

**Mathematics Enrichment Camp Experiences
Amid the COVID-19 Pandemic: Teacher Voices and Perspectives**

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Abstract

This article discusses how mathematics teachers seized the opportunity to keep the mathematics component of STEM camp on track by transforming the camp into a virtual camp themed *Out of this World*. Teachers and camp interns encountered technical, social, and instructional challenges in transitioning to a digital platform while preserving the integrity of the prior learning experiences. Such challenges presented opportunities for collaborative and innovative resolutions as well as personal and professional growth. The lived experiences presented a need for a vector from instructional theory to practice and resulted in the development of an authentic professional learning community. The voices of these educators speak hope and promise for mathematics teachers answering the call to remote learning.

Keywords: hands-on instruction; virtual instruction; middle school; math instruction; engaging; virtual math camp; COVID-19; remote learning;

Introduction

Even in the 21st century, many middle school mathematics teachers primarily perceived synchronous learning as face-to-face learning in a brick-and-mortar space. The Spring 2020 COVID-19 global pandemic necessitated a different take: the dominant approach to synchronous learning would be conducted remotely using video conference platforms (i.e Zoom). In this article, three master teachers of mathematics share their experiences transitioning from a traditional one-week summer camp to a virtual one. During a 4-week span, they made adjustments and helped produce an online STEM summer camp themed, *Out of This World*, focusing, particularly, on a variety of engaging mathematics activities for students possessing *hidden or unmet potential* (Sheppard, 2019). The subsequent text will include three non-competing voices of teachers providing intricate details regarding their experiences in hopes of

assisting other teachers in the field to navigate pathways of creating and delivering digital learning experiences.

Teacher Vignettes and Context

Vignettes have been used to provide insight into understanding best practices and effective instructional strategies, establishing relationships, providing an illustration of current classroom situations, and identifying beliefs and perceptions of educational systems (Strecher, Le, Hamilton, Ryan, Robyn, & Lockwood, 2006; Callicott, 2003; Slead, Durrheim, Kriel, Solomon, & Baxter, 2002; Campbell, 1996; Schwartz & Riedesel, 1994). Vignettes also give the educator an opportunity to identify problems within lessons, identify and analyze strategies that might be effective, and develop questions that might advance or scaffold learning (Strecher et al., 2006; Jefferies & Maeder, 2004; Hughes & Huby, 2002). Novice and pre-service teachers can use observations as a means of professional development, but when in-person observations are not feasible, using vignettes gives the learner a reflective narrative of the specific setting and/or situation (Richman & Mercer, 2002). School systems, universities, or teacher preparation programs can also use vignettes to measure an educator's pedagogical content knowledge in given situations (Jefferies & Maeder, 2004). Vignette usage will become increasingly important during pandemic times because it allows an educator a glance into the classroom to engage, assess, and reflect upon classroom practices and strategies while demonstrating the educator's pedagogical knowledge during reflection and discussion (Strecher et al., 2006; Jefferies & Maeder, 2004; Slead et al., 2002; Schwartz & Riedesel, 1994; Campbell, 1996).

The *Out of this World* (OTW) camp experience will be illuminated through the use of vignettes and voices. This project is funded by a National Science Foundation (NSF) grant that provides master teachers an opportunity to mentor pre-service teachers while collaborating and building hands-on STEM lessons and implementing them in a summer camp setting. In previous years, this camp was held at a local middle school, and campers had the opportunity to engage in these activities in person. Due to the COVID-19 crisis, this camp was forced to shut down or move to a virtual setting. The educators in this paper represent those master teachers who shifted from in-person to virtual mathematics lessons. The voices and vignettes of these three educators offer an inside perspective while giving life to mathematics teaching during the COVID-19 pandemic. These educators offer a glimpse into three lessons that were presented at the OTW camp as hands-on mathematical lessons moved from in-person to a virtual platform via Zoom. These educators desired to keep their lessons aligned to best mathematical practices including

hands-on activities that were highly engaging and rigorous while keeping the lesson challenging with an alignment to science and engineering standards (NCTM, 2014). In order to protect the anonymity of participants, pseudonyms will be used throughout each vignette. The purpose of using vignettes for these experiences is to provide other educators a peek into the design and preparation of engaging virtual STEM lessons while giving them a space in which they can reflect, analyze, critique, and possibly sharpen their pedagogical knowledge of best practices in creating virtual mathematics lessons.

