affirms my decision to use journals in the classroom. Countryman's biggest strength is her ability to make it user friendly and her many suggestions for use within the classroom. She also suggests helpful ways to look at and respond to journals if you have never used this type of writing in a math lesson. I also like her "practical considerations" section. This is a beginner's approach to using this type of writing in the math classroom and also serves as a reminder that it will be different for every educator.

One area where Countryman is lacking is in actual samples of student work or examples of responses she has given. As a visual learner, I always feel that examples really help to show the learner what you expect or can clarify an idea. Sample or actual responses would've also helped in my research when I am giving students feedback on their entries. An overview of the context she is using these journals would also be helpful. There isn't much information given on ages, abilities or demographics of where these activities are being implemented.

Math Journals

Author Jane Moore attempts to use math journals in her 2/3 grade classroom to have

students understand math by using "their own experiences" and "provide teachers with a unique diagnostic tool". This brief article states the topics (time, fractions, multiplication) where math journals were used and included actual examples of student responses showing deeper understanding of said topics. Student examples also showed how Moore uses questioning techniques to illicit deeper understanding from the students.

The biggest strength is the inclusion of student examples and a wonderful example of creative writing that shows a student explaining why 5/8 is larger than 1/2. Moore also states the benefit of using journals to check for teacher effectiveness. I like this idea. A teacher can read through journal responses to see if the concept was grasped. This may be a better way than the students solving a problem using the standard algorithm where they can just guess correctly, or even copy from another student. Using a journal requires a deeper understanding and more thorough responses from the student, thus showing teacher effectiveness and guiding instruction.

A weakness again is the lack of context of the journals. Although we know it is a 2/3 grade classroom, I would be interested in learning more about how this type of mixed classroom works. Will all students be working on the same concepts? Are there different journal activities for different grade levels? I would like for Moore to go further into her discussion of the journal activities and give further proof that this would be a beneficial practice in the classroom.

Math Journals Boost Real Learning

Math journals are a valuable resource for the classroom that can help students to "stretch" their thinking. Students are expected to "examine, express, and keep track of their reasoning." Journals can be used as an assessment tool where teachers can evaluate a students progress and

be able to identify individual weaknesses and strengths. A math journal can serve many purposes depending on your classroom needs. Journals can be used to take notes, solve problems, record questions, as well as, student reflection. Burns and Silbey recommend the following uses: problem solving, process prompts and class discussion. When problem solving, students can record and show their thinking processes in their journals. Using journals with process prompts can help students to reflect on daily learning. Examples of prompts include: What I know about ----- so far is----- , or What I'm still not sure about it------. These types of journal entries can help to improve language expression also. You can begin by having students explain their thinking to you and then transfer those thoughts onto paper. Additional questions or prompting can help to arrive at a final product. Finally, you can use class responses to prompts as a means to discuss different ways of solving problems. Also, class responses can model detailed descriptions versus brief descriptions. Following class discussions, students can then revise their entries following the discussion. Burns and Silbey also offer a few suggestions for responding to what children write. Avoiding general comments, not feeling the need to comment of every individual entry and using the entries to try to learn more about each students can help make journals a successful addition to the classroom.

A strength of this article is the author really makes it seem reasonable and easy to implement for any classroom. Discussing as a class is very beneficial to both the teacher and the student. Sharing allows for deeper thinking among the students and often leads independent student revisions.

The article was very brief, and while it offers great suggestions, I would’ve liked more examples of how to use the journals and more activities that have been used within the classroom.

Using Math Journals to Enhance Second Graders' Communication of Mathematical Thinking

This action research project completed by Kostos and Shin focuses on mathematical literacy. The current trend in mathematical instruction is to be able to communicate mathematically. The goal of math instruction stressed by the NCTM is to have students be able to communicate their answers clearly using "language to facilitate understanding" and not through memorization. We see this more than ever in the types of short and extended constructed response questions on state tests. Kostos and Shin believed using math journals would create "a comfortable, non-threatening, and effective way to express mathematical thinking" (Kostos & Shin, 2010. P. 224). The students wrote in their journals about three times a week for five weeks using 16 different prompts that consisted of concepts previously taught, as well as, basic concepts. In the beginning of the journaling, prompts were modeled for students showing a variety of ways to solve the problems. Modeling also provided guidance on how to solve a math problem using step-by-step explanations. The teacher researcher also used mini-lessons to teach students how to use math vocabulary from the prompt in the response, how to look for clue words to help solve the problem, and how to use step-by-step explanations to solve problems. Data collection included: identical pre- and post- assessments focusing on the extension of patterns, student journal entries to examine development and progress, interview participation by eight of the students randomly picked at the end of the 5 week period, and the teacher's reflective journal written on days when mini lessons were taught or students wrote in their math journals. All data was analyzed resulting in three findings. Most students (thirteen out of sixteen) increased in overall score from the pre- to post- assessment, and the mean score of the

explanation portion increased for all students. The mean score of journal entries also increased while also showing that students needed less assistance and used more mathematical vocabulary and terminology over the course of the five week period. This teacher researcher also benefitted from using the journals as an assessment tool. By reading responses, accurate insight was given on what topics needed to be re-visited or which students were having difficulty with a specific topic. In addition, being able to analyze responses can help to identify errors in work and not misunderstanding of the topic. In conclusion, math journals can serve as a beneficial tool for both the student and the teacher.

