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Student and Teacher Perceptions of Math Workstations in a Third-Grade Classroom

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Abstract

Math workstations can offer teachers an outlet to differentiate instruction in the math classroom in order to better meet student needs. The purpose of this study was to discover how students and the teacher in a third-grade classroom felt about using math workstations. Specifically, the researcher wanted to discover whether or not the students and teacher participants enjoyed using math workstations and whether or not they felt math workstations helped students' understanding of mathematical concepts. The researcher collected data through student surveys, student and teacher interviews, and observations. Data were analyzed using the constant comparative method to help the researcher notice four major themes. These themes included feelings or instances of changes within station work, instances of engagement, references to independent, partner, or small group work, and references to understanding. This study might provide insight to educators who are considering using math workstations in their classrooms.

Student and Teacher Perceptions of Math Workstations in a Third-Grade Classroom

Wide-eyed, gape-mouthed, and (quite literally) tear-filled, I looked around the room for the first time. Noise filled the air as dice were rolled on desktops, and uproarious laughter arose. Tiny mathematicians were scattered among the classroom, encaptivated by games and discussion and curiosity. "What on earth is happening here?" I thought to myself, only to be grabbed by the hand and led throughout the classroom by an enthusiastic third-grader who explained what they were doing and learning. In that moment, a moment I am certain I will not soon forget, I realized my life, or at least my profession, would never be the same.

I had heard about these classrooms before – the ones where the students are fully engaged in what they are doing, the teacher is seemingly nowhere to be found because she is at the students' level, discussion and questioning fill the space in which there would otherwise be silence. I never knew these classrooms actually existed. To my surprise, and to my excitement, this was where I would spend a full year teaching and learning. I asked the teacher, Ms. Smith (all names replaced with pseudonyms), what the students were doing, and she shyly told me that the students were working on math workstations. She quickly followed with an apology for the mess and the noise and the lack of space; they had only just started using the workstations a few weeks ago. "Ms. Smith," I asked, "What more do I need to know?"

Purpose

This study was conducted with the purpose to understand the feelings and attitudes of math workstations by the teacher and students in a third-grade classroom. I wanted to discover if the students and teacher enjoyed using math workstations and if they felt math workstations aided in the students' understanding of math concepts. I used the following questions to guide

my research: What are student and teacher perceptions of math workstations in a third-grade general education math classroom?

Sub question 1: What are students' attitudes or feelings toward using the materials and resources to learn mathematical concepts through math workstations?

Sub question 2: How do students feel that math workstations are helping them understand mathematical concepts?

Sub question 3: What are the classroom teacher's attitudes or feelings towards using math workstations?

While I was conducting this study, I was enrolled in a master's of education program. As part of the program requirements, I had to conduct an action research study and complete a year-long clinical teaching placement, for which I was placed in a third-grade departmentalized math classroom at Pine Elementary. Pine Elementary is located in a town in West Texas and is home to about 122,000 people and 14 elementary schools. This Title I school served about 575 kindergarten through fifth-grade students. The demographics making up Pine included a majority of White and Hispanic students, and many of the students were children of military parents. My clinical teaching placement was in a mixed-ability classroom with one student who had a hearing impairment and required an interpreter.

Literature Review

Differentiated instruction is a term coined by Tomlinson (2014) in which the traditional classroom structure is reformatted in a way that meets the needs of all learners. Teachers implement differentiated instruction by engaging learners through a variety of approaches, interests, instruction, and complexity (Tomlinson, 2014). Differentiated instruction is necessary in a classroom because all learners differ in the way they prefer to learn, in their approach to

learning, or in their development (Felder & Brent, 2005). Educators take on the task of providing students an experience to learn in a way that promotes individual growth based on their varying responses to instruction (Benders & Craft, 2016). Bailey and Williams-Black (2008) found that differentiated instruction positively affected students through motivation, rigor, and excitement. Differentiated instruction does not necessarily come easily to educators. In fact, Thomas (2015) indicates that it requires a paradigm shift in order to release control and facilitate an effective learning environment that values collaboration, problem solving, and student choice. Differentiated instruction allows educators to meet the needs of all learners, but there is a significant amount of time, energy, and resources needed to effectively and efficiently do it well.

One accessible way to differentiate instruction is through the use of guided math (Sammons, 2009). Guided math is an instructional framework used to create an environment that realistically meets individual student needs. Sammon's (2009) framework for guided math instruction begins with a whole-class warm-up followed by whole-group instruction, which leads into small-group instruction. During small-group instruction, students not involved in the small-group work individually or in pairs to complete tasks such as math fact practice, online or offline math games, or problem solving activities (Sammons, 2009). Independent or paired math tasks allow students to choose activities based on what they can do or what they need to practice. At the same time, students work at their own pace and develop 21st century skills by collaborating with peers, communicating effectively (using math language), and fostering creativity and critical thinking skills (Sammons, 2009). Part of what makes guided math instruction worthwhile is the availability of hands-on instruction used by students. Sammons' (2009) idea of the workshop portion of guided math – the part of class time when students work

independently or in pairs – allows students to use a variety of math manipulatives or play math games related to different math standards.

