

AN EXPLORATION OF EQUITABLE MATH PRACTICES IN UPPER ELEMENTARY  
AND MIDDLE SCHOOL CLASSROOMS DURING THE COVID-19 PANDEMIC

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## DEDICATION

To my incredible husband, Jaime. Your unwavering belief in me has been a constant source of inspiration and the wind beneath my wings. I am so grateful to have you by my side.

To Stephanie and Sean. Thank you for your love and support as I balanced graduate school and being your mom. This is for you, too.

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## **ABSTRACT**

This qualitative single-case study explored how eight upper elementary and middle school math teachers from an independent school in Hawai‘i conceptualized equitable math practices and implemented these practices into their classrooms amidst the COVID-19 pandemic. The research revealed teachers' concepts of equity included individualization, access and opportunities for learning, inclusive learning environments, and fostering a growth mindset. The implementation of equitable practices by teachers to aligning with these conceptualizations was demonstrated through strategies such as differentiated instruction, technology integration, and collaboration. Emphasized in the research was the role of the teacher in creating inclusive, supportive learning environments that embraced student diversity and nurtured a growth mindset. The study also identified challenges faced by teachers, such as access to technology, resource limitations, and the task of maintaining student engagement.

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## CHAPTER 1: INTRODUCTION

Understanding mathematics is vital for daily activities like shopping, budgeting, cooking, and home repair, and as we become more reliant on technology, mathematical understanding and problem-solving abilities remain essential skills in our workplace and society. Mathematical literacy, or an individual's capacity to reason mathematically, is a key component in developing the 21st century skills needed to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts (OECD, 2018). Effective math instruction is driven by instructional practices that involve challenging and collaborative math tasks in a manner that provides access for learners at all levels and abilities. It is in elementary school where a young student's identity, attitude, and disposition around mathematics is formed and often follows them into middle and high school grades (Ball & Bass, 2008; Schaeffer et al., 2021). The interactions between students and their teachers in these early years can greatly impact the students' long-term experience with math. Thus, "[t]he question is not whether all students can succeed in mathematics but whether the adults organizing mathematics learning opportunities can alter traditional beliefs and practices to promote success for all students" (NCTM, 2014, p. 61). Accordingly, students need effective and equitable math instruction as they develop their math proficiencies and skill sets.

Equitable math instruction plays a key role in ensuring that students continue to learn. Equitable math is distinct from the concept of "equality." Equality means that all students receive equal treatment and identical instruction. In this study, equitable math practices refer to flexible instructional approaches that are designed so that every student can access the curriculum, receive quality learning, personalized support, and sufficient time to meet the high expectations of the curriculum. These practices are rooted in the belief that all students possess

the capacity for advanced mathematical thinking, emphasizing the importance of inclusivity and providing support to nurture students' mathematical potential. Instructional approaches refer to the various strategies and methods used by teachers to deliver instruction and facilitate learning in the mathematics classroom.

As became apparent during the COVID-19 pandemic, high quality math teaching and learning was dependent on structures, teaching practices, and advocacy that met the varying needs of all students (Dorn et al., 2020; Pier et al., 2021). This study explored how upper elementary and middle school math teachers conceptualized and incorporated equitable math practices into their classrooms.

### **Problem of Practice**

The purpose of this section is to discuss the challenges that teachers face when planning instruction for learners with diverse needs, particularly in the context of the distance and hybrid learning exacerbated by the COVID-19 global pandemic. By understanding these challenges, we can highlight the importance of addressing them through research and propose effective solutions. This section will first outline the general challenges teachers encounter when planning instruction, followed by a focus on the specific challenges in math classrooms, particularly in relation to creating equitable learning opportunities. Lastly, it will explore the impact of the pandemic on teaching and learning, emphasizing the amplified need for effective and equitable teaching practices during these uncertain times.

A teacher's ability to comprehensively plan for the needs of each learner in their classrooms is an age-old problem. Combined with the distance-learning challenges of a global pandemic, this problem became even more complex. Teachers encounter numerous obstacles when planning instruction for students with varying knowledge, understandings, and cultural

backgrounds (Ball & Bass, 2008; Cheeseman & Klooger, 2018). With class sizes ranging from 20 to 30 students, teachers must consider multiple factors in aligning their pacing, learning objectives, and curriculum to cater to the diverse learners in their classes. Furthermore, educators face the challenge of fostering equitable participation, learner agency, and independence through the identification and development of inclusive instructional routines and structures (Ball & Bass, 2008; Cheeseman & Klooger, 2018). Accommodating such student heterogeneity has long been one of the most enduring and challenging problems faced by teachers (Darling-Hammond, 2001; Gay, 2010; Tomlinson, 2001; Ward, 1987).

In math classes, the teacher's role in creating learning opportunities that result in equitable participation is a vital piece of a child's mathematical development, identity, and mindset. A student's math identity is the belief the student develops about their ability to participate effectively and to use mathematics across the different contexts of their lives (Aguirre et al., 2013). A student's positive or negative math identity is often formed early on from math routines such as timed fluency tests, lessons that emphasize learning algorithms, and differentiation grouping strategies based on ability (Boaler, 2014). Therefore, this is part of the challenge for upper elementary and middle school teachers to design accessible learning experiences for all students, considering their diverse rates of development and the impact that certain math routines have on students' math identities. Thus, teachers possess the ability to influence and reshape how students perceive themselves based on their instructional practices and the environment they create in their classrooms. Through intentional and inclusive teaching practices, educators can nurture a positive math identity and empower students to view themselves as capable and confident mathematicians. By fostering a supportive and inclusive classroom environment, providing differentiated instruction that meets students where they are,

and highlighting the strengths and growth potential of everyone, teachers can inspire transformative shifts in students' self-perceptions and help them recognize their innate mathematical abilities. Ultimately, the teacher's guidance may impact how students see themselves, paving the way for greater mathematical engagement, resilience, and lifelong learning.

Traditionally, elementary, and middle schools have attempted to account for the varying abilities of students by placing students in ability groups or tracks based on their skill level in order to scaffold or extend the curriculum to a specific grade level (Cheeseman & Klooger, 2018; Hunter et al., 2019; Oakes, 2005). While these two approaches of grouping students by abilities or on learning tracks overlap in some ways, they are distinct approaches used by educators to address the differences in students' math abilities. Both ability grouping and tracking attempt to match students with a curriculum based on the students' ability or prior performance, but the two practices differ in several respects (Loveless, 2013). For example, ability grouping in elementary school is a strategy for creating an ability-based structure within mixed ability, or heterogeneous, classrooms. In an ability grouping structure, the teacher creates multiple ability groups within the class based on the teacher's assessment of the data about the students' readiness for advanced work, as well as the students' relative skill levels and the teacher's perceptions of their abilities. Based on that evaluation, the ability groups can and often are more flexible in nature because as instructional topics change, students can move within different groups based on their skill set.

On the contrary, tracking, or the practice of creating different learning tracks based on student ability, creates learning groups from multiple classes. For example, a school will create an honors track versus the regular track for geometry or algebra and will route students to the different learning tracks based on ability. These honor tracks have been shown to lead to

increased access to classes like calculus in high school (Tieso, 2003). Moving tracks is often harder to change, however. We know from the research that a student's placement in a particular track is often determined by their performance on assessments or based on teacher perceptions, which are not always determinative of a student's long-term success (Boaler, 2008). Students who are placed in low achieving ability groups in elementary school are likely to continue in lower math tracks in middle school, and the trend continues in high school where students choose courses that lead to non-college-preparatory tracks (Oakes, 2005; Shulruf et al., 2010). Ultimately, research findings on tracking and ability grouping shows that these are ineffective ways to provide access and agency to students. Although designed to provide individual attention, differentiation, and meet students where they are, it actually leads to a decline in learning and an increase of deficits that struggling students may never escape (Boaler, 2014; Spade et al., 1997).