Kostos and Shin included both qualitative and quantitative data within their research providing for triangulation and to "provide a more in-depth look at how the students communicated in their mathematical thinking when using math journals" (Kostos & Shin, 2010. P.229.). Data collection included pre- and post- math assessments, students' journals, student interviews, and the teacher researcher's reflective journal. I liked the methods used to collect data and am leaning towards using the same types of data for my own research. Both the teacher and student journals will allow for honest narratives, while also being looked at for common themes and patterns. In addition, responses are being scored using the Saxon Math Teacher Rubric for Scoring Performance Tasks (Kostos & Shin, 2010. p.227). The assessments will show the quantitative data as an overall score, but will also be looked at qualitatively in the specific area of explanation. I agree that it is important to have both qualitative and quantitative to increase the scope of the research.

The weakness I've identified is the same the authors have addressed; time constraints. The actual process of reading all of the students responses and coding or sorting them for patterns and themes seems overwhelming and unrealistic. It is also unrealistic to devote three

times a week for journaling activities depending on the scheduled time you are given for math. However, the authors do report that a rubric helps greatly and the benefit of increased communication outweighs the time needed to analyze. Within my classroom, I have tried to implement journals. In the beginning of the year, my intent was to do it weekly. In actuality, I have only done three entries because they take about an hour of class time per week, not including reading and analyzing responses. For that reason, I am strongly considering choosing a focus group of students out of the 18 in my math class. A second weakness identified was writing ability on a second grade level and if this would impact the ability to respond to the journal prompts. The writing ability did not have a huge affect on responses and most students were able to explain. I do not feel I should have a problem at the fifth grade level.

Increasing the Engagement and Understanding of Concept in Mathematics

For her action research project, Valerie Pinzker, focused on high school math students and their engagement and understanding within the classroom. By using baseline data such as teacher observations, assessment scores, student journals and the Sixth Mathematics Assessment of the National Assessment of Educational Progress results which states there is a math deficiency that includes "students have not had the opportunity to learn important topics, curriculum did not engage them, quality of the mathematics instruction is highly variable and lack of communication to learning" (as cited in National Council Of Teachers of Mathematics, 2002) , Pinzker identified 37% of her students as non achieving. Pinzker (2001), identifies an "inadequate depth of involvement in mathematical activities and understanding of mathematical concepts" (p.7). She attributes this lack of achievement to poor student attitudes and beliefs, poor teaching methods and lack of a variety of instructional strategies and issues in the math

curriculum. As part of the solution to these problems, Pinzker focuses on increasing meaningful experiences by utilizing cooperative learning, portfolios and alternative assessments, and journal writing. The altering of instruction and assessment practices was the research Pinzker observed and analyzed to measure comprehension levels and engagement in mathematics. Teacher-made tests, review of portfolio assessment, analysis of teacher observations, and analysis of students journals were the types of data Pinzker collected to accomplish her project objective: increase involvement and deepen understanding of concepts.

Overall, the intervention showed a significant increase in the student's engagement and understanding. A 36% increase in achievement was recorded. The effects of cooperative learning, alternative instruction and assessment and the use of journals created a more comfortable environment where trust was gained, students enjoyed being able to showcase abilities in a variety of ways and through writing students were able to self- reflect on their strengths and weaknesses honestly. Students recognized that "achievement is related to effort, time, and seeking help from more competent others" (Pinzker, 2001.p.237) .

I was relieved to read a research dissertation like Pinzker's, as it relates to my study topic and is the closest finished product that I have seen that most relates to my upcoming research study. The contextual information was exceptionally done and really gives a better look into the topic. It is important to know exactly who was being studied and what circumstances can influence such a study. I really liked her organization and appendices. The appendices can be a great supplemental resource to high school level math teachers who are trying to integrate new teaching methods and strategies within their classroom. Pinzker clearly picked a topic that was important to her and important to the success of her students. Much work went into her alternative instructional methods and assessments. I appreciate her motivation to better her

teaching. Her use of portfolios and alternative assessments is appealing to me, but with so much riding on state testing and teacher evaluation, it is a risk to deviate from common core structured assessments.