Use of manipulatives and games in the math classroom has been a topic of discussion among educators for several years. Boggan, Harper, and Whitmore (2010) found that student use of manipulatives has the potential to positively affect student learning if used correctly. By that, they mean that the teacher must clearly explain the use of the manipulative and the connection the manipulative has to the mathematical concept being taught (Boggan, Harper, & Whitmore, 2010; Moyer, 2002). In a research study conducted by Liggett (2017), the researcher found that second-grade students who received intervention using manipulatives performed better on a post-test than the students who did not receive the intervention. While the use of manipulatives might potentially increase student achievement, a caveat to using mathematical manipulatives is that they might work most effectively if students are given an opportunity to make meaning of the materials on their own (Moyer, 2002). Manipulatives are meant to be concrete representations of mathematical concepts, but students need opportunity to question, touch, manipulate, and discover what that meaning is while being guided by the teacher.

Additionally, manipulatives should be used for the entirety of a math period for maximum effectiveness (Moyer, 2002). If a math teacher plans on using manipulatives, they should be used during whole-group, small-group, and independent instruction and learning. Moyer (2002) found that students and teachers found the use of manipulatives enjoyable in a middle school math classroom because they received instruction using a hands-on approach. Manipulatives alone do not provide a rich student-driven math classroom. One of Sammons' (2009) approaches to math instruction is the use of mathematical games. In a study conducted by Ke (2008), students who played digital math games were able to experience higher levels of

peer and teacher scaffolding, as well as positive attitudes toward mathematics. Online and offline games allow the math classroom to be rigorous, while promoting collaboration, and extension and reinforcement of learning (Ke, 2008).

Math teachers can most effectively use manipulatives and games via math workstations. Math workstations are a variety of tasks targeting different math concepts and standards utilizing materials and manipulatives used during instruction (Boucher & Sammons, 2018). Diller (2011) wrote that math workstations allow students an opportunity to be highly engaged in the math classroom by offering activities that take the place of paper and pencil work and that help students extend and practice what they learned. Typically, math workstations are changed based on mathematical concepts, but stations should remain in place for ongoing practice (Boucher & Sammons, 2018). While math workstations generally prove beneficial to student engagement and learning, Worthy et al. (2015) warned that independence in math workstations could potentially lead to students who demonstrate off-task behaviors or confusion over the mathematical concepts. Workstations in the math classroom can work most effectively if there are clear routines and expectations established or by allowing students to work in pairs or groups (Diller, 2011; Worthy et al., 2015). Math workstations can be set up systematically, and work well when students have an opportunity to work alongside a teacher or a more knowledgeable peer, when they can review and correct mistakes on previous material, when they can practice, or when they can show what they know and how they know it (Andreasen & Hunt, 2012). Math workstations work in general, mixed-ability educational settings where learners enter the classroom with a variety of needs (King-Sears, 2007). By using math workstations, teachers can meet the needs of all learners by offering station tasks that are differentiated to benefit all

learners (Andreasen & Hunt, 2012). Math workstations are a way that teachers can effectively implement differentiated instruction in the math classroom.

Despite a growing body of research on math stations, little work has examined the implementation of math workstations in the classroom. Typically, math workstations are a component of Sammons' (2009) guided math instruction. Within the work that has been written about math workstations, no research has examined student and teacher perceptions. Because information about math workstations and student and teacher perceptions is limited, this study will help elementary math educators understand the benefits or drawbacks of using math workstations according to the perceptions of students and teacher.

Methods

In the following section, I describe the process I used to conduct this study including participant selection, data collection, and data analysis. In the second semester of the school year, I had established rapport and relationships with my students, which meant the teacher and students were comfortable with my role as a teacher researcher. The students and teacher had been using been using math workstations since the beginning of the school year and were accustomed to the expectations and routines of using them.

Participant Selection

There were 21 students in Ms. Smith's homeroom class. All students came from homes of low-mid socioeconomic status. There were eight Hispanic students, four students who were Black, and nine Caucasian students. Nine of the students were boys, and 11 were girls. Every student was sent home with a parent letter with information about the study. The teacher also received a letter with the purpose and information about the study. Only students who returned a

signed parent consent and assent form were considered for the study. The teacher also returned a signed consent form to participate.