When planning for equitable math instruction, the way the teacher decides to group students has an impact on access, math identity, and curriculum (Boaler, 2005, 2008, 2016). Lower ability groups typically progress through curriculum at a slower pace than those in higher level groups, which may create gaps in content knowledge, thus negatively affecting achievement, and can be damaging to the low achieving student's attitude and self-concept (Worthy, 2009). For example, material covered in one week with a higher-level group may take a lower-level group two or more weeks to complete. This may negatively impact the lower ability students' self-esteem and attitudes when compared to more advanced and fast-paced ability groups (Tieso, 2003).

Planning for a wide range of knowledge in heterogeneous classrooms is challenging in a normal educational setting. However, when you add the unstable and complex nature of teaching

during a pandemic, meeting the needs of all learners whose learning environment is uncertain presents a unique problem for educators (Ruef et al., 2022). In spring of 2020, teachers were forced to pivot quickly to an online remote learning platform for students from kindergarten to college. This shift required teachers to learn new technologies and establish virtual classroom structures like never before.

The following fall semester, many K-12 schools offered a hybrid approach bringing some students back in small cohorts with safety precautions in place to mitigate the spread of COVID-19. These precautions included wearing masks, eliminating additional mixing of students outside of class, and putting six feet of distance between desks (Gill et al., 2020). As the pandemic moved into 2021, schools who returned to face-to-face instruction were faced with highly contagious variants infecting children. This led to unstable attendance as schools created safety protocols to keep communities safe. These new protocols caused a disruption to teaching and learning routines and practices. Furthermore, with safety protocols of masking, social distancing, and hybrid learning, teachers had to create new ways to form groups within their classroom setting and online.

The challenge of effectively meeting the needs of all students in an equitable manner was significantly amplified during the pandemic. Teachers were confronted with the task of solving the ongoing problem of practice, striving to ensure that every student's needs were addressed amidst the unique circumstances of teaching remotely as brought about by the pandemic. The rapid transition to online and distance learning posed its own set of challenges. As teachers tried to adapt to this new instructional landscape, tracking students who required additional support became increasingly challenging (Ruef et al., 2022). While the process of meeting individual needs turned complex and turbulent, it simultaneously opened up opportunities for students who

might have found traditional classrooms difficult to navigate. The shift in instructional approaches, though not without its difficulties, offered a different kind of learning experience that catered to the unique needs of some students. Overall, the pandemic compelled educators to rethink their instructional practices and create innovative solutions to address the diverse needs of students.

### **Purpose of the Study**

This research explored two important notions related to the problem of practice. The first is how upper elementary math teachers at a large independent school conceptualize equitable math practices in their classrooms. The second important inquiry is how teachers incorporated these conceptions into their day-to-day teaching practices amid the ongoing COVID-19 pandemic. Likewise, in exploring how teachers conceptualize equitable math practices and implement these ideas into their classrooms, this study discovered how the pandemic shifted teachers' practices and what implications this may have on the equitable teaching and learning of mathematics after the pandemic is over.

### **Research Questions**

To carry out the purpose of this study, the following research questions were addressed:

1. How do upper elementary and middle school teachers conceptualize equitable math teaching practices?
2. How do upper elementary and middle school teachers implement these conceptions of equity in their day-to-day instructional activities particularly amid the still ongoing COVID pandemic?

## **Significance of the Study**

This research topic is significant as it explores the importance of equity in math education. By studying equity in math education, we aim to ensure that all students, regardless of their backgrounds or abilities, have equal access to high-quality math instruction and opportunities. This inclusive approach is vital for fostering not only academic success, but also for promoting students' self-esteem, sense of belonging, and overall educational development. A math education that embraces equity allows for diverse perspectives and contributions, empowering students to become knowledgeable, flexible, and innovative problem solvers who can actively participate in shaping our society's future. This is important in creating a culture and curriculum that supports inclusive instructional approaches for all learners. By ensuring that all students have access to equitable math instruction, we can cultivate a generation of individuals who are well-equipped to tackle challenges, contribute to advancements, and make meaningful contributions to our society.

The goal of this study was to examine and gain insights into how teachers at Oceanview Academy, a pseudonym for a large independent school in Hawai'i, conceptualized and implemented equitable math teaching practices during the COVID-19 pandemic. By exploring their perspectives, instructional strategies, and experiences, the study aimed to contribute to the understanding of effective approaches for promoting equity in math education in challenging and rapidly changing educational contexts. The findings of this research may help teachers understand how they might better meet the needs of a diverse population of students that they encounter in their classes, and perhaps, improve access to math learning outcomes for all students. This is important in creating a culture and curriculum that supports equitable participation and engagement for all learners. Further, this study may create opportunities for

teachers, including myself, to work together to refine our understanding of equity and improve student achievement. It may also provide space for teachers to examine their professional practice with the goal of shifting mindsets and improving equitable learning outcomes for all students. This is important in creating a positive focus on changing mindsets and improving professional learning and practice. Finally, as the significance of the study focuses on all students, we can hope that an exploratory study such as this may have a positive impact on both teacher practice and student learning and achievement.

## CHAPTER 2: REVIEW OF THE LITERATURE

My review of the literature explored a variety of sources around mathematical equity to include journals, books, policies, and reports. Although I found plenty of literature on mathematical equity, what I saw as a gap is related to the timing of this study and the setting of my study. Studying teachers' mindsets and practices post-pandemic and during a racial divide, I believe offers an opportunity to add valuable knowledge to the field of work on math equity, equitable math practices and, possibly, an opportunity to learn theory. Further, there is much to be gained by studying what upper elementary and middle school teachers at a progressive and high-achieving independent school in Hawai'i did to address math equity during the COVID-19 pandemic.

What I learned from the literature is equity in mathematics is a complex topic and ever evolving. As my understanding of this deepened, it became clear that agreement around how to define and implement equity in mathematics was not uniformly agreed upon by the notable scholars in the field. This literature review is organized into four parts. The first part is around conceptualization of equity using Gutiérrez's Four Dimensions. The second section highlights principles, tools, and frameworks for promoting equitable mathematics. The last two areas address the role of the teacher, and finally, student identity and participation.

### **Four Dimensions: A Framework for Equity in Mathematics Education**

I found Gutiérrez's (2009) framework for addressing math inequities to be relevant for centering the literature and data analysis in this research study. According to Gutiérrez (2002, 2009), equity should be understood as "fairness" rather than "sameness," and she proposes four key dimensions that encompass equity in mathematics: access, achievement, identity, and power.

This framework offers a helpful lens through which to interpret my findings, as it breaks down the concept of equity into distinct domains that can guide analysis and interpretation.

### *Access*

Access according to Gutiérrez (2009) involved ensuring all students have equal opportunities to learn high-quality mathematics. This encompasses having capable teachers, a challenging curriculum, sufficient resources, and an environment conducive to learning. It also includes considering factors such as socioeconomic status, race, gender, or disability that might affect a student's access to a quality math education. Access relates to factors that enable or hinder students from gaining quality math education. Similarly, Boaler (2016, 2019) emphasized the significance of providing equitable access to mathematics education by creating inclusive learning environments that promote access to high-quality instruction for all students. She advocated for a growth mindset approach that recognizes the potential of all students to excel in mathematics and emphasizes the importance of instructional strategies that cater to individual student needs, promote active engagement, and foster a positive mathematical identity. Equity work aims to address access barriers and provide equitable opportunities for learning, ultimately striving to create a more inclusive and empowering mathematics education experience for all students (Boaler, 2016).

While Gutiérrez's (2009) framework provides a comprehensive perspective on equity, Boaler's (2016, 2019) research delved deeper into instructional practices and pedagogical approaches that can foster equitable access and student achievement. They both contribute valuable insights to the field, but their focuses and emphases differ, providing a broader understanding when examined together.