The only weakness that I find in this research is that it is short term. I would like to know the long term results. I would like to know if these types of alternative instruction and assessment continued to be used the remainder of the school year. Did the students that became more motivated continue to utilize the math lab? Was the achievement and deeper understanding enough motivation for these students to keep achieving after their year with Pinzker? I would also like to know if Pinzker shared her success among colleagues and if they were interested in altering their instruction as well.

Conclusion

After researching, selecting, reading and summarizing five pieces of literature about using journals within the classroom, I am confident in my decision to choose math journals for my action research project. All of the literature was extremely positive and affirmed that journals are an asset to any classroom depending on a teacher's needs. Journals aren't one size fits all and can be modified for any type of subject and a variety of activities other than journal prompts. A few of the articles included sample activities to try, examples of student and teacher responses, and suggestions for teacher feedback to students. The only issue that seemed consistent was the time needed to read and respond to journals. Both research pieces validated that journals, in conjunction with other activities, increased student's achievement.

How can using math journals in the classroom increase engagement, motivation and achievement in student learners?

Research Based

Math Journals

Burns &Silbey (2001)

Journals are beneficial to any classroom and can be used in different ways. Examples include problem solving, process prompts, and language experience. Journals offer a chance for class discussion and student revision.

Math Journals

Moore (1991)

Journals allow students to proceed at their own rate while giving teachers real insight and revealing student misconceptions and confusion.

Writing to Learn Mathematics

Countryman (1993)

Using math journals can help students to construct math themselves, offers opportunities to organize, interpret, explain, construct, symbolize, and communicate while planning, inferring and reflecting. Journals can tell more about what is grasped than traditional assessments.

Using Math Journals to Enhance Second Graders' Communication of Mathematic Thinking

Kostos & Shin (2010)

Journals provide both the teacher and student with a valuable tool of personal learning. Additionally, journals are helpful in guiding instruction and can be a communication tool. In this study, journals positively influenced mathematical thinking.

Increasing the Engagement and Understanding of Concept in Mathematics

(Pinzker,2001)

High school students' engagement and comprehension of concepts increased when a program that included frequent use of math journals was implemented. In addition to cooperative learning activities and portfolios, Weekly math journals (10-15 minutes) proved to be a useful and valuable honest diagnostic tool.

Methodology:

A. Participants

The students chosen for this study came from my third section of fifth grade math students. The class contains 18 students, 8 male and 10 female. Out of these 18 students, one has autism and a full time aid and three qualify for basic skills. Out of my three sections, this class is the most behaviorally challenged. Many of the students constantly talk and do not pay attention to the lesson. A huge issue with homework completion is also present. Out of a typical week, there may be one night where the entire class completes the homework assignment. There is a lack of student accountability. Daily, there can be anywhere between 4-7 students who do not complete the assignment. Of the 18 students, I chose nine students for a focus group. I chose five boys and four girls based on current ability, participation, motivation, engagement during daily lessons and current grades.

Types of Data & Collection Procedures

The first type of data collection I used was student interviews to get some insight on feelings about math and math class. I conducted a teacher survey with the push in teacher to gather responses about how she views the current levels of participation, engagement and understanding within the classroom setting. The actual student responses from the interactive math journals were collected and reviewed weekly. I read responses for accuracy and grouped

responses together based on any themes or patterns that I found. I focused on the left sides of the journals where the students are expected to restate the objective, record what they already know about the topic, what they have learned, a proof and a reflection. While the journal activities were taking place, I was recording field notes through my observations of the class to monitor for participation, engagement and understanding from discussion with the class. While observing, my co-teacher facilitated the lesson. These field notes were also read and analyzed in March for any patterns or themes. Notes were taken and recorded for later analysis. After data collection, I conducted post interviews with both the students and the push in teacher. All above data information was used for the data analysis.

Data Analysis &Interpretation

I analyzed my data in the following four stages. First, I organized my data and prepared for analysis. During Data Preparation, I assembled the surveys and interview questions and checked to make sure the students responded to each question. I formed my focus group. I assembled my notes from the teacher interview and student surveys, and from classroom observations.

In the second stage, Preliminary Analysis, I read and reviewed all of my data, making notes of key ideas and recurring points of interest. These ideas became the categories I used to code the data. In the third stage, Core Analysis, I re-read my data several times, coding the data. I then reviewed the coding and identified main themes, in light of my research questions.

In the fourth stage, Confirmation, I asked my research partner to review my themes and my examples from my data to support my themes, confirming that they are a valid interpretation.

Projected Timelines

January

Created and conducted student and teacher surveys. Set up focus group to copy and read response journals. Planned 6-8 topics for weekly interactive journals. Read and recorded findings from weekly journals. Read over weekly field notes from the actual journal implementation and identified any themes and/or patters.

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February

I continued to implement weekly interactive journals. Read and record findings from weekly journal responses. Continued to read weekly field notes and identify any themes and/or patterns.