Sixteen students provided signed parental consent and assented to participating in the study. I administered a survey to those sixteen students to assess their feelings and attitudes about math workstations. I used the results of the student surveys to conduct purposive sampling (Patton, 1990) to select six students to interview. I chose two students who enjoyed using workstations, two who did not, and two who seemed indifferent about workstations. Additionally, I conducted an interview with my cooperating teacher, Ms. Smith, to gather her perspectives about the use of math workstations. I chose these participants in order to have a diverse collection of perspectives included in this study.

Data Collection

I used three methods of data collection to better understand student and teacher perceptions of math workstations in a third-grade classroom. The data collection methods used in this study included student surveys, observations of math workstations, and student and teacher one-on-one interviews. I first administered a Likert scale survey to the students, which asked eight questions to evaluate students' feelings and attitudes towards using math workstations and how they felt workstations helped them understand math concepts (see Appendix A). Each question offered four responses ranging from "I don't like it" to "I love it". At the end of the survey, there were two open-ended, short answer questions. These were administered to Ms. Smith's homeroom class in the third week of the second semester.

For my second method of data collection, I observed students' (with consent and assent) participation, behavior, and attitudes while using math workstations from 1:30-3:00 on Monday and Wednesday afternoons for three weeks. My observations were in the form of head notes

because I needed to be able to interact with my students while observing their use of math workstations. I used a composition book to write down notes as needed throughout the observation period and immediately following the observation period.

Finally, I administered semi-structured interviews based on the survey responses (Hendricks, 2017). This allowed opportunities for open-ended questions and responses (see Appendix B). The one-on-one student interview were conducted in 10-15 minute intervals, with two students who indicated they did not like math stations, two who indicated they enjoyed math stations, and two who showed indifference. In addition, I conducted a 20-30-minute semi-structured interview with the classroom teacher. All interviews were audio recorded on two devices and transcribed.

Data Analysis

To analyze my collected data, I first began with my survey results. I graphed the responses of the students' surveys on a scatterplot in order to see frequency counts (Hendricks, 2017). This offered me a visual to better understand what students did or did not like about using math workstations as well as choose the students who were to be interviewed. For each survey response, I assigned a numerical value in a table (see Appendix C). Positive student responses had higher numerical values than negative responses, and responses were assigned numbers one through four. For example, a response of "I love it" correlated with a numerical value of four. I averaged the numerical values of each question to create a scatterplot. The scatterplot allowed me to see students' perceptions of specific components of math workstations.

I used Hubbard and Power's (2003) constant comparative method to code, or organize, data from my classroom observations and student and teacher interviews. Using this method, I identified level 1 codes, which are pulled directly from the data to describe emerging, recurring

themes (Tracy, 2013). I found level 1 codes for the first 20% of my data, which helped me create a list of 15 codes, from which I coded the remaining 80% of my data. After looking through my level 1 codes, I compiled a list of four level 2 codes, which I interpreted from my data (Tracy, 2013). Level 1 codes were grouped together based on how they related to one another, from which the level 2 codes were created. All of the level 1 and level 2 codes were compiled in a codebook (see Appendix D). As I analyzed data, I recorded memos for each of my level 2 codes. These memos allowed me reflect on the code, how it related to the research, and what the code's significance was to this study.

Findings

As I analyzed data, I noticed four overarching themes, or level 2 codes, in which all level 1 codes were organized. The level 2 codes were titled "Making a Switch", "Engagement", "Who Do You Work With?", and "Understanding". In the following sections, I explain how the student surveys, student and teacher interviews, and field observations related to the level 2 codes.

Making a Switch

As I watched students work in stations, I noticed quite a bit of redundancy. From the survey results, I gathered that many students felt less excited about using a new station. I also observed that students picked the same partners consistently or chose the same stations every time. Beau, for example, chose the "Read It!" station almost every time the class did station work because he liked that he could "get big books, and...read them fast...". There were some students who noticed when it was time to try a new station, as Jacob did on February 14, when his partners wanted to do one activity, but he said, "No, I've played that too much!" causing them to choose a different station. Ms. Smith noted that she might

decide to integrate a checklist that would allow students to "rate each math station as they do it" to gather more data about how students felt about particular stations and to see in which stations students were spending their time.

In the student surveys, four students wrote about how they disliked when stations change. (Abe's example of one open-ended survey response can be seen in Figure 1.) I found this interesting for a few reasons. On one hand, it showed that students had high levels of engagement and motivation. Every time we set out new stations, students found a couple they enjoyed and showed motivation to do those stations. On the other hand, when students chose the same station each time, they limited the number of materials they interacted with, which differed from what I thought would happen. I also found it interesting because even though students indicated that they disliked when stations changed, they showed excitement when we introduced new stations. They mostly liked working on the activities in the stations, even if they did go to the same station every single time, which tells me that their feelings toward math stations were positive.