Magnum Pi's Voice and Vignette

From my perspective, when students can see the application of mathematical concepts rooted in real-world scenarios, they are able to see that the need for learning and using this material extend beyond the classroom. This results in mathematical understanding that is both meaningful and long-term. Helping students develop their mathematical expertise requires teachers to incorporate hands-on problem-solving opportunities into daily instruction in order to enable students to make these connections between the mathematics they are learning and their personal prior experiences (Boaler, 2016). Aligned with the Louisiana Student Standards for Mathematics, these require application through critical thinking and take the form of a game or competition where students work independently or in teams to arrive at solutions. These activities have proven far more engaging than pencil-and-paper tasks and provide opportunities for authentic reinforcement and a valid means of informal assessment. Transitioning these activities from in-person to a distant learning setting may be challenging but worthwhile because campers have technology experience. This technology can be used to enhance the student's interaction with mathematics, as well as allow for a space of reflective, rigorous mathematical learning (Boaler, 2016; NCTM, 2014).

Game Room Activities

From the first year of the camp experience, my sessions were known as the *Game Room*. Students looked forward to finding out what form each day's game would take. They collaborated in teams and shared their reasoning as they solved rich multi-step problems.

In prior years, a *Game Room* favorite was the physical escape room challenges that offered mathematical problems in locked boxes, detective tools encased in sealed compartments, and even logic problems or puzzles in jigsaw format. Teams uncovered clues by solving problems or answering riddles. Answers led to other riddles and more questions. Campers used code readers and UV flashlights to decode secret messages written in cryptic code or with

invisible ink. They might discover a key or batteries in a can of Diet Coke or inside the cover of a school book. Mathematical problems were critical at every level of the activity, and campers had to apply critical thinking and collaboration skills in order to achieve the break out! Moving the enthusiasm and zest associated with the game room experience to a distant learning setting would prove to be taxing.

My greatest challenge in planning a virtual escape room activity for the OTW camp was in designing the activity to guarantee student engagement and interaction from remote locations. I had been teaching algebra in a distance learning model from the time we were sent home in March of 2020 due to the pandemic restrictions. I struggled with getting students to participate in discussions or to answer direct questions. These were my honors students who had been together in my classroom for the entire school year, yet would not talk in a Zoom class. It was as though they had never met! Thus, I knew I would have to plan the OTW camp activity in a way that guaranteed collaboration and communication.

I began by writing sets of problems that were primarily based in real-world contexts. These addressed concepts that were to have been big ideas for the camps activities including algebra, geometry, probability, proportionality, and problem solving. They included multi-step word problems, numerical sequences, vocabulary tasks, and logic problems. Solutions to these items would be embedded into some kind of puzzle or code. I created puzzles that allowed for incorporation of problem-solving strategies and logic.

I quickly discovered that the digital layout would require much more variety in presentation of codes and clues without duplication of the same. I found that the exclusively virtual design would not allow for the same flexibility found in the set-up and design of a physical breakout, but the situation commanded some diversity, challenge, and decor in order to gain the gamers attention and passion for competition. A jigsaw puzzle, for example, can be completed by an individual or by a team sitting around a table in a physical set-up. A digital jigsaw, however, despite the ability for screen sharing, can only be completed by the individual who is controlling the device in the share. Where a single jigsaw could have been used to develop an entire code in a physical room, I would need four or five jigsaws, one for every team member. Each would reveal a single piece of the solution, and team members would have to put their information together in order to build a single code for the virtual activity. Using this jigsaw puzzle would be similar to the unlocking of boxes or opening doors in an in-person setting and

would add the thrill of moving to another step, all the while providing mini-math breaks for campers.