March/ April

Conducted post research surveys with students and interview with push in teacher. Began analyzing date by reading field notes, focus group discussion notes and student journal responses to check for evidence of increased engagement, motivation, and achievement. Finished analysis and began to write paper while also preparing for a presentation of findings.

May

Finished writing research report and presented findings.

Findings

General Findings

After assembling and reading all of my data, I have found three major themes. The first theme evident from my research is the students were very motivated and enthusiastic to use the hands on interactive math journals as a different way to learn the math concepts being taught and were highly engaged for the 80 minute math block. The students would ask every Friday if we were going to work on the math journals, and when I replied yes, I was met with reassuring positive comments such as "yes" and "awesome." The second major theme I found was behavior was exceptional during the 80 minutes we were working on the math journals. Using observations from my field notes, I mentioned every single time I was using the journals, behavior was excellent and there weren't any disruptions to the lesson being taught, not even students asking to leave the room to go to the bathroom! Lastly, I found students have an extremely hard time thinking metacognitively.

Increased interest and engagement using interactive math journals in the classroom

All students in the fifth grade class, including my focus group thoroughly enjoyed working with the interactive math journals. Each week, they looked forward to a different approach to teaching math. From the very moment that a student was picked to hand out the journals, the students were excited, engaged and eager to participate in the lesson. The initial journal set up was a little difficult to get through because it was a new way to learn math and there were some set up instructions that needed to be followed. I had to introduce the format of the journals which included a “right thinking side” page and a “left thinking side” page. The

right side is for the display of the interactive tools which is modeled by the teacher and copying the learning goal which is the common core standard for the concept. The left side of the journals is for the students' own assessment. Students record the learning goal again, but this time in their own words, the "What I Know" section is where the students record what they already know about the topic prior to completing the hands on tool, a "What I Learned" section, where the students record what they learned after completing the hands on tool followed by a proof and reflection. The proof is a chance for students to create examples to prove what they learned while the refection is where the students were expected to reflect on their learning and express it in different ways. Students were able to choose their own proofs and reflections. The students also needed to understand the difference between teacher learning objectives and student friendly learning objectives. Once these topics were addressed and the students were comfortable completing these parts, the students were paying attention and participating. They were actively engaged for 80 minutes. Signs of engagement included listening to directions, helping to hand out materials, raising their hand to ask questions or volunteer to share answers, remaining in their seats and helping to clean up. Each journal had a different hands- on component, thus they were expected to complete different activities each week. Activities included brainstorming, cutting out templates, copying words or phrases from the board into their journals, labeling, coloring and gluing the finished template into the journal. In order to progress through the lesson, students needed to be engaged to listen to and follow directions, be able to write and share responses in a whole group setting and apply the content of the lesson by creating a reflection piece.

Increase in positive behavior/ decrease in negative behavior

During the weekly 80 minute math blocks the interactive journals were used in, negative behavior was virtually non-existent. Using observations and field notes, all students were engaged and cooperative with both teachers, Mrs. R and Ms. L, and other students. Most students were very eager to volunteer to share information, offer suggestions, ask questions or answer questions being asked. Students remained in their seats and were able to have non distracting dialogue with classmates while completing the journal activities. Most students were focused, on- task and accurately copying down words and phrases from the whiteboard. During the six journals that were completed, not one student asked to leave the classroom for any reason.

Difficulty with metacognitive thinking

The most challenging part of implementing the journals is the difficulty I discovered when asking the students to reflect on the topics and skills they have learned. The students were given a worksheet that provided a list of 28 possible ways to reflect. Many times the students would all copy the example reflection that I had modeled as an example for the class in their journals. They didn't know how to think about their own learning, much less express it in a written format. One of the reflection pieces they could pick was to create a crossword format to go with the vocabulary for the concept we worked on for that journal. This consisted of writing a vocabulary word used for the skill and linking other vocabulary words by crossing or overlapping letters. Almost all students would pick this reflection piece every time, or they would pick the "draw a poster" reflection piece and simply draw a square with the concept written inside of it. For example, one student drew a box, colored the inside different colors and wrote the words “Place Value” inside the box. This did not give me any insight into whether they

understood the topic or could actually apply the concept when asked to do so. The idea behind choosing a poster was to promote the topic “place value” in a poster format. I found some students would even leave this section blank or spend a real long amount of time thinking about what reflection to pick only to find that they ran out of time and couldn’t complete the reflection. I had thought this section would be the easiest to complete because it gave the student freedom of choice and creativity. I was not correct in my assumption. Any part of the journal that included metacognitive thinking or independent thinking was where I saw a decrease in participation. Students didn't understand how to take a learning objective and restate it in student friendly language so they could better understand exactly what they would be learning and applying. There weren’t many students that were willing to share their answers because they either didn't have one or weren’t sure their answer was correct. Instead of risk taking, they played it safe by waiting for another student to share their answer. These students would sit quietly with blank sections in their journals, some had the beginning stem to an answer, but it was incomplete. Other students had incorrect answers or answers that lacked coherence.