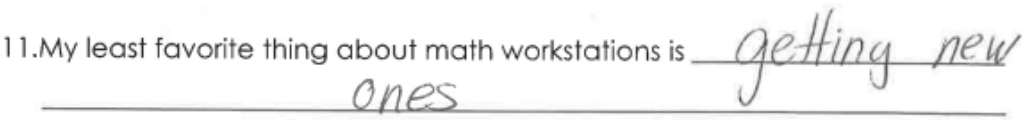

Figure 1. Abe's least favorite thing.

During my data collection, the class ended one unit and started a new one (fractions and geometry), which meant that the station activities changed. Students showed excitement for the new geometry stations, even though it meant that most of the fraction stations were gone. When I asked him how he felt about the teachers switching stations out for new concepts, Sam said that while he enjoyed when stations changed, it might have been more difficult for students who were still struggling with a previous concept. Even while station work gave Ms. Smith and I opportunities to meet with struggling learners, I

understood how switching stations might have hindered student understanding of math concepts, especially those who were struggling in a unit.

Ms. Smith mentioned that one drawback of using stations in the math classroom was that it could be difficult to maintain stations. She mentioned how typically by January, she did not use station work in order to focus on content to prepare for the State of Texas Assessments of Academic Readiness (STAAR test). Along with that, she mentioned that in the past it had been harder to make a switch to using stations when other teachers were not teaching that way. In that way, I saw how her attitude toward stations might have been negative. She mentioned how it could be a struggle to use stations when there was so much pressure on students to understand the content, especially in third-grade, but she still loved how students were able to move around the room and play games to learn, which was something that the students mentioned they loved as well.

Ms. Smith and several of the students that I interviewed mentioned how they loved the fact that math stations allowed them to move around the room and do activities that were new and different than sitting in a desk and working on a worksheet. When I interviewed Baylee she said she liked stations because "they're fun, and you get to move around the room and...just have fun". Even if students chose the same station and the same partner and disliked new stations, the fact that stations offered opportunities to learn in ways other than what they were accustomed to influenced how the students and teacher felt about math stations in the classroom.

Engagement

When I first stepped in the classroom and observed students working in math stations, my immediate thought was that student engagement was high. As I looked

through the student survey responses, I noticed that their feelings toward math stations were mostly positive or indifferent. Eighty-one percent of students indicated that they either loved or liked doing math stations, which suggested that student engagement and motivation were high. After reading their responses to the survey, I wondered why engagement was so high. I wondered if engagement was high because students enjoyed learning math through games and manipulatives or if other factors influenced their excitement towards stations. In my observations, I noted several instances of students needing redirection while working in stations. (See a sample of my head notes journal in Figure 2.) Redirection occurred thirteen times and typically happened as a result of students working with partners and talking about things besides math.

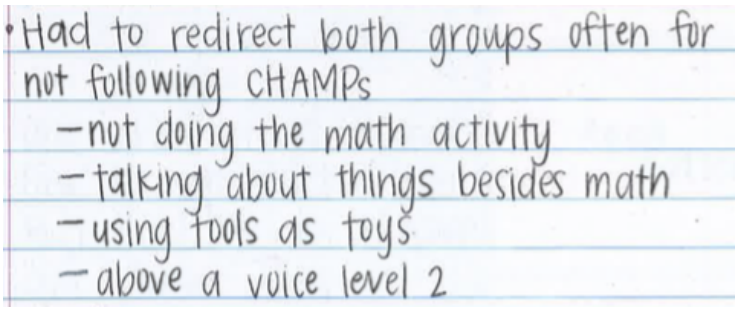

Figure 2. February 6, 2019 head notes journal entry.

I was curious if redirection occurred often because students were not engaged in the math, but I noticed that there were almost an equal number of instances of engagement as there were of redirection. As I walked around the room, I heard in-depth mathematical conversations. Students would stop me to show me what they were working on, and they would ask for extra materials to help solve their problems. Additionally, as I interviewed students, several of them indicated that one change they would make to math stations is how often they are able to do them. In his interview, T. J. said he wished their class could do math stations for three hours. Perhaps that was an overstatement, but it did

demonstrate how much he loved working in stations. When I asked students what their favorite thing about math stations was, most of them mentioned specific stations such as "Versa Tiles" (which T. J. mentioned about five times in his interview), "Flocabulary," or "Spin and Cover." What stuck out with me most was that throughout the student interviews, they recognized which stations they liked or disliked and whether or not a station was helpful to their learning.

I had wondered if students were engaged in the math or if they were engaged for other reasons, such as working with a partner or playing games. I found that engagement was typically a blend of social and academic motivation. Because of the data I collected about math stations through survey responses, observations, and interviews, I noticed that students showed engagement in the math classroom. Because of high engagement, I would say that the students' and the teacher's perceptions of math stations were mostly positive. My initial thoughts about math stations were true: as students collaborated and solved problems while playing games and moving around the room, chances were high that they enjoyed math stations.