After completing the problems and codes for the activity, I drew on the writing skills of one of my eighth-grade students to create a narrative to encapsulate the activity. A camper drafted a manuscript with eight levels of conflict before a final resolution by means of escape. It was carefully aligned with our theme for the camp, *Out of This World!* Our camper discovers that she has been given a summer job working at NASA where her dad is a shift supervisor. She finds herself in one dilemma after another and must uncover clues in order to complete her work by day's end.

After many unsuccessful attempts at building scene pages, I realized that it would be necessary to create a separate webpage for every image that was a part of any of the solutions. This included every word problem, code, clue or image, and every Google form that served as a "lock" for the room. I located images that represented each level in the narrative, and embedded links for pages that led to each code within the scene. Then it was a matter of adding text for the narrative and publishing the pages.

Campers would complete the escape room using a virtual meeting platform with breakout rooms containing smaller teams that would compete against each other for the quickest escape time. My two interns (math majors) from the local university and a first-year math teacher, were assigned to breakout rooms and facilitated discussion among campers. This part of the activity allowed for small group discussion time amongst teams very similar to in-person discussion in traditional settings. Although it took away from the personal connection that occurs during in-person camp, this scenario still allowed for interaction amongst campers, interns, and teachers.

The interns completed a virtual dry run escape room activity in small groups prior to OTW camp start. Upon completion of the dry run, we used intern escape room results to predict the time it would take for the campers. We also planned back-up activities in the event that a team would finish earlier than expected.

We began the first OTW camp day with an icebreaker that allowed campers to become familiar with each other. Icebreakers at in-person camps had been successful year to year because campers were faced with challenges that required them to work together expeditiously in order to attain a goal. All of the campers could see each other and the progress that each mini-team would be making which would add enthusiasm and desire into the current discussion. This was a necessary, but challenging activity because of the virtual learning platform. Campers could

not see other teams and could only see the faces of those campers that wished to share their images on Zoom. Icebreakers were necessary to move campers to a comfort level using this virtual learning platform and aided in establishing relationships amongst all involved.

The icebreaker activity successfully alleviated some of the discomfort of working with a group of complete strangers and set the stage for students to grapple with the task at hand. They were given the link to the launch screen and were separated into teams. This grouping was done randomly, but some effort was made to ensure campers were intentionally placed into groups with campers they did not know. An intern was assigned to each room and facilitated campers' navigation through the activity. I switched from breakout room to breakout room to monitor and to provide support as needed.

There was little discussion as campers began reading the narrative and exploring the layout of the initial screen. They were locked in a virtual closet and had to find a code in order to get out of the room. Camper two was a bit confused when the solution to the first problem he answered did not open the lock. A teammate explained the image he'd found that showed that there might be more than one problem to solve. The strategizing began when campers discovered that they were finding different problems and noticing different things about the way that they were written. Camper three suggested to his team that they would have an easier time if they left all of their tabs open until they solved a particular level. Camper three stated

“Hey, guys, if you leave all of your tabs open, you can go back and forth from one problem to the other until we solve the code. After we solve the code, we can close the tabs and move to the next screen. That will probably be a little easier. I’m going to write down the codes in case we need them later.”

The second level of the activity contained links to a jigsaw puzzle website. Students had to put a set of puzzles together in order to discover a four-digit code. Each puzzle contained number words that were written in different colors. Each also contained a mathematical statement, of sorts, that would make it easier to complete the jigsaw a little more quickly. On more than one occasion, though, campers interpreted the slogan to determine what math they had to do in order to find the code. One card read, “Don’t be average. That’s just mean!” The discourse that resulted, though was completely off target in regard to the code, was meaningful and led to good discussion about measures of central tendency. In more than one instance,

campers tried to calculate the mean of the number words on the card, but decided that the four-digit number was probably not a decimal. This level resulted in a lot of correct, but unnecessary calculations! Math for the win!

In each remaining activity scene, there were rich mathematical discussions. Campers readily shared discoveries within each level, and each was able to find entry points for problems in order to contribute to his team's successes. Teams required the full length of the camp experience in order to break out of the project. One student exclaimed, as they finished, "Oh, man! I knew we would finish it if we only stuck with it! This was so much fun!"