Findings by types of data

In addition to my general findings, there were other findings when looking at the different types of data I collected.

Surveys

The main findings I was able to see from the surveys I had given the focus group were quite interesting. First, all of the students seemed to see math in a very positive light. When asked the question, "How do you feel when the bell rings to come to math class?" students

responded, "great", "excited", and "happy to learn new things." Only one student's response was negative, "Scared, because I don't know if the work is hard." So I was at an advantage going into this action research because the students had good attitudes toward math class. Seven out of nine students also agreed that if math class were more fun, they'd perform better. When asked how I could make math class more fun, students wanted to include more games, snacks, jokes, and music into the instructional methodology, as well as, using scissors, crayons, glue and having free time. One student simply stated, "make it in an exciting way, so it is not boring." Students seemed to enjoy math more when it was more kid friendly incorporating the types of activities they find fun. I think the hands on component made it seem more game like for them. The majority of the students enjoyed working in groups more than individually and being able to go over the homework answers on the chalkboard/whiteboard. A few of the students responded that they liked homework the best. However, I found that these students weren't always completing their homework. The students' perceptions of themselves sometimes did not coincide with their actions. The post-surveys were positive and affirmed my decision to use the journals to increase motivation and engagement. Students agreed that math was fun either "always" or "sometimes". Not one of the focus group responses was "disagree". Seven out of nine students felt that the time we spent on journals was "just right." Six out of the nine students agreed the hands- on component was the most enjoyable part of the journal. Additionally, three students marked the reflection part as the most enjoyable, even though I found this to be the most challenging part for all students. Overall, the surveys gave good insight on attitudes towards math before and after the implementation of the journals. The majority of the students enjoyed math and the journals, especially the hands- on component.