Who Do You Work With?

Much of what I discovered from the student survey data was what I anticipated. Outside of the research data, I noticed that this class typically showed enjoyment for social opportunities (whether they had permission to do so or not), and they also usually enjoyed any level of competition, which came to light in the classroom through the games included in math stations. Unsurprisingly, most of the students enjoyed working with partners during stations, and did not enjoy working alone, which I know because those are the highest and lowest scores from the survey data respectively. Before beginning the research, I figured that students would have

positive attitudes toward working with partners, but I did not anticipate how much students enjoyed working with partners. In fact, much of what I found through analyzing the data was that most of the students and the teacher had highly positive attitudes about working with partners during math stations.

As I walked the room for the first time, I saw students working with partners, talking about math, and problem-solving. I wondered how working together influenced students' attitudes toward stations, and what I discovered was exactly what I anticipated. On the Likert scale survey, all sixteen students indicated that they either liked or loved working in partners during station work. Only three students responded that they preferred working independently, and the results for how students feel about working with the teacher were mostly mixed. In the open-ended responses, nine students wrote about working with partners. Six students said that partner work was their favorite thing, and four said it was their least favorite thing. Ms. Smith said that she loved the fact that students could work in pairs to correct mistakes and grow.

When told that they would work in partners, I noted in my observations that students showed excitement. Ms. Smith and I assumed that students would prefer choice in partner work, but when Ms. Smith chose students' partners for them, they showed more excitement than when they were able to choose partners on their own. I noted some disagreements between partners, but disagreements were scarce and resolved quickly. Most problems and instances of redirection occurred as students were off-task with partners, but partners typically worked well together.

During the student interviews, almost all the students mentioned that they enjoyed working with partners. Baylee said that she liked working with partners just because it

was fun to talk to someone else. Sam mentioned that he liked working with partners because "it's nice to have a partner to help you." Many of them mentioned how working with a partner helped them grow by working to correct their mistakes or misconceptions. T. J. was the only one who said that he would rather work independently. He was also the only student who said that he did not enjoy working with the teacher during math stations. Beau mentioned that he felt okay about working with the teacher because he saw it as a "privilege to get your grades up," by which he meant it was an opportunity to correct mistakes. Most students had positive attitudes about working with the teacher even though it meant they missed out on station time. Ms. Smith enjoyed the fact that stations gave her an opportunity to meet with students one-on-one or in small groups.

Because they were able to work in partners, and they mostly enjoyed working together, it showed that students had positive attitudes towards working in math stations. They mentioned several times how working in partners helped them grow, which demonstrated students' beliefs that working with partners helped them better understand mathematical concepts. Most students noticed that working with partners influenced their attitudes toward math stations in a positive way.

Understanding

I wanted to find out if students enjoyed math stations and whether or not the students felt that the math stations helped them understand mathematical concepts. Student survey results were mixed as to whether or not they believed math stations helped their understanding. Sixty-three percent of students said that math stations only helped them understand a little or did not help at all. Some students wrote in that some of the stations were too difficult to understand. Patricia in particular wrote that there were some

stations that were hard (see Figure 3). This was interesting to find in the survey results, especially because I noticed deep understanding through my observations. As I walked around the room, I noticed students talking about math stations with their partners, I heard them using math language, correcting mistakes together, and demonstrating understanding of the content. John used a newly acquired vocabulary word when working with a partner, two students worked together to correct a mistake on writing a fraction as four over one instead of one-fourth, and students helped one another identify fractions in fraction bingo by looking at the pictures and saying the fraction names.

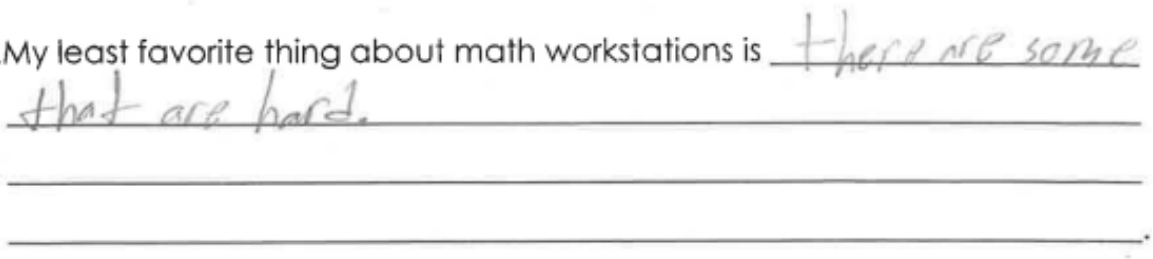

Figure 3. Patricia's response.