Projector Gadget's Voice and Vignette

My prior year's camp lessons focused on geometry aligned with mathematical practices and specifically included model boat building, model boat racing race, geometric pinball machine models, scaled drawings to design t-shirts, geometric drawing for superhero capes, and geometric-inspired neighborhood models. Hands-on experiences that include opportunities for students to engage in mathematical conversations that are rigorous and activate critical thinking are needed to produce future mathematicians or STEM leaders (Boaler, 2016, NCTM, 2014). All lessons for OTW camp include NCTM's (2016) mathematical practices to ensure that we are developing mathematics thinkers.

I monitor the lesson success through student growth and camper/parent feedback. Past campers' feedback has always been positive. Some have even expressed an enthusiasm for applied mathematics and engineering. Moving hands-on learning from an in-person setting to a virtual learning setting was challenging. I had to ensure students had access to materials and if they didn't, we had to agree on materials that could be used that would be beneficial and fair to all involved in the challenge. Engaging students in rigorous hands-on learning in an isolated setting with little to no physical assistance from an intern or teacher would either slow down the process or require the student to think and manipulate the activity more. I was hoping this would not increase student frustration. COVID-19, regardless of challenge or distance, was not going to stop me from keeping the excitement for real-world, hands-on, STEM experiences alive.

Rube Goldberg Activities

Prior to the outbreak, my plans were to conduct a Rube Goldberg challenge with specific building materials. The idea of a Rube Goldberg machine is to convert a simple energy transfer into a complex machine that a multitude of complex energy transfers, basically making

something very simple into something very complex (Dolenc & Cohen, 2018). Much thought was given to this and the way in which interns would help navigate the students' thinking and the activity in order to promote the most success. Implementing this lesson online, at home would present many challenges.

After careful deliberation and collaboration, my team decided on specific materials that students would have at home without having to purchase items. After all, supplies were limited because of COVID19. Instead of giving campers a supply list, I used an app called Goosechase to make finding the needed materials (household items) into an activity, "The Rube Goldberg Scavenger Hunt." I listed items on this app, and campers earn points for finding these materials, taking a picture with the material, and uploading to the app for all to see. I also included geometry questions pertaining to areas of various shapes or asked campers to identify shapes based on qualities in order to give all students the opportunity to gain points if they were unable to find some of the items on the scavenger hunt. Campers were also allowed to make items on the scavenger hunt in order to gain points. They were allowed to work collaboratively, and mathematical discourse was encouraged and provoked. This scavenger hunt was done on the first day of camp and took approximately 55 minutes. An email was sent to parents prior to this day so they could download this app. Some campers came on the day of the hunt with no app, because they were unable to download it, or their phones were not compatible. I simply assigned an intern to each of these students, and the student found their items then brought it to the computer to have the picture taken and uploaded by the intern. Distance learning required the student to be 100% responsible for these belongings within their own homes.

Campers were told to keep items in a box or to pile them in an area of their room so they would be easily accessible for the rest of the week. Each day we only had 55 minutes and wanted to be able to complete the build and observations of the final builds by Friday. To our surprise, many students had returned their items, thrown some items away, or someone cleaned their area and items were missing. Upon reviewing the scavenger hunt list, we made this revelation and I knew immediately that this would slow our building process.

I showed three different Rube Goldberg machines ranging from very simple to ultra-complex to give campers an idea of the mechanics. Campers were encouraged to search online for other builds, discuss possibilities, and view videos of finished machines. Each class was split into three groups with one intern and up to 4 campers. This provided an opportunity for students to engage in discourse and receive assistance. I acted as a mentor to the interns, moving from one

small group to another (very similar to in-person camp, but done in a virtual environment - Zoom).