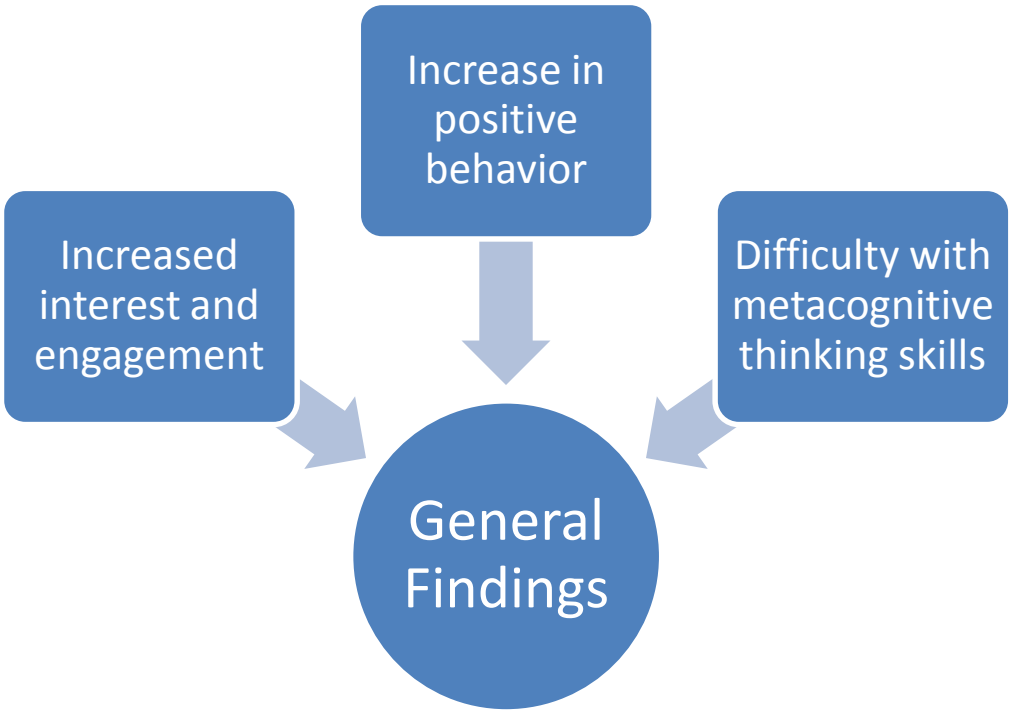
Observation and Field Notes

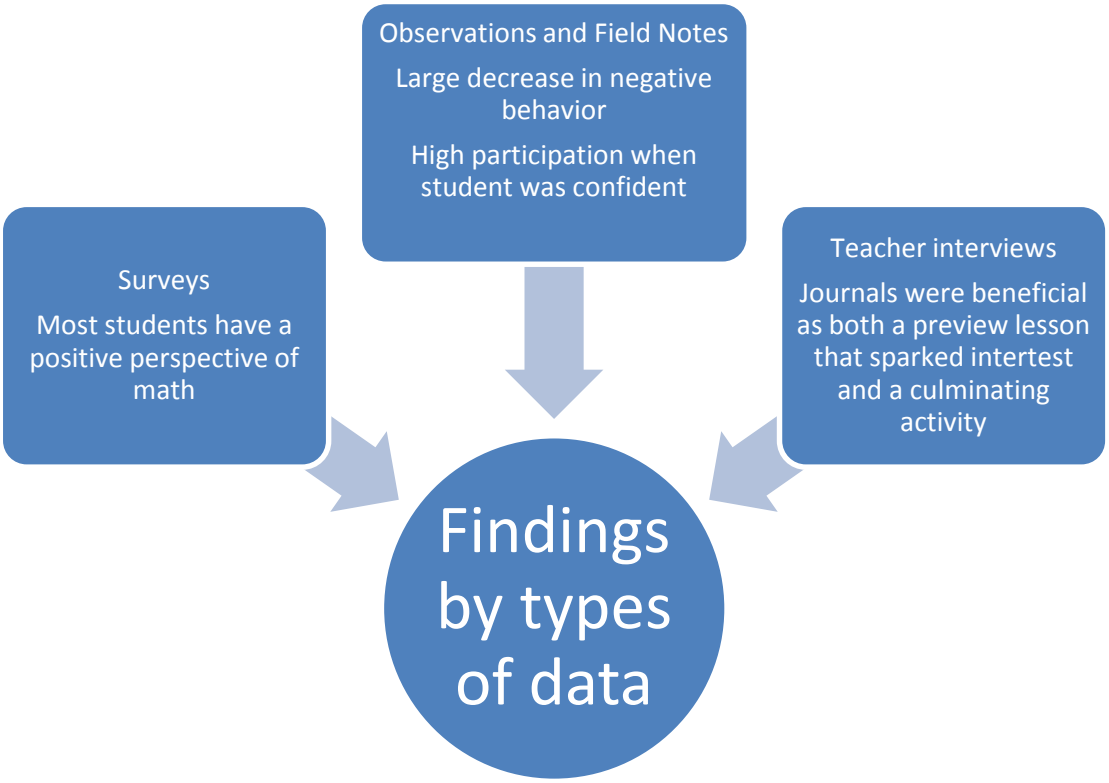
As already mentioned earlier, my observations overwhelmingly showed that student misbehavior was non- existent in the classroom. I also observed that some students, even though they looked like they were actively participating, did not have they correct answers copied down in their journals or did not have the entire phrase they were given on the board copied down. I was very fortunate to have another math teacher be able to help instruct the journal, while I walked around the classroom to closely observe the students and their journals. I often had to ask these students to write down more of the notes given on the board and correct answers that were given out loud, or that they themselves had found. I began to notice that students left the student friendly objective blank, only copied down a portion of it when answers were being shared, or copied down another student's entire answer without any of their own input. I began to discover that the students who had a good grasp on the content were very confident in their answers and willing to share, while those who seemed confused or maybe didn't have enough time to think about the concept, didn't volunteer to share answers. Again, these students either didn't have answers or were looking to other students to copy answers. These students needed much prompting when trying to illicit responses. Even when prompted, some students had difficulty restating objectives and stating what they knew about the topic from previous years. I also found that when I was talking one on one with students who had difficulty restating objectives or stating what they already knew about the topic, they could give a verbal answer with a little less difficulty, only to find that when they transferred the dialogue into written expression some of it was still incorrectly stated and confusing. Students seemed to take a lot of time to copy down words or phrases from the board and if we moved onto the next section in the journal, students would leave the answer incomplete or blank. When this occurred, I would prompt the student to

complete the section and help them by rereading the notes on the board and making sure they were writing it down in their journals. The observations and field notes also allowed me to see how much the students struggle with restating objectives and stating what they already knew about the topic. Both the push in teacher and I would allow the students to discuss with other students in their groups or close by to help produce more dialogue and responses to these sections. When being able to discuss with other students, there were more answers volunteered to the class.