Ms. Smith was unsure of whether or not stations helped students understand the content. She said, "...They get more exposure to the conceptual level of the understanding and more time to manipulate the manipulatives or the content...," but she also mentioned that she did not notice if their academics were better. The beneficial thing about stations to Ms. Smith and to the students was that students were able to learn in a supportive, fun, and engaging environment. Ms. Smith said that even though she was unsure of the ways stations helped their understanding, she still chose to use stations in her classroom. She mentioned that the way that students were able to work together and collaborate to solve different higher-order thinking problems and correct mistakes to help them grow influenced her attitude to direct her to continue using stations. Although Ms. Smith was

unsure whether or not stations helped students' understanding of math content, the students mostly believed stations helped them better understand math concepts. Both the students and teacher had mostly positive attitudes toward math stations.

Implications for Teachers

My research questions were focused on attitudes and perceptions about math stations and how students and the teacher felt math stations helped student learning. It seems that as much as I discovered, I still have many more questions. For the most part, the students and the teacher love using math stations, but while the students mostly believe stations help them learn, the teacher is unsure. I am left with the following questions: What is a better way to measure student understanding of math stations? How do math stations affect student performance in the math classroom? For now I am focused on perceptions and attitudes because if students do not like the practice, there is little chance they are learning.

Changing the game is difficult, especially in the field of education, where standards and testing requirements can weigh down on teachers. Ms. Smith needed a way to engage students in the math classroom while still upholding her professional responsibilities as an educator in a third-grade classroom. I had assumed she loved stations, but her response to the use of stations surprised me. When asked how Ms. Smith felt about stations in the classroom, she explained,

> "I love them, but I also feel a lot of anxiety about them because I feel like maybe I'm not giving them the content...you know, 'cause there's the old-fashioned way of just teaching them the concepts, and paper/pencil, and so I don't know if I'm giving them high enough expectations for the content. I don't know... I'm in the middle. I- I love them. I think they're high engagement. I think they're good. I think they have...I think they do have

higher-order thinking skills... But, I don't know if that develops them to where they need to be... Am I preparing them?"

While students are engaged in the content and their needs are met, Ms. Smith still wonders if she is doing enough for their learning.

I asked each of the six students whom I interviewed how math stations helped them grow as a mathematician, and Beau provided a response that I did not expect. He said, "Sometimes we do a math station, and we have to, like, take a test in our book. I know since, like, stuff on your test is connected to math stations," which meant that the activities in the stations helped him understand assessment material better. Sam described how the stations that "didn't do it for us, we had to figure it out...really helped" him understand math better. The most interesting thing to me is that while the students mostly enjoy using math stations because they were fun, most of them still saw stations as an opportunity to help them better understand mathematical concepts. Beau and Sam recognized that the activities included in math stations helped them make connections between concrete and abstract concepts and encourage higher-order thinking. John, when answering what his favorite thing about math stations was on his survey, wrote that they get to stretch their brains. (See John's open-ended survey response in Figure 4.)

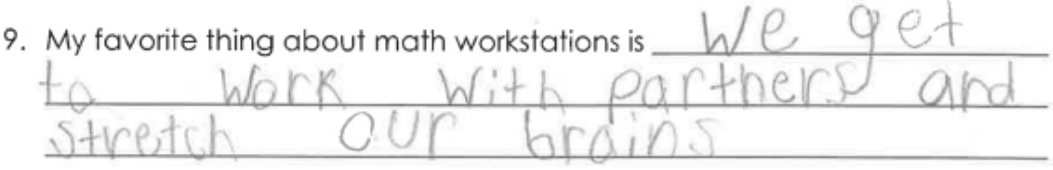

Figure 4. John's favorite thing.

As I conducted my research, I realized that if teachers are to use stations, consistency is an important factor. There are three prongs to consistency in the use of math stations: change, routine, and partners. While I focused my research on perceptions, I still noticed that students typically do not like when stations change. I think the reason is because in our classroom, when

we rotated stations for a new unit, the old stations were never used again. Sam mentioned how that can be detrimental for student learning, and I agree that removing stations permanently does not help meet student needs, which is the aim of station work. A better practice would be to keep at least one station in rotation from previous units.

Additionally, partner work helps students grow, which I noticed in all the data that was collected. Students need opportunities to grow and learn alongside of peers. Even if they need redirection, most of our students loved math stations simply because it was an opportunity to work with someone else – it was different from what they were used to throughout the day. Taking that opportunity away is appropriate sometimes, but not every time; there must be consistency for higher student engagement. In the same way, the use of stations should be routine. Ms. Smith and I rarely took stations away from the whole group because we understood that allowing them to touch and feel the materials was better than working alone in a book. We also knew that establishing the routine of using stations was more beneficial to their learning and engagement.