This online opportunity offered an immediate experience for interns to transform into teachers who were responsible for all aspects of the campers' journey. Interns were alone with students for longer periods of time in comparison to in-person experiences. It was extremely important that interns understood the content and ways to engage students without my expertise. This intern-to-teacher transformation happened within minutes of the beginning of an activity, and they seemed to rise to this challenge very expeditiously and gracefully. Also, campers who normally would have been antisocial during in-person camp had to rely heavily on their peers and on the interns because they were alone at home. It took some of the campers a few moments to speak up, but once they did, they established a quick bond and relationship with their peers and relied on their help.

It was finally time for the biggest challenge, the Rube Goldberg Machine. We anticipated a lot of problems, because in past years campers struggled in finding their creative voice and touch to engineer an authentic piece. Many children have never been allowed to really dig into engineering for a variety of reasons. Therefore, at in-person camps, campers spent a lot of time talking and discussing possible outcomes. We knew that we did not have a lot of time and knew there would be interruptions because of the online environment being at home. We decided to show videos of machines that had been built but nothing too similar to our end goal. Our goal was to take an object and throw it into the air at least 4 feet. We had to allow campers to pick any object or recreate needed objects because they were at home, and we didn't know if every child would have access to one specific item. During in-person camp, there would be a specific materials list and students would not be able to deviate from this to increase the amount of challenge in building this machine. Completing the lesson in a distance learning environment required, flexibility in the lesson and materials. However, allowing students to recreate materials or resources only increases the complexity of the build while expanding innovation, creative thinking, and the development of STEM leaders (Dolenc & Cohen, 2018). Many campers were very successful with re-creating objects such as instead of having a cylinder object, students used construction paper, glue, and tape to recreate a cylinder that would allow for a ball or marble to travel down a tunnel to create a force. Watching this creativity come to fruition was thrilling. This was a positive aspect of online learning because the in-person experience may not have

allowed for such re-creation. Re-creation increased creativity, critical thinking, and fine-tuned students' engineering skills.

I also encouraged campers to use web-based search engines as resources in finding other types of levers and machines. My thought was centered around the assumption that even if campers duplicated some parts of others' machines, they would not necessarily copy the entire machine either because it was too difficult or they would not have access to all objects they saw on the video. This would produce an authentic camper-built machine. This was a necessary move because the online learning setting decreased the amount of time and resources campers had access to. Therefore, it was necessary to allow some duplication in order to get students moving in a direction that would increase their success.

Campers spent a short amount of time discussing possible ideas and viewing others machines online. Many campers immediately got to work and started building something within the first five minutes. Some students observed others and asked for advice from peers and interns about their own ideas. Interns suggested campers build one energy transfer and allow this build to be monitored by another intern or teacher. Then interns suggested campers test if one transfer worked prior to adding a second transfer to the current machine. Many campers used this step-by-step approach as they continued to build. One camper didn't use this approach and decided to build the entire machine before testing. He completed his machine within an hour and then tested it. Unfortunately, the machine failed instantly. This camper found his mistakes and immediately began again, using the step-by-step method. This trial, error, and failure was extremely beneficial, because campers learned the ways which worked best for their situation from this one child's error, and they learned to work collaboratively for the greater good.

Something very interesting started to happen by the third and fourth days of camp. Most campers had successfully built 4 to 6 working energy transfers. Campers were very motivated to finish but challenged because they were running out of supplies and ideas. Little by little, I would see an extra face sitting next to one of the campers, or I could hear someone else trying to talk to me from one of the homes. I would respond or ask questions to figure out who would be talking. By the fourth day, over 50% of the children had either invited their parents to camp, or the parent chose to become part of the lesson. I had several parents even participate and compete against their child in building the machine. Some parents acted as a second pair of hands for the child and actively worked alongside their child during the build. Many campers started inviting their siblings, neighbors, or kids that they were babysitting to come to our online camp and

become part of the challenge. We also had a few new campers enroll because they witnessed the build at another child's house and wanted to join. This made the online environment a perfect place for camping expansion.