Findings from Push-In Teacher surveys and interviews

Mrs. R seemed to be very receptive to using the interactive math journals in the classroom and played a big part in helping me implement them. Overall, Mrs. R agrees the journals were beneficial to the students and served as either a preview lesson that sparked interest and excitement for lessons to come or as a culminating activity. When asked if she thinks students learned new skills, she replies, "Students are learning how to discuss and explain topics using proper vocabulary while learning to organize new material and assignments." Mrs. R stated that she would definitely use the journals in her classroom if time allowed. The journals could serve as a wonderful resource of learned math topics that could serve as a reference to refresh their memory. Mrs. R found the most difficult part of the journal to be restating the learning objective in a language that was easier for the students to understand. However, she mentioned that this concept did get easier as the exposure increased. She also noticed the struggle students had with the reflection piece which she acknowledges this is a new concept for the students. Mrs. R thinks it will be easier for the students to complete if they were continuously asked to reflect on their own learning


Increase in positive behavior
Increased interest and engagement
Difficulty with metacognitive thinking skills
General Findings


Observations and Field Notes
Large decrease in negative behavior
High participation when student was confident
Surveys
Most students have a positive perspective of math
Teacher interviews
Journals were beneficial as both a preview lesson that sparked intertest and a culminating activity
Findings by types of data

Implications

A. What my findings mean to me, related to my questions

After analyzing all of my data, I have concluded the journals were a successful addition to the math curriculum and did in fact increase engagement within the classroom. I could easily say that motivation also increased, but I feel lucky that I discovered my students were already moderately motivated. I think the journals didn't create motivation, but definitely helped add to what was already present. I would have to do more thorough research to find in-depth answers in regards to actual achievement as far as an actual grade or growth is concerned. I wasn't consistent enough in checking prior skill achievement with post journal skill achievement to make that kind of valid conclusion. With the help of my findings, I have realized that I would like to analyze my teaching more often. I want to take more class time and devote it to student teacher dialogue, as well as, more student-to-student dialogue to discuss math concepts and how we learn. Being able to have these discussions will aid in checking for understanding and students being able to verbalize their responses.

Limitations/Subjectivity

A. Discussion of problems

When creating the beginning surveys for the focus group, the one I created was too open ended and didn't yield the kind of responses I was looking for. I was trying to collect too much data at once. Most of the nine students responded that they loved anything and everything about math! Their responses indicated that they wouldn't change a thing. I realized that I needed to create a more specific survey with multiple choices for answers instead of open-ended type

questions. I also needed to include questions that were specific to the layout of the journal sections and not just regular math instruction. Even after the second survey was given, I found a disconnect between answers to the surveys and actual behavior in the classroom. For example, a student responded that her favorite part of math is the homework, but this student doesn't complete most of the homework assignments! This student perception created confusion for me because answers weren't accurate.

Time restraints also were an issue. Originally, the 80 minute block I set aside weekly didn't always allow enough time. At times, we would be at the tail end of the journal but still have the proof and reflection parts to complete. These two sections would often take the most amount of time because they proved to be difficult for the class. The proof and reflection were also critical components to the journal concept. The lack of ability to complete the sections in the 80 minutes led to revisiting the journals at a later date, sometimes a week later and it was very difficult for the students to retain the information and pick up where we left off. In the future, I'd allow more discussion among students before having them fill in certain parts of the journal. I'd allow them to think-pair-share with a partner to come up with responses. Hopefully, this would make up some of the time that was lost to due to confusion or lack of an answer.

In reference to the actual math interactive journal part, I'd do some of the cutting parts before class started. This type of activity was very time consuming and lack of directional skills ended up taking away valuable discussion time.

B. Discussion of subjectivity

I've discovered that my perspective of the student’s abilities can hinder my acknowledgement of their actual success. I have very high expectations for the students, but at

times, these expectations can be unrealistic, and what I am seeing as not much increase in achievement is actually quite the opposite. I thought the proof and reflection would be easy for the students to complete. I became frustrated when they weren't getting completed. When I was able to take a step back and discuss with another teacher and my partner from class, Kelly, I could see that they were successful, it just didn't fit the exact definition I had in my mind. I need to remember that not all students will learn at the same speed, and I need to allow for more student interaction and dialogue during math class.

Emerging Questions

Overall, I am pleased with the findings of my research. However the following questions have emerged and need to be researched further:

1. Does the use of a journal increase achievement in the specific concept or skill? How do I measure that success? What does achievement look like to me? What does achievement look like to others?

2. How can I foster more use of reflective thinking amongst my students? I would like for students to feel comfortable completing the reflection piece, as well as, share with the class.

3. How can I reduce the time needed for each journal entry?

4. How can I encourage the students to pick more in-depth reflection pieces?

5. How can journals have a more permanent role in the math curriculum?

Conclusion

a. What my findings mean to me

Implementing the interactive math journals has definitely helped me to view my teaching

in a new light. I've realized through pure observation and written responses that a fair amount of students were merely "getting by". Students were passive in the verbal and written response part, but very actively engaged in the hands-on part. Being able to watch another teacher instruct and take time to circulate the room and really read individual student responses helped me to discover students had incorrect responses written down or had no response. I've also been able to discover that students struggle with directional skills and sharing answers verbally within a group setting. I would model how to get to an answer much more frequently in the classroom. It is not safe to assume the student knows how to get the answer and model independently.