While pressures and demands caused Ms. Smith (and I am certain countless other teachers) to question whether or not the use of math stations benefits the students, I have seen how students respond to the use of stations in the classroom. Every single time we said they were about to work on stations, our students showed ridiculous amounts of excitement. To see that much engagement and motivation in a third-grade math classroom led me to believe that students held highly positive perceptions of math workstations. Whether I teach math or not, the data showed how positively the students and teacher viewed stations work. The students in the classroom appeared to be highly engaged by math stations. They also perceived that they enjoyed stations and learned from them. It is unclear from my research to what extent the

students learned mathematical concepts from using stations, so while I noticed excitement and motivation, additional research is needed to confirm the extent of student understanding.

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Appendix A

Student Survey

Math Workstation Survey

1. How do you like doing math workstations?

I don't like it I like it a little I like it I love it

2. How do you think math workstations help you understand math?

Not at all Only a little It helps It helps a lot

3. How do you feel about working with a partner for workstations?

I don't like it I like it a little I like it I love it

4. How do you feel about working with the teacher during math workstations?

I don't like it I like it a little I like it I love it

5. How do you feel about doing math workstations on your own?

I don't like it I like it a little I like it I love it

6. How do you feel about math workstations changing throughout the year?

I don't like it I like it a little I like it I love it

7. How do you feel about using a new workstation sometimes?

I don't like it I like it a little I like it I love it

8. How do you feel about the activities in the workstations?

I don't like it I like it a little I like it I love it

Write your response to the following sentence stems…

9. My favorite thing about math workstations is _____

_____

_____

_____.

11.My least favorite thing about math workstations is _____

_____

_____

_____.

Appendix B

Interview Protocol

One-on-one Student Interview Protocol

1. What is your favorite thing about math workstations? Why is that your favorite thing?
2. What is something that you wish was different about math workstations? Why?
3. Why do you think you use math workstations in this class?
4. What is something that is easy in math for you?
5. What is something that is difficult in math for you?
6. What about math workstations helps you understand math better?
7. What about math workstations might not help you understand math better?
8. How do you feel about getting to work in partners for workstations?
9. How do you feel about getting to work with the teacher during workstations?
10. What is one way math workstations have helped you grow as a mathematician?

Teacher Interview Protocol

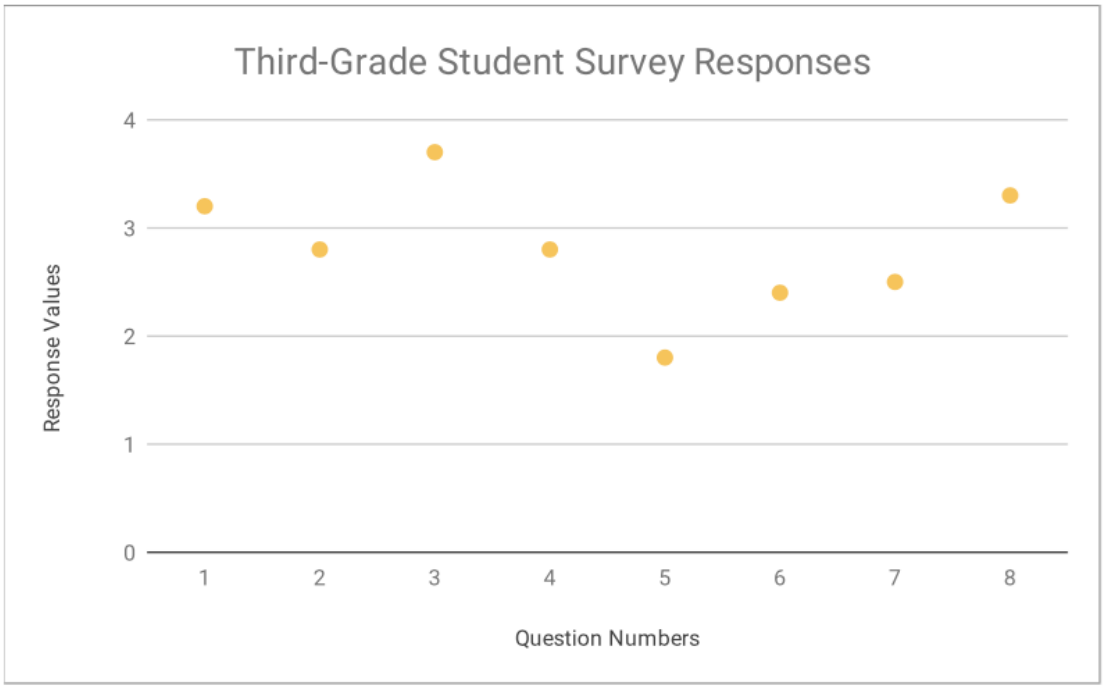
1. How has the use of math workstations impacted how you teach math?
2. What changes have you seen in student engagement in the math classroom?
3. How have you noticed math workstations impact student understanding of mathematical concepts?
4. In what ways do you feel math workstations help students?
5. In what ways do you feel math workstations might hinder students?
6. What has been the best part about using math workstations in your classroom?
7. What do you wish were different about the use of math workstations in your room?
8. How do you think the students feel about math workstations?
9. In what ways do you predict using math workstations will benefit students in the future?
10. How do you feel math workstations are meeting student needs?