## *Achievement*

Achievement refers to the importance of all students developing a deep understanding of mathematical concepts and the ability to apply them in various contexts. This stresses that students should not only acquire procedural knowledge, how to do the math, but also conceptual understanding, why the math works. (Boaler et al., 2016; Gutiérrez, 2009). Achievement involves a student's ability to participate in many types of math classes and show evidence of their learning through a variety of assessments. This includes standardized tests and participation in what Gutiérrez (2009) called the math "pipeline." An example of the math pipeline is when students choose to major in math during college or pursue careers in math-based fields that offer higher salaries and greater societal prestige. These two dimensions of math equity can be thought of as dominant drivers of math as we know it because it reflects the status quo in society and favors the views and perspectives of a relatively elite group. Boaler (2016) argued that math achievement should not be limited to narrow measures such as standardized test scores or the ability to quickly calculate answers, but instead promoted a broader definition of math achievement that encompasses conceptual understanding, critical thinking, problem-solving skills, and mathematical reasoning. Her work challenges traditional notions of math achievement and advocates for a more inclusive and growth-oriented approach.

Other scholars have advocated for achievement in the context of differentiated and personalized instruction (Bray & McClaskey, 2018; Tomlinson, 2001). Their approach to differentiation is aimed at maximizing student learning and success. By tailoring instruction to address students' individual needs, interests, and readiness levels, Tomlinson (2001) sought to create an inclusive learning environment where all students have the opportunity to achieve their full potential. Bray and McClaskey (2018) agreed, yet, also proposed that personalized learning

models give students the agency to take control of their learning outcomes through goal setting and self-awareness. Differentiation, according to Tomlinson (2001), was not about lowering expectations or watering down content. Instead, it was about providing appropriate support, challenges, and opportunities for students to reach high levels of achievement. She believed that by differentiating instruction, teachers can help students develop a deep understanding of the content and achieve academic success. According to Gutiérrez (2009), there was a danger of students having to downplay their personal, cultural, or linguistic capacities to participate in the math pipeline, so the issue of identity has become a more significant role in equity research.

### ***Identity***

Gutiérrez (2009) highlighted the importance of students perceiving themselves as competent doers of mathematics. This involved nurturing a positive mathematical identity where students feel a sense of belonging in the math classroom and recognize the relevance of math in their lives. When exploring identity, we consider how students' cultural backgrounds and individual identities impact their relationship with learning. It involves finding a balance between students seeing themselves represented in the curriculum and providing opportunities for them to view mathematics from a broader lens. Teachers have a role in shaping students' math identity and creating inclusive learning environments (Gay, 2010; Ladson-Billings, 1995). For example, if a teacher explores mathematics from a social justice lens, then marginalized students may have an opportunity to analyze math in the context of issues that are personal to them. For instance, teachers in Hawai'i might design math problems relating to the State's unique natural environment. Examples might include calculating the volume of a volcano, analyzing the growth rates of native plant species, or statistically examining the impacts of climate change on the islands. Another approach is to create math problems related to significant local industries

like tourism or agriculture, such as investigating the economic impact of tourism using percentages or studying the production rates of Hawai'i's pineapple and macadamia nut industries. By connecting mathematics to real-world contexts, students can find meaning in their learning experiences, recognize the relevance of mathematics in their lives, and encourage them to bring their whole selves into the classroom (Gay, 2010).

### *Power*

The domain of power addresses issues of status and roles within the math classroom and society. It highlights how mathematical ability can be seen as a form of power, with the potential to either empower or disempower students. Gutiérrez (2002, 2009) argued for recognizing and challenging the societal and systemic inequities that influence who is perceived as being "good" at math. Power offers a critical review of societal issues and power dynamics in math education.

The three dimensions of equity in mathematics—access, achievement, and identity—are essential, but they alone are insufficient in establishing true equity if the field of mathematics does not also promote enhanced interpersonal relationships. Therefore, the final requisite component for equity is power (Gutiérrez, 2009). Power, within the scope of mathematical equity, extends beyond merely controlling classroom discourse. As TODOS (2020) observed,

While teachers in interviews may say they 'want to empower students,' they almost always mean it only as it relates to achievement, not with respect to helping students reach personal goals of excellence that may intersect with the doing of mathematics. (p. 4)

Thus, true empowerment in the context of mathematical equity necessitates helping students achieve their personal excellence goals that intersect with mathematics, not just facilitating academic success.

According to Gutiérrez (2009), power in the classroom could be monitored by considering several factors. These include examining who contributes to discussions and decision-making regarding the curriculum. Finding ways for students to apply mathematics in different contexts around societal issues and offering to investigate different understandings of knowledge by reframing mathematics as a field that is as reliant on people as people are on it. Identity and power comprise an important axis of these four dimensions as it takes students' identities and builds mathematics around them in ways that address social and political issues, while also highlighting the perspectives of marginalized groups. According to Gutiérrez (2009), all four dimensions were necessary to have true equality in mathematics, however, as researchers we must understand that at times one axis might shift temporarily to the background. For example, teachers cannot be expected to address power issues every day in the classroom in ways that are meaningful to every student, just like some days traditional mathematics may take a backseat to a curriculum that deals directly with identity or power issues. The goal is to balance all four dimensions over time. When looking for evidence that equity is working, Gutiérrez asserted (2009) we should not look to see that everyone arrives at the same place at the same time, instead the goal is to measure all four contexts of equity overtime.

### **Promoting Equitable Math Instruction: Principles, Tools, and Frameworks**

#### ***Principles***

The National Council of Teachers of Mathematics (NCTM)-created a research-based set of principles to help broadly guide mathematics education to address issues of equity and promote inclusive learning environments (NCTM, 2014). These principles emphasized the importance of providing all students with high quality learning experiences and recognizing the value of students' cultural backgrounds, experiences, and language. These principles do not refer

to specific mathematics content or processes, but instead describe crucial issues that influence the development of curriculum frameworks, the selection of curriculum materials, the planning of instructional lessons, the design of assessments, how students and teachers are assigned to classrooms, instructional decisions in the classroom, and the establishment of professional development for teachers. The six principles of high-quality mathematics included: (a) equity, (b) curriculum, (c) teaching, (d) learning, (e) assessment, and (f) technology. According to NCTM (2014) these guiding principles were the foundation of an equitable, inclusive, and effective math program.

### ***Tools***

Pathways to Equitable Math Instruction is a toolkit developed by a group of math equity researchers, teachers, and district curriculum developers designed as a specific resource that focuses on providing practical guidance and strategies for implementing equitable math practices in the classroom (Cintron et al., 2021). Pathways to Equitable Math Instruction and the principles for equity outlined by the (NCTM) are interconnected in their focus on promoting equitable math teaching practices. The toolkit focuses on five key strands of learning, which include: (a) dismantling racism in mathematics instruction, (b) fostering deep understanding, (c) creating conditions for students to thrive, (d) connecting critical intersections, and (e) sustaining equitable practice. By targeting these areas, the toolkit aims to enhance math equity in educational settings.

### ***Frameworks***

The California Board of Education initiated the revision of their K-12 Curriculum Framework in 2020 to align math instructional practices with the Common Core Standards and enhance engagement and accessibility for students from marginalized groups (Boaler, 2016; California Department of Education et al., 2021). California's vision for equitable math teaching,

as outlined in the K-12 framework, encompassed five core beliefs. Firstly, it recognized that all students deserve access to powerful mathematics, and high-level math achievement can be cultivated rather than being dependent on rare natural gifts (Boaler, 2016). Secondly, it emphasized that access to an engaging and humanizing education is a socio-cultural and universal right. Thirdly, student engagement was considered a fundamental design goal in mathematics curriculum, alongside content objectives. Fourthly, students' cultural backgrounds, experiences, and language were seen as valuable resources for learning mathematics. Lastly, the framework asserted that all students, regardless of their background, language of origin, differences, or foundational knowledge, are capable of deep understanding and meaningful engagement in rich mathematics tasks.