B. How will it be useful to others

First and foremost, my research identifies the difficulty students have in written expression of math concepts, especially being able to think about their own learning process and express themselves. The math journals would also be a new way to instruct and engage students in meaningful math lesson.

C. What effect do I think my study may have on my students' learning

The biggest effect is to teach students there are fun ways to make math instruction more interesting. I would hope they are learning how to be able to have meaningful discussions about math and use these discussions to communicate about math not only verbally, but also in a written format as well. I think my students understand they are accountable for their learning and the answers they produce. I also would like to think I have helped the students understand the importance of following directions.

Implementation plan

Since Mrs. R played a huge part in the implementation of the journals, she was able to see how beneficial the process was. I would like to pass the completed journals from the fifth grade on to her for use with the students when they are in sixth grade. The journals could serve as a useful resource to refresh their memories on topics that have previously been covered. It will be a wonderful resource to have after a long summer break!

I would also like to share my findings with the other math teachers in the building. Showcasing the finished journals may spark interest in the teachers to use more of this type of instructional piece in their own classroom and help to foster metacognitive thinking at an early age.

Looking forward, I would like to adjust my teaching to allow for more hands-on activities for each lesson that allows it and have more math discussions/dialogue with the students to get them thinking critically and verbalizing thoughts. In addition, I would like to collaborate more with the ELA teacher to introduce more types of reflective writing pieces and create some mini-lessons to expose students to this type of response.

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Name_____

Date_____

Math Survey

1. Is math class fun? Explain your answer.

2. What is your favorite way to learn math? Could you describe this way to me?

3. When the bell rings to go to math class, how do you feel?

4. Describe your perfect math class.

5. If math class is fun for you, do you think you perform better?

6. What activities during math class are boring? What activities during math class are fun?

7. What is your favorite part of math class?

What could make math class more fun

Name _____

Date_____

Math Survey

1. Math class is fun for me:

_____ Always
_____ most of the time
_____sometimes
_____ once in a while
_____ never

2. What is your favorite way to learn math?

_____The traditional way (use the textbook, pencil and paper to solve problems)
_____Using the smart board and whiteboard to learn and share problems
_____ Using math journals and centers

3. When the bell rings to go to math class, I feel

____I always feel excited
____I sometimes feel excited
____ I never feel excited
____I'm not excited, but I don't mind math
____I'm not excited, and I don't enjoy math

4. What would your perfect math class be like (check one)
____ Teacher centered. Ms. Loverich teaches and we practice.
____-student centered. Students complete all the problems on the board and/or with partners.
_____ I like a mix of both the students solving and Ms. Loverich teaching

5. If math class was fun, I would perform better. (check one)

____I strongly agree
____I agree
____I don't know
____I disagree
____I strongly disagree

6. I find the following activities fun during math class: (check any that you think are fun)

_____ checking homework
_____problem of the day
_____centers
_____ the homework game
_____ working with a partner
_____ working on my own
_____ completing graded assignments in class
_____ using the smart board or whiteboard
_____ putting answers on the board
_____ working on math journals

7. Which activities are not fun during math class: (check any that you think are not fun)
_____ checking homework
_____problem of the day
_____centers
_____ the homework game
_____ working with a partner
_____ working on my own
_____ completing graded assignments in class
_____ using the smart board or whiteboard
_____ putting answers on the board
_____ working on math journals

8. The amount of time that we spend working on math journals is (check one)

_____ too long, I get bored or distracted.
_____ just right, I enjoy filling in all of the parts on the left and right side of the journals.
_____ not enough, sometimes I get confused and need more time to complete the activity.

9. The part of the math journal that I enjoy the most is:
____ Filling in the learning objectives/goals
____ Completing the actual bonds on piece (cutting, folding, filling in answers and gluing)
____ Completing the "What I know" section
____ Completing the "What I learned" section
____ Completing the proof section
____ completing the reflection section

Is there anything that we could do that would make the math journal easier for you to complete?

Name _____

Date_____

Post- Survey

Did you like using the math journals in the classroom?

__-yes

__ no

___ I have mixed feelings. Some were fun, some were not fun.

Do you feel that the math journals helped you to learn anything new? If the journal did help you to learn something new, what did you learn?

What was the easiest part of the journal for you?

_____ student learning objective

_____ what I know

_____ what I learned

____ proof

____reflection

____ the actual part we made, cut, colored and filled in

What was the most difficult part of the journal for you?

_____ student learning objective

_____ what I know

_____ what I learned

____ proof

____reflection

____ the actual part we made, cut, colored and filled in

I am deciding if I am going to use the math journals in the classroom for next year's fifth graders. On the back of this sheet of paper, create a poster about why I should continue to use math journals in the classroom, or why I should not use journals in the classroom.