In past in-person camps, we only had parents come on the last day for a recognition ceremony. Because of this online experience, parents stranded at home decided to jump into the lesson and join in on the fun. By the last day of camp, we had expanded our camp participation by at least forty percent. The greatest part of this experience included the fact that campers brought in younger family members or parents. From an education standpoint, it made the lesson even more powerful and successful because the love for learning and the quest for engineering had been expanded not only for the students but for other children and adults in their homes and neighborhoods. This was a fantastic way to complete this Rube Goldberg journey during a very complex time in our history. Smiling faces, shared learning experiences, and authentic machines made for a grand celebration!

Parker Sister's Voice and Vignette

Designing engaging lessons for a virtual experience was the biggest challenge during the 2020 camp. For the last few years, I had access to all of the hands-on resources that a teacher could need to create innovative and highly engaging lessons that connected to mathematics standards. I created lessons that involved marbles, action figures, and matchbox cars. It was simply a matter of connecting things kids liked to play with to real life mathematics and watching it come alive in person. However, Summer 2020 was a challenge to keep that same philosophy while being restricted to digital resources such as websites and apps. It is equally taxing to attempt to provide opportunities where campers could interact with each other and engage in mathematical discourse, which is vital to developing campers as mathematicians (Boaler, 2016). The following lesson was designed to be my first lesson of OTW camp so it needed to be a great one that grabbed their attention. After all, if this lesson flopped, campers had the option of not showing up to my Zoom lesson the next morning and sleeping in. These lessons were not mandatory or graded. They were optional learning opportunities and I wanted all of my campers to return to learn the following day. I needed their first experience to be positive and impressionable.

Battleship Virtual Lesson

I started my lesson design by selecting a game that I loved as a kid but that I had a digital way of playing. I picked *Battleship* because I was very familiar with a graphing website called

Desmos and I knew it would be possible to recreate a *Battleship* type game with the *Desmos* website. I created a story to go along with our camp theme of *Out of this World*. We pretended that alien invaders had commandeered several ships in the ocean and it was my campers' jobs to find them and sink them as a team. I had about 7 - 10 campers working together in a whole group setting on Zoom for this digital lesson. Prior to the lesson I predetermined several coordinates for a 5 unit x 1 unit ship, a 4 unit x 1 unit ship, a 3 unit x 1 unit ship and a 2 unit x 1 unit ship. I told campers that they were sitting on the 2 units by 1 unit sized ship somewhere in the ocean, so they had to be careful not to sink their own ship. Their objective was to guess all the coordinates of the ships and sink them all.

Round 1 was created in a way that gave all campers access to the lesson without a feeling of intimidation and provided an opportunity for camper success. It involved very little risk of being incorrect. It was pure luck in the beginning and all campers seemed to jump right in and play without hesitation or lack of expertise. Each student was given the opportunity to provide coordinates and I used a shared screen of the *Desmos* grid to label each set of coordinates a hit or a miss. I limited the first round of the activity to the first quadrant and gave x- and y-axis limitations to make the probability of a hit higher. Once a student landed on a hit, the next camper needed to use his knowledge of the coordinate plane and strategy to try to sink the ship by hitting it again. Once all the predetermined coordinates at the ship's location were hit by various campers, the ship was sunk, and we celebrated. Some campers did not catch on right away that if (3,4) was a hit, they should guess coordinates around that hit in order to try to sink that ship. I refrained from guiding them so that the campers that understood the objective and had an effective strategy had the opportunity to teach this strategy. Within three bad moves, two campers spoke up and taught the rest of the group a better strategy than guessing. They did a fantastic job of explaining and worked well to answer each other's questions. An example is displayed as follows:

Student A: Would (5,8) be a better guess?

Student B: Yes, (5,8) is next to the hit at (5,9). We know there is a ship at (5,9) and we have not sunk that ship yet. It could be at (5,8) or maybe even (4,9) or (6,9).

This round took about 5 minutes and campers were excited and cheered on screen once they sunk all the alien ships.