Questions may vary and additional questions may be asked depending on the answers of the participants.

Appendix C

Survey Analysis

Student	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Caelyn	4	2	3	3	4	3	4	4
Rudy	3	4	4	3	2	3	1	4
John	3	3	4	3	1	1	2	3
Sam	4	3	4	4	2	4	4	4
Derek	4	4	4	2	2	4	3	4
Sara	3	1	3	3	1	2	4	2
Sophia	3	4	4	3	2	1	4	4
Jacob	3	4	3	2	1	2	2	4
Patricia	3	2	3	3	2	3	2	4
Cody	3	3	4	4	3	1	1	4
Baylee	4	3	4	1	1	1	1	1
Beau	2	1	4	1	1	3	1	2
Abe	2	2	3	3	1	3	2	3
Raya	4	4	4	4	4	4	4	4
Elizabeth	4	2	4	2	1	3	3	2
TJ	2	3	4	3	2	1	3	4
Response Values	3.1875	2.8125	3.6875	2.75	1.875	2.4375	2.5625	3.3125



Appendix D

Codebook

Color	Code Name	Level	Definition	Example
	Making a Switch	2	References changes within station work	Raya: "When we learn new [math stations] some of them are really hard."
	New Math Stations	1	Refers to any changes to math stations	2/4/19: "I introduced new station: 'Zooming in on Fractions' – review on familiar concepts"
	Something/Someone Different	1	Instances of students choosing a new station or new partner	2/14/19: "Jacob's partners wanted to play 'Spin and Cover', but he said, 'No, I've played that too much!' They chose a different station."
	We're Getting to Do Different Ones Every Time	1	References to why the teacher and students enjoy math stations	T. J. : "'Cause they're fun, and you get to move around the room and...just have fun."
	I Feel the Struggle	1	Teacher feeling the struggle of using stations in the classroom	Ms. Smith: "...I usually throw math stations to the side..."
	Engagement	2	Students demonstrating engagement or lack thereof	Baylee: "I think that I'm learning more and more as I go to math stations."
	They Were Redirected	1	Instances of students not talking about or doing math tasks	2/14/19: "We don't get to look at our [Valentine's] bags if we don't focus on the math! This isn't fun time, it's math time!"

	I Just Love It So Much!	1	Instances of being on task or excitement for math stations	2/20/19: "Can I please get a piece of scratch paper to use for Flocabulary?"
	That We Would Get One Every Day	1	Instances of students indicating that they wish they could do stations more often	T. J. : "I wish we could do it, like, three hours a day."
	VERSA TILES (and Other Stations)	1	Students mentioning specific stations they like or dislike	Ms. Norwood: "What is your favorite thing about math stations? T. J. : "Versa Tiles!"
	How Does That Help?	1	Students indicating stations that are helpful or not helpful to learning	Sam: "It didn't do it for us, we had to figure it out."
	Who Do You Work With?	2	References students working alone, with a partner, or with a teacher	Ms. Smith: "And they get to talk to a partner and bounce their ideas off of each other."
	Sometimes We Get to Work With Partners	1	Students' feelings about working with others during stations	Sam: "...It's nice to have a partner to help you."
	With the Teacher	1	Students' and teacher's feelings about working with the teacher during stations	Patricia: "[It makes me feel] sometimes bad and sometimes...I don't really care"
	Go Old School	1	References feelings about having to work using paper/pencil	2/4/19: "T. J. and John broke CHAMPs expectations and had to 'go old school'..."
	Understanding	2	References how stations influence understanding of math concepts	Sam: "I think we use math stations in math class to help us figure out the math..."

	To Help Our Brains Learn (or not)	1	Instances of students indicating that stations do or do not help them understand math concepts	Raya: "...When I worked in the math stations, it started helping me do all my math."
	Mistakes	1	Instances of students recognizing how mistakes during stations help them grow	Raya: "...When we start doing harder and harder stuff...we learn and may correct our mistakes."
	It Doesn't Mean the Academics are Better	1	References how the teacher feels stations do or do not influence academics	Ms. Smith: "I just feel like they're more engaged, but I don't know that they're academics are better."