The aim of California's mathematics framework was to address the structural barriers that hinder students' access to the math pipeline through high-quality and equitable math instruction (Gutiérrez, 2009). This plan was designed to dismantle traditional structures that have impeded success for all learners. Traditional structures included tracking, limited access to advanced courses, stereotypes and biases, fixed mindset, narrow definitions of success, lack of culturally relevant curriculum, and inequitable distribution of resources. These structures have perpetuated inequities by segregating students, limiting opportunities, reinforcing biases, discouraging growth mindset, overlooking conceptual understanding, disregarding cultural backgrounds, and creating disparities in resources (Boaler, 2016; California Department of Education, 2021; Cintron et al., 2021; NCTM, 2014). The framework is currently undergoing peer and public review before final approval (Hong, 2021). Its inclusion in this literature review is relevant for supporting the understanding of researched practices in equitable math instruction.

In summary, the principles outlined by the National Council of Teachers of Mathematics (NCTM) provide a research-based foundation for equitable math education, while the Pathways to Equitable Math Instruction toolkit and the California K-12 Curriculum Framework offer practical strategies and frameworks for implementing equitable math practices. These resources emphasized the importance of addressing issues of equity, dismantling racism, fostering deep understanding, creating inclusive learning conditions, and connecting critical intersections in math instruction.

### **The Role of Teachers in Creating Equitable Math Learning**

Teachers play a crucial role in creating equitable math learning environments. The National Council of Teachers of Mathematics (NCTM, 2018) highlighted the significance of specific teacher practices in promoting equity-based mathematics education. These practices included reflection, noticing, and engaging in community. By actively engaging in these practices, teachers contributed to the development of inclusive classrooms where all students have equal opportunities to succeed in mathematics. In this section, I will discuss what the literature shared regarding the role of teachers in fostering equitable math learning and the importance of these practices in promoting educational equity.

#### ***Reflection***

Equity-based teaching encourages teachers to reflect on their own pedagogy and classroom norms, but also reflect on their positionality and how they are viewed by others, fostering a deeper understanding of equity in the educational context (Crockett, 2008; Gutierrez, 2013b; Walshaw, 2010). Reflection includes developing advocacy dispositions such as “habits of mind including both cognitive and affective attributes that filter one’s knowledge, skills, and beliefs as well as impact the actions one takes in classroom or professional settings” (Thornton,

2006, p. 62). One way to develop an advocacy disposition is by first assessing yourself on the Multicultural Mathematics Dispositions Framework (MCMD) along these three strands: openness, self-awareness/self-reflectiveness, and commitment to culturally responsive math teaching (White et al., 2012). Finally, developing advocacy dispositions for equity means advocating for both students and teachers.

Self-reflection for teachers is also knowing and examining your own identity, beliefs, and positions regarding grouping and sorting of students. A review of the literature surrounding grouping of students found that overall mixed ability grouping resulted in higher student outcomes than tracked or homogenous groups (Boaler, 1997, 2000; Liljedahl, 2009, 2020; Venkatakrishnan & Wiliam, 2003). However, in these studies it was more about the actions and dispositions of the teacher versus the grouping that had either a positive and/or negative influence on student outcomes. In mixed ability groups, the teacher prepared resources and lessons that provided for a wide range of knowledge. Whereas, in homogenous groups the teachers prepared one-size-fits-all materials for a specific level of perceived ability. Those students placed in the high achievement group complained about feeling stressed because the pace went too fast, and the teacher made assumptions about student skill because they were placed in the higher group. Conversely, the students placed in the low groups complained the work was too easy and they had inconsistent low-quality teachers which affected their identity and how they viewed themselves as mathematicians (Boaler, 2005).

In summary, equity-based teaching involved self-reflection to understand pedagogy, positionality, and classroom norms. Developing advocacy dispositions supported culturally responsive math teaching. Mixed ability grouping generally yielded better outcomes than homogenous groups, and differentiated resources promoted positive learning experiences.

## *Noticing*

Noticing and acknowledging students as learners was a key aspect of promoting equity in teaching. By actively getting to know students and understanding various aspects of their lives, such as their living environments, self-perception as mathematicians, and mathematical thinking, teachers created a supportive and inclusive learning environment (Jacobs et al., 2010; Wager, 2014). However, it was important to recognize that effectively noticing and appreciating strengths in all students can be challenging due to various factors (Jilk, 2016). Teachers may be influenced by unconscious biases or preconceptions about certain students or groups, limiting their ability to appreciate the strengths of all students equally (Boaler, 2016; Kobett & Karp, 2020). Additionally, traditional assessment methods that may identify and focus on weaknesses rather than highlighting students' strengths and abilities, along with limited time and resources, hindered a teachers' ability to thoroughly assess individual strengths in mathematics. Moreover, incomplete understanding of students' mathematical strengths may arise from limited classroom observations or missed opportunities for students to showcase their abilities.

According to research to overcome these challenges, teachers may benefit from engaging in reflective practices that foster a growth mindset and an inclusive perspective (Boaler, 2016; Boaler & Dweck, 2015; Jilk, 2016; Kobett & Karp, 2020). By actively seeking to overcome biases, teachers may create a classroom environment that values and celebrates diverse strengths in mathematics. Providing opportunities for students to showcase their abilities and implementing formative assessment practices can help teachers gain a more comprehensive understanding of each student's strengths. Through these efforts, teachers may better notice and nurture students' mathematical abilities, fostering a more inclusive and equitable learning experience for all.

In summary, fostering an inclusive and equitable learning environment involves actively noticing and appreciating students as learners, overcoming biases, valuing diverse strengths, and implementing formative assessments to nurture and showcase students' abilities.

### ***Community***

Another key practice in equity-based teaching is the establishment of classroom norms that foster a mathematics community where every student has a voice in the co-construction of mathematical knowledge. An example of this was in Gutiérrez's study (2002) of effective teacher communities and equitable math practices. In her study she found that tracking was not the pivotal policy that distinguished an effective math department from ineffective one. Moreover, the measure of success was not dependent on formal faculty meetings, years of teaching experience, faculty degrees, or school culture. Interestingly, the standout departments shared three key organizational and cultural aspects: a rigorous and standardized curriculum, a commitment to collective enterprise, and commitment to students. Research suggests that fostering classroom discussions that value student strategies, sense-making, and reasoning can contribute to the development of a supportive learning community (Chapin & O'Connor, 2013; Liljedahl, 2020).

### **Student Identity and Participation**

Boaler and Staples (2008) explained that teachers can build equity within the classroom community by employing complex instruction a set of principles to support participation in which will be discussed in this section focused on student identity and participation.

#### ***Student Identity***

The way students participate in class can have as much to do with the way they see themselves than about their content knowledge. Aguirre and her colleagues (2013) defined

mathematical identities as “the dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the contexts of their lives” (p. 13). Students often chose to participate, and are allowed to participate, in mathematics to the degree that they are seen, and view themselves as smart. Jilk (2016) asserted that we must redefine the word “smart” when working with students. Although some teachers have stopped using the word, Jilk (2016) aimed to “take back” its use and develop an expanded definition of what it means to be a smart mathematician by recognizing that everyone is mathematically smart by the fact they live in our world.

Students perceived mathematical skill can be intertwined with their social, peer, and academic standing—their status (Wood et al., 2019). Higher status students are often seen as smarter than their peers, their teachers, and even themselves, and therefore participate more often, whereas the lower status students often get sidelined. For example, in a math class, higher status students might be more likely to be called upon, receive positive reinforcement for their contributions, and have their ideas acknowledged and valued. In contrast, lower status students may receive less recognition and opportunities to actively engage in mathematical discourse. This disparity in participation and recognition can perpetuate inequities in the classroom and hinder the academic progress of lower status students. What counts as participation and how teachers allow for equitable participation can help eliminate the “Matthew Effect” where children who have a slight advantage continue to get better and better at that skill (Chubb, 2018). In a simple, yet effective example, a child who plays soccer early in life over time gets better and better at soccer because that child continues to get access to the ball more and more. The same idea perpetuates in math classes according to Chubb (2018), who noted that children

who consistently get called upon in math classes because they raise their hand or shout out the answer get more practice time which can lead to inequities in the quiet or less confident student. The teacher's role as community builder is important in these scenarios because noticing students who have not participated and providing them with opportunities to do so helps build the students' positive math identity.

### ***Participation***

One way to build equitable participation and take student status into account is by implementing complex instruction, a set of principles created by researchers after observing unproductive student interactions (Boaler & Staples, 2008; Cohen & Lotan, 2014). A student's status, or how they and others view themselves, may be judged on characteristics that have little to do with mathematics intelligence, and more to things like physical appearance, race, language ability, and popularity (Wood et al., 2019). However, student status can change when students are viewed as capable. A student's status increases when they make a mathematical contribution that is recognized by a classmate or teacher. As status increases, a student is likely to gain confidence and to make further contributions to their math understanding and within their classroom community. Essentially the more opportunities a student gets to successfully participate, the more their confidence and achievement grows.

The teachers at "Railside" High School recommended modifying expectations of success and failure, assigning group roles, and using group assessments to support equitable participation in mathematics learning (Nasir et al., 2014). These strategies involved incorporating tasks that cater to different abilities, ensuring equal contributions within groups, and fostering a sense of responsibility for each other's learning and appreciation of diversity.

Equitable participation in mathematics classrooms can be supported through various practices that employ complex instructional strategies (Wood et al., 2019). One important practice is to focus on participation instead of student ability. Teachers actively monitor classroom discussions, noting which students are frequently speaking out and which students may be more reserved. Expanding what counts as mathematical competence is another recommended practice. Instead of solely valuing quick calculations or understanding of complex algorithms, teachers can design tasks that require a range of academic skills. By doing so, students with different strengths can make meaningful contributions to the mathematics discourse. For instance, a teacher may assign a project that involves real-world applications of math, such as analyzing data sets or creating visual representations. This allows students who excel in data analysis or visual thinking to showcase their mathematical competence (Cohen & Lotan, 2014; Featherstone et al., 2011).

Another way to foster participation is to highlight student strengths by recognizing and acknowledging diverse abilities and contributions of all students (Kobett & Karp, 2020; Wood et al., 2019). In fostering collaborative learning, one effective strategy is to only take group questions (Liljedahl, 2020). This encourages students to engage in group discussions and collective problem-solving. Teachers can address questions that have been deliberated upon by the group but remain unanswered, fostering a sense of shared responsibility and cooperation.

Establishing the norm of collective understanding is another powerful practice for equitable participation (Cohen & Lotan, 2014; Liljedahl, 2020). Teachers can set the expectation that no one is considered finished until everyone in the group has a solid grasp of the concepts being discussed. This eliminates the problem of one student dominating the thinking process while others passively follow along. Each group member is responsible for verifying that all

members understand the material before moving forward. This practice promotes active engagement and aims to support all students, so everyone has the opportunity to comprehend and contribute to the learning process. Wood et al. (2019) emphasized the importance of viewing students as active participants in the mathematics classroom, which aims to create a positive and productive learning environment. By implementing inclusive and supportive practices, teachers may foster equitable participation, deepen students' understanding of mathematical concepts, and promote collaboration. These efforts can contribute to a positive learning environment that values every student's contribution and nurtures their mathematical abilities, ultimately promoting equity in mathematics education.

### **Summary of the Literature Review**

This chapter presented a review of the literature on mathematical equity in education, encompassing a wide range of sources including journals, books, policies, and reports. The literature review is structured into four key sections: conceptualization of equity using Gutiérrez's Four Dimensions, principles, tools, and frameworks for promoting equitable mathematics, the role of teachers in creating equitable math learning, and student identity and participation. This review underscores the complex nature of mathematical equity and highlights the significance of reflective practices, the recognition of students' strengths, and the cultivation of a supportive learning community. The research on equity, including Gutiérrez's four dimensions, remains pertinent and provides a valuable framework for understanding equity in math classrooms. The National Council for Teachers of Mathematics (NCTM) defined equity-based math teaching as practices that acknowledge the perpetuation of oppressive norms in math education and actively strive to eliminate them. The goal is to ensure that all students can engage meaningfully in math learning and construct their own mathematical knowledge (NCTM, 2014).

## CHAPTER 3: METHODOLOGY

As stated in Chapter 1, the aim of this study was to explore how teachers at Oceanview Academy, a large independent school in Hawai'i, conceptualized equitable math practices and implemented them in their classrooms during the COVID-19 pandemic. The study addressed two research questions: first, how did upper elementary and middle school teachers conceptualize equitable math teaching practices in their classrooms? Second, how did these teachers implement these equity-focused practices in their day-to-day instructional activities, particularly amid the pandemic? The methodology for this study includes a rationale for using a qualitative research approach, information regarding the research site and sample, methods of data collection and analysis, threats to validity, philosophical foundations, researcher positionality, ethical considerations, and potential limitations of the study.

### **Rationale for Qualitative Research Design**

The purpose of this study was to explore how upper elementary and middle school teachers at Oceanview Academy, a large independent school on Oahu, conceptualized equitable math practices and implemented these practices in their classrooms during the COVID-19 pandemic. To achieve this purpose, a qualitative case study was implemented.

According to Merriam and Tisdall (2009), qualitative researchers are interested in understanding how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences. The goal of this study was to learn how teachers conceptualized equitable math instruction, as well as how they implemented their vision of equity in their day-to-day instructional activities during the pandemic. These topics are suitable for qualitative research, which aims to achieve an understanding of how people make sense out of their lives and how they interpret what they experience (Merriam & Tisdell, 2009).

A case study is an in-depth description of a bounded system, such as a person, a school, or a math curriculum, that allows researchers to focus on the "case" and retain a real-world, holistic perspective (Yin, 2014). In this case, the bounded system is: Oceanview Academy upper elementary (3-5) and middle school teachers (6-8) who taught the math curriculum during Spring of 2020-Fall of 2021. The rationale for selecting a case study approach lies in its ability to provide rich, detailed insights into the complexities and dynamics of a specific context. By delving deeply into the experiences and practices of the teachers within this bounded system, the case study will enable a comprehensive understanding of equitable math instruction during the challenging period of the COVID-19 pandemic. Through the case study approach, I gained a holistic perspective on the practices, challenges, and strategies employed by the teachers in facilitating equitable math instruction.

In addition, the case study approach aligns with the research objectives of this study. By closely examining the experiences and perspectives of the teachers, the research aims to gain valuable insights into the conceptualizations and implementation of equitable math instruction. This understanding can inform and enhance professional learning for teachers and contribute to the broader field of math education. The research in this study was appropriate for a qualitative case study because it explored initial discussions about equitable math conceptualizations and practices to understand how teachers in this system conceptualized and implemented equitable math strategies. The study also aimed to understand how teachers incorporated instructional routines that fostered equitable participation in their heterogeneous classrooms.

Through this study, I aimed to report the stories of teachers and align these stories with common themes emerging from the participants. The study was not designed to evaluate the curriculum in any way or to collect detailed personalized data. Rather, it sought to explore and

report on how teachers first conceptualized equitable math practices and then incorporated these ideas into their classroom instruction during the pandemic. It also sought to understand how the teachers pivoted and adjusted their routines to support students in a new way when they returned to school in a hybrid learning and face-to-face instructional model.

As a qualitative study that explored the stories of teachers at the school it may provide a deeper understanding on how math teachers incorporated equitable math instruction into their classroom routines using different instructional approaches. The successes may offer opportunities for teachers to build on what is already in place within their teaching teams. Further, this research may offer school administrators and policymakers awareness and insights into future growth opportunities around understanding equity in a broader sense, and potentially the findings around teachers' conceptualizations of equity may brighten a spot within the grander strategic initiatives underway at Oceanview Academy. Ultimately, this research has the potential to make a positive impact on the school community by promoting fairness and inclusivity in math instruction.

### **Research Site and Participants**

The research case study was conducted at Oceanview Academy. In January of 2022, a proposal letter outlining the study was sent to the Director of Analytics and Planning to gain access to the research site. After the initial proposal process, a WebEx video conference was conducted with the Oceanview Academy Research Analyst to discuss the details of the study and any considerations needed in conducting research at the school. Permission to use the research site was granted by the Analytics and Planning team in early February of 2022. Before data collection could begin, the proposal and IRB approval were submitted to the Director of Analytics and Planning.

The research site was selected for two reasons. One, the school offers flexibility in planning and pacing lessons, along with teacher autonomy, so there was the potential to explore innovative and personalized approaches to equitable math instruction. Second, my role as an upper elementary school math teacher on campus provides a unique perspective and deeper understanding of the educational context of the math curriculum and teaching at Oceanview. This familiarity with the campus, culture, curriculum, and faculty allows for a more comprehensive exploration of equitable math practices within the specific setting. It provides an opportunity to identify effective strategies, challenges, and opportunities for promoting equity in math education, which can inform future efforts to enhance teaching and learning practices in similar contexts and that of my own school.

A purposeful sample was proposed for the study participants. The sample included teachers who taught math to upper elementary and/or middle school students, taught math during 2020-2022, and were employed full-time as math teachers or generalists at Oceanview Academy. Purposeful sampling was used to discover, understand, and gain insight from the sample. A secondary snowball or network sampling approach was utilized to identify and recruit six to eight teachers who were willing to share their practices. To ensure a comprehensive understanding of equitable practices within the school, an effort was made to recruit teachers from each grade level. This balanced representation of teachers across different grade levels aimed to provide a broader perspective on the range of equitable practices being implemented at the school.

Upper elementary math teachers were defined as those who taught third through fifth grade, while middle school teachers worked with students in grades six through eight. Elementary teachers were generalists who taught multiple subjects and had a smaller group of

students that remained in one classroom most of the day. Upper elementary classrooms had 25-26 students and followed a self-contained model in grades three and four, and a rotational team-based model in grade five. Fifth-grade students had two teachers, one specializing in humanities and the other teaching math and science. The students were organized in teams where 50 students were shared between two teachers. As students progressed to middle school, teachers became more specialized in their subject matter. Teams of students rotated through four core classes, math, science, English, and social studies, and the school had between 22-24 middle school students per rotating class totaling approximately 92 students per teaching team.

The study explored how the teachers in upper elementary and middle school classrooms conceptualized equitable math practices and applied their conceptualizations of equity into their instructional approaches during the COVID-19 pandemic. By studying both middle school and upper elementary school teachers' conceptions of equity in math instruction offered a comprehensive and nuanced understanding of how equitable practices are perceived and implemented across different grade levels. The knowledge gained may add to teachers' understanding of equitable math practices between grades, ultimately meeting the needs of more students. By understanding the expectations and routines of students in the grades before and beyond what they teach, teachers' practices could be enhanced, and learning could be improved. Participation in the study was voluntary, and participants were allowed to exit the study at any time.

### **Data Collection**

Grounded in a social constructivist framework, this study was designed to help teachers, administrators, coaches, and myself understand equitable math conceptualizations and practices that support student learning and engagement in mathematics. Under social constructivist theory,

when students are active participants in classrooms, more learning happens. In turn, within mathematics, teachers who create intentional opportunities for all learners to participate also help foster a positive math identity in students.

Data was collected from May 2022 to October 2022 through eight participant interviews, historical documents shared by the participants, and a researcher's journal to ensure triangulation of data. As Creswell (2013) advised, the backbone of qualitative research is extensive collection of data, typically from multiple sources of information, which aids in the triangulation of data that will help identify themes related to upper elementary and middle school math teachers' equitable approaches to teaching and learning. Marshall and Rossman (2016) agreed that interviews, observations, and document reviews form the core of a qualitative inquiry. All data collected must be de-identified and rendered anonymous by stripping any information that would identify the participants or research site in any way (Creswell, 2014).

Creswell (2014) suggested creating and planning an interview protocol that includes steps for taking notes, audio recordings, and questioning. I conducted audio-taped and transcribed interviews via video conferencing software including Zoom or WebEx. These sessions were recorded, and the audio was transcribed using Otter.ai software. The interviews were semi-structured using open-ended questions and follow-up prompts to ensure participants could share their entire story. All video recordings were destroyed after the data was coded for themes.

In my research, data collection followed a specific sequence: guided interviews, document collection, and the continuous maintenance of a researcher journal. This order allowed me to establish rapport with participants before requesting documents (Marshall & Rossman, 2016). Throughout the process, I maintained a researcher journal, recording analytic memos, notes on my learning, and research ideas. Conducting individual, unstructured, and open-ended

interviews was intended to provide an opportunity for study participants to share their opinions, stories, and experiences without external influence. Interviews are useful when participants cannot be directly observed, can provide historical information, and allow researchers control over the line of questioning (Creswell, 2014). Interviews with participants were scheduled to take one-hour at the convenience of the participant and did not intrude on their teaching duties.

The documents as a data source provided triangulation of the data providing additional insights into the research topic. Documents included lesson plans, slide decks, instructional videos, and policy guidance documents. These documents provided alignment with self-reported data, illustrative examples, and context of pedagogical approaches employed by the teachers, which helped inform the interpretation and analysis of interview data.

My researcher journal provided a space to document my thoughts on the research design, methodology, and ethical considerations. During data collection, the journal served as a repository for detailed field notes, capturing observations, conversations, and interactions with participants. In the data analysis process, the journal was useful for developing initial codes, categories, and emerging themes. I recorded my analytical insights, interpretations, and connections as I engaged with the data. This process helped identify initial patterns and develop a coherent framework for analysis. Finally, I recorded any methodological decisions throughout the study to support transparency and accountability.

To enhance the credibility and trustworthiness of the research data, member checking was employed (Creswell, 2007). This involved sharing the written transcripts with the participants and inviting them to review and provide feedback. I aimed to accurately represent the participants' words, ideas, and stories while respecting their perspectives. Participants had

full control over their transcripts and were encouraged to make revisions as necessary. This approach aimed to help validate the findings through participant verification.

## **Data Analysis**

The analysis framework was developed by integrating Creswell's (2014) six-step process with Yin's (2014) qualitative strategies for case study analysis. An inductive approach was employed to analyze the research findings, allowing for the emergence of themes and patterns from the data. This combined approach provided a comprehensive framework for interpreting and making sense of the data collected in the study. Figure 2 highlights the coding process that I used to come up with themes and findings.

The beginning stage of data analysis included organizing the data, transcribing interviews through Otter.ai, and organizing documents that were collected. This process allowed me to get a sense of the data that had been collected. The analysis also included a cross sectional review of the audio recordings. Transcripts were digitized and stored for further analysis later.

The next step in analyzing the data was reading through the transcripts of interviews and listening to the recordings to correct any errors that may have occurred through the transcription process. Instead of names, pseudonyms were assigned for each participant to ensure confidentiality. The transcribed interviews created from Otter.ai were transferred into a Microsoft Word document with line numbers to track all data. Creswell (2014) proposed a linear hierarchical framework for data collection, but in practice, the process proved to be more interactive. In my study, data collection involved interviews conducted over a span of several months. Waiting until the end of the study to organize and analyze the data was not productive. Instead, the analysis was ongoing, and data was organized as it was collected, allowing for a more dynamic and iterative approach.

After the information was organized and transcribed, the next stage was coding the data to determine themes. A code is simply a text-based label that gives meaning to a segment of the data (Lochmiller & Lester, 2017). Because predetermined codes did not highlight the voices and stories shared by the teachers, as the coding process unfolded, I created codes that identified categories and themes within the three types of data collected.

During the data collection phase, Merriam and Tisdell (2009) suggested that researchers adopt a conversational approach with the data, posing questions, making comments, and engaging in an interactive dialogue. Similarly, Yin (2014) recommended researchers to "play" with the data, exploring patterns, insights, and promising concepts. To facilitate this interactive approach to data analysis, a descriptive coding method was employed. This involved a meticulous review of interview transcripts to identify salient topics that emerged from the data. Relevant words, descriptions, and quotes were then compiled into a spreadsheet to facilitate organization and identification of emerging topics. To visually organize the data and make connections, I used the digital bulletin board platform Padlet. The evidence was sorted into themes and subheadings, with each theme incorporating data from each interview. The data was analyzed in an interactive and iterative manner, allowing for the exploration and identification of meaningful topics and themes that emerged.

After that, the collected information was used to generate a description of the setting, people, and themes that emerged from the data. Description involved a detailed rendering of the people, place, and events within a setting (Creswell, 2014). These themes became the major findings from the study and were used as headings in the findings section of the analysis. The intention was to collect data that included multiple perspectives, quotations, and evidence to support the themes that emerged from the coding process.

The next step of data analysis was to determine how to represent the findings. As the data was collected, coded, and analyzed, qualitative data in the case study emerged and was summarized through a descriptive narrative as opposed to a scientific report. Where appropriate, visual data was represented in tables and figures. Thick descriptions were employed to communicate a holistic picture of the findings and experiences of upper elementary and middle school teachers and avoid the use of thin, superficial descriptions (Creswell, 2014).

The final step of data analysis was interpreting the findings. This included returning to the literature and comparing the findings to previous research to confirm past information and evaluated how the findings diverge from what previous research has said on the topic. An interpretation of the findings also suggested additional questions and action steps that emerged that need to be taken. The findings section of the analysis is also the place where equitable strategies that emerged from the research that may enhance educators' practices in the areas of teaching and learning, collaboration, and professional development have been included. In addition, practical examples of equitable math instructional practices emerged that other educators could tailor to contexts that they may encounter in their classes, and perhaps, improve access to math learning outcomes for all students.

### **Potential Threats to Validity**

Validity refers to checking to ensure that the findings from qualitative research are accurate and credible. As Creswell and Miller (2000) noted, one of the strengths of qualitative research is the ability to determine validity based on examining whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of an account. Within this study there are three key areas to address related to validity: researcher bias, reactivity, and

respondent bias. To reduce these threats to the validity of the study, I am drawing on the strategies from Creswell and Yin.

Creswell (2014) suggested eight strategies a researcher might use to ensure validity: (a) triangulate different data sources; (b) use member checking; (c) use rich, thick description; (d) clarify researcher bias; (e) present negative or discrepant information; (f) spend prolonged time in the field; (g) use peer debriefing; and (h) use an external auditor. These are listed in order from most frequently used and easy to implement to those that are used less often and more difficult to implement. Yin (2014) similarly discussed three tactics used to increase validity in case studies. These included: using multiple sources of data, establishing a chain of evidence, and having a draft case study report reviewed by key informants.

As an upper elementary math teacher researching math instructional practices at the school where I teach addressing researcher bias and reactivity is important for the validity of the study and accuracy of the results. Addressing and recognizing the possibility of reactivity in qualitative research is important to ensure that I did not accidentally disclose what they expected the study to show or presented biases that made the respondents feel uncomfortable or pressured to answer a certain way.

To address these two threats to validity, I collected data from multiple sources and triangulated these data to justify the major themes that emerged from the coding process. In addition, the report also shares major findings, themes, and case analysis with participants to check that their stories have been recorded accurately. The use of peer debriefing with my committee and other scholarly colleagues provided a peer review of the initial findings to help balance threats to validity from researcher bias. As a faculty member at Oceanview Academy, my prolonged exposure to the research site helped mitigate the threats of researcher reactivity

and respondent bias. The extended time spent at the site fostered a comfortable environment, enabling participants to engage more openly and provide honest responses. Consequently, I was able to develop a deeper understanding of the participants and present their stories in a comprehensive and detailed narrative. Recognizing the potential for respondent bias is crucial, particularly during participant interviews, which emphasizes the necessity of implementing clear, intentional, and reliable interview protocols.

To ensure research is reliable, Yin (2014) recommended documenting as many steps of the research protocols as possible. A research journal served as a log of the process and protocols used along the way to strengthen the reliability of the research. The use of a research journal not only provided a record of my research process, but also served as a means to enhance the transparency and rigor of the study. By documenting the process and protocols employed, it may support that the research could be replicated and verified by other researchers, further contributing to the reliability and validity of the findings. Alongside, the research journal facilitated reflexivity, allowing for critical reflection on the researcher's own biases and assumptions, thus promoting a more robust and nuanced analysis of the data.

### **Philosophical Foundation and Researcher Positionality**

Using epistemological assumptions, this study presented the views of math teachers in the context of upper elementary and middle school classrooms in order to understand how they conceptualize, plan, and incorporate equitable math instruction into their classes. The research approach was grounded in the participants' perspectives, rather than being solely driven by existing theories or the researcher's own viewpoint (Creswell, 2013). It followed a social constructivist paradigm, which focuses on understanding how individuals construct knowledge and interpret their experiences. The aim was to rely extensively on the insights and perspectives

of the participants in order to gain a deeper understanding of the research topic. By prioritizing the participants' voices, the research sought to capture an authentic and comprehensive understanding of the subject matter. These views were formed through interaction with others and through historical and cultural norms that operate in individuals' lives. In presenting research in this manner, the researcher's values are minimized; However, as Creswell (2013) noted, there is recognition that their background will shape their interpretation. How the researcher "positions themselves" in the research is important to understanding and acknowledging how their interpretation flows from their own personal, cultural, and historical experiences.

### **Researcher Positionality**

As the researcher, my positionality is deeply intertwined with my personal and professional experiences. Currently serving as a fifth-grade math and science teacher at Oceanview Academy in Hawai'i I bring to this research a wealth of classroom teaching experience spanning twelve years across public and independent schools in the United States and Asia. My perspective is influenced by the belief that life, much like learning, is a collaborative process. I am firmly rooted in the constructivist view that truth is variable, socially constructed, and ever evolving. The past 31 years as a military spouse, moving around the globe, have fostered my belief that knowledge is collectively constructed. I understand that social context and interaction shape our realities. A constructivist stance concludes that knowledge is socially constructed, and "multiple realities are built through our lived experiences and interactions with others" (Creswell, year, p. 6). This perspective aligns with my ontology, which views reality through a constructivist lens. I believe knowledge to be the outcome of mutual understanding and that my reality is not rooted in a singular truth but in the myriad truths of others within a shared worldview. As a math teacher, my pedagogical approach is grounded in a constructivist

framework for math learning, allowing for multiple pathways to understanding and accuracy. Consistent with constructivist thought, I uphold the idea that knowledge is socially constructed and that multiple realities are forged through our lived experiences and interactions with others. Therefore, the lens through which this research is conducted embraces a perspective of multiple truths and realities, stemming from a foundation of social constructivism, and just as I believe in student-centered learning and multiple pathways to understanding, I approached this study with the same idea of centering the voices of my participants. My dedication to professional growth led me to pursue a doctoral degree and this research reflects my passion for advancing education.

### **Ethical Considerations**

Given my role as both researcher and practitioner, I had to navigate several ethical considerations throughout this study. These considerations included potential issues related to interviewing colleagues from my immediate working environment and those from outside my direct sphere, who may harbor their own respondent biases. To mitigate these concerns, I sought and received permission to conduct the research at the campus. Moreover, all study participants provided informed consent, underlining the ethical foundation of the research process. Marshall and Rossman (2016) emphasized the central role of interpersonal skills in successful research. These skills encompass establishing trust, maintaining healthy relationships, respecting norms of reciprocity, and diligently considering ethical issues throughout the research process. Beyond these, the successful navigation of organizational politics and a sensitivity towards human interaction was also essential. My awareness of these factors was integral to ensuring the ethical integrity and effectiveness of the research process. Thus, my dual role necessitated maintaining a delicate balance between interpersonal skills and ethical considerations in the research setting.

Beyond having welcoming and trusting communication skills, it was also important to recognize that I interviewed colleagues, and some of what they shared was privileged or perhaps information they trust was not used towards a larger theme in the findings, not as an evaluation, or spotlight on their teaching practices. The information should not be used in any other form other than this research. To get at the true nature of how teachers think and imagine equity in their math practices, it was not only important to build a bond between myself and the participants, but to also assure them that what they shared could be trusted in the hands of the researcher.

### **Limitations to the Study**

Along with the threats to validity and positionality, I acknowledge the limitations of the study. In this qualitative case study, the exploratory research will focus specifically on how upper elementary and middle school teachers conceptualized or thought about equitable math practices, and how those teachers created equitable opportunities for students to participate in classrooms bounded by strict safety protocols related to COVID-19. As this is a single-subject case study that focused on one independent school in Hawai'i, the results are not generalizable to other schools or similar settings. Moreover, the study has a limited participant sample. As such, the data collected, and the results of the study are not representative of the entire school or the larger independent teaching community in Hawai'i. However, the goal was to accurately represent the voices of the participants and share the findings as authentically as possible.

### **Summary of Methodology**

In this chapter, descriptions of the proposed methodology planned to conduct this study are presented. The research design consisted of open-ended interviews, document review, and a

researcher's journal. Interview data was audio recorded, transcribed, coded, and analyzed. Data was collected according to IRB protocols.

## CHAPTER 4: FINDINGS

The purpose of this study was to explore and understand two main aspects related to math teaching practices in upper elementary and middle school. The first was to understand how teachers perceive and understand the concept of equity in the context of mathematics education. The second objective was to examine how teachers may have implemented these conceptions of equity in their day-to-day instructional activities, particularly amid the ongoing COVID pandemic. This included exploring the practical aspects of how teachers at Oceanview put their conceptual understanding of equity into action in their classrooms, taking into consideration the challenges and unique circumstances posed by the pandemic. Through this analysis, I aimed to gain insights into the ways in which the pandemic may have facilitated innovation in teacher practices and the potential implications for post-pandemic teaching and learning of mathematics.

### **Participant Demographics**

The participants in this study were eight full-time lower school faculty members from Ocean View Academy. They represented a wide range of teaching experience gained at Ocean View Academy and abroad (Table 1). Two of the participants were male and six were female; five taught in grades 3-5, while three were middle school educators in grades 6-8. There was at least one participant from each grade level in this study (Table 1). All participants taught mathematics at Oceanview Academy during the time period of this case study from April 2020 through October 2021. To ensure the protection of participants' identities in reporting, a pseudonym has been used for each of the participants. The pseudonyms, specifically Jaime, Alex, Taylor, Pat, Jody, Quinn, Casey, and Jordan, were chosen to safeguard the anonymity of the study participants.

Table 1

## Participant Demographics

Characteristic	n	%
<b>Gender</b>		
Female	6	75%
Male	2	25%
<b>Years Teaching</b>		
5-14 years	3	37.5%
15-20 years	2	25%
Over 20 years	3	37.5%
<b>Grade Taught</b>		
3-5	5	75%
6-8	3	25%

The teachers who participated in the semi-structured interviews were and are active math instructors at Oceanview Academy, and the interviews were conducted during the first semester of the 2022-2023 academic year. My interview questions included nine semi-structured questions asking participants to describe their vision of an equitable math classroom and their own teaching style and practices in their math classrooms. They were asked to describe ways in which they addressed learning differences, COVID-19 related student absences, and student collaboration during the pandemic. Subsequently, they reflected on the challenges to implementing equitable math practices during the pandemic along with any related instructional practices that improved student learning. Each interview lasted between twenty and seventy minutes, was audio recorded, then transcribed into printed text.

## **Math Curriculum**

Oceanview Academy incorporates the Savvas enVision 2.0 math curriculum as a key component of its mathematics education. The enVision 2.0 curriculum is utilized for grades 2-8 and emphasizes conceptual understanding, problem solving, and individualized instruction. Prior to second grade, students engage with the inquiry-based Investigations 3.0 curriculum, which places a strong emphasis on student-centered approaches, active learning, and collaboration. The transition to enVision 2.0 in second grade allows for a deeper focus on individualization, problem solving, and developing a robust conceptual understanding. Teachers are asked to teach this curriculum adhering to a specified scope, sequence, and pace within each grade level. All participants in this study taught math using Savvas enVision 2.0 math curriculum.

## **What is Meant by Equitable Math Practices?**

In this study, equitable math practices refer to flexible instructional approaches that are designed so that every student can access the curriculum, receive quality learning, personalized support, and sufficient time to meet the high expectations of the curriculum. These practices are rooted in the belief that all students possess the capacity for advanced mathematical thinking, emphasizing the importance of inclusivity and providing support to nurture students' mathematical potential. Instructional approaches refer to the various strategies and methods created by teachers or embedded into the curriculum to deliver instruction and facilitate learning in the mathematics classroom. These instructional approaches are individualized to cater to the needs of all learners, providing the necessary structures to support the learning process.

## **Findings**

This chapter presents the findings from my study that examined how eight upper elementary and middle school teachers conceptualize and implement equitable math teaching practices. The study aimed to explore how teachers understand equity in math education and their efforts to incorporate equitable practices into their day-to-day instructional activities, particularly amidst the ongoing COVID-19 pandemic. The findings provide insights on the teachers' conceptualization of equitable math teaching practices, as well as the challenges they encountered in implementing these practices during the pandemic.

I analyzed the data from the eight interviews with teachers from Oceanview Academy and will report the findings through two major themes:

1. Conceptualization of Equitable Math Practices
2. Implementation of Equitable Math practices amid the COVID-19 Pandemic

The findings section is divided into two parts, each consisting of several sub-themes. Each sub-theme that emerged from these findings will be thoroughly explored, highlighting its significance within the classroom context. The first theme explores participants' conceptualization of equitable math practices, addressing the first research question. It delves into their vision of equality in math education. The second theme focuses on participants' implementation of instructional strategies during the COVID-19 pandemic, exploring their alignment with the themes related to conceptualizing equity in mathematics. This addresses the second research question, offering insights into the practical application of equitable math practices in a challenging educational context. The chapter concludes by highlighting the challenges encountered by teachers in implementing equitable math practices during the pandemic.

## **Conceptualization of Equitable Math Teaching Practices**

The participants in this study shared their thoughts and perspectives on equity in mathematics and four sub-themes emerged from the data. Teachers emphasized the importance of addressing individual needs, ensuring equitable access and opportunities, creating inclusive learning environments, and fostering a growth mindset. These four themes emerged as central to participants' conceptualizations of equity in their math classroom. By exploring these themes, this research aims to provide a deeper understanding of how the study participants at Oceanview Academy envisioned an equitable math classroom.

### ***Addressing Individual Needs***

Findings showed that participants' shared understanding of educational equity, emphasizing the necessity of acknowledging and accommodating individual learning needs within the classroom. Central to this notion is the idea that equity does not imply equality; rather, diverse types and levels of support are required to cater to each student's unique learning needs and starting points.

Quinn, for example, asserted the significance of providing support systems that allow all students to reach high academic standards. Quinn perceived equity as challenging, engaging, and supporting every learner, irrespective of their learning style or level, reflecting an understanding of the unique interpretive and problem-solving skills each student brings to the classroom. Casey pointed out that equitable math instruction should consider each student's unique starting point in terms of mathematical comprehension and skills and offer them the ability to grow at least one year beyond where they started. Casey believed in providing targeted individualized support for students who had knowledge gaps and extension activities for those who were ready to move ahead. Further reinforcing this

sentiment, Jamie associated equitable math practices by accommodating the unique pace at which each student learns. Jamie's goal was to create an environment that neither rushes students nor leaves them waiting for their peers.

For several participants, supporting individual needs started with