Round 2 was more challenging than round 1. I made the condition that in order to sink a ship once located on the coordinate plane, campers must give me a proportional equation of a line that will run straight through the ship. This took campers out of their comfort zones because some campers did not know what I meant by “give me a proportional equation.” This led to a rich dialogue among campers to revisit proportional equations. “Oh yeah, straight line through the origin,” they said. Then campers struggled to remember how to get the equation to go through the point that they wished for it to go through. This was a great learning opportunity as campers continued to adjust their equations through trial and error. Even though campers were not immediately successful in describing the line, they immediately started looking for patterns in their lines that worked. By the end of round 2, they were able to give the equations to sink my ships very easily without trial and error.

Round 3 was the hardest round as it required campers to hit two places on a ship that was placed diagonally on the board and then give me a linear equation going through both points in order to sink the ship. This required campers to dig up what they knew about slope and slope intercept form. Some campers remembered this from their previous lessons in class, but it seemed as if other campers had not yet learned how to graph a linear equation. The campers that clearly understood slope were able to teach the other campers about slope and how there would only be one line that would go through the points given. Campers did their best in trying to teach the process to calculate slope and y-intercept given two sets of coordinates. I noticed that the campers that were able to provide a better explanation to their peers were the campers with a better math vocabulary. I had some campers that knew how to get the equation but said they did not know how to explain it to their peers, while other campers explained it just as a math teacher might explain it. The use of vocabulary here was critical and gave me some insight on the power of proficiency in mathematical language.

Implications for Middle School Teachers

“Opportunities do not come with their values stamped upon them” (Babcock, 1901). The purpose of this article is to disseminate through vignettes the ways in which three master teachers navigated some of the complexities triggered by COVID -19. Their lived experiences show how they stayed the course. The challenges were grand opportunities in disguise.

These *Out of this World* experiences may provide educators a view of mathematical experiences that provide students with an opportunity to engage in highly engaging, hands-on mathematics experiences, critical thinking and analysis and mathematical discourse while

promoting creativity, innovation, and enthusiasm for mathematics. These educators have been able to create lessons that are aligned to the mathematical practices and allowed for advancing and scaffolding of mathematics when needed. Transitioning this type of experience from in-person to virtual brought about challenges that in the beginning seemed to be ever-lasting. The students' eagerness to engage in activities and their growth were easily noticed once campers were immersed in these opportunities.

Collectively, the experiences of virtual mathematics camp presented children with an opportunity to remove themselves from isolation and presented a space in which students could reconnect with others their own age and caring adults. These three mathematical activities prompted communication amongst campers through ice-breaker activities or through these STEM experiences. While critical thinking and analysis halted because of COVID-19 school closure and the need for isolation, these activities brought high order thinking opportunities to the doorstep of those who participated including neighbors, parents, siblings, and others who were invited by participants to engage alongside campers. Mathematical discourse, student engagement, and the need for critical thinking re-emerged through campers distant learning experiences. This was a win-win experience because it increased mathematical discussions while promoting a positive social-emotional climate for students to reconnect and engage.

Applying hands-on, engaging, learning experiences to a distant learning setting seems almost impossible in the beginning. Having a positive, flexible mindset and knowing that students' have previous experience and possess a degree of expertise with technology is needed in order to make this transition as seamless as possible (Boaler, 2016; NCTM, 2014). As lessons are reinvented to fit virtual learning experiences, teachers can keep in mind that allowing for the re-creation of resources extends a children's creativity and critical thinking skills, which only maximizes his/her understanding of the concept being presented (Dolenc & Cohen, 2018). The same intellectual, creative stimulation and re-creation can occur for educators if they are open to these experiences that defy the norms of traditional schooling and scripted curriculum. When called on in class, teachers expect students to be able to *think on their feet*. When the COVID-19 pandemic called on school systems, teachers were expected to be able to *think on their feet*. This article provides three answers to the nonroutine real-world problem faced by middle school teachers of mathematics: transitioning to a virtual environment. Meshing different skill sets in technology (Google classrooms, Zoom, and various websites and apps) with those of teaching (creativity, communication, dedication, and content knowledge), these teachers

successfully turned challenges into opportunities: helping students learn what teachers want them to know. We hope these voices and vignettes from middle school mathematics teachers have positive implications for practice for readers of these reflective narratives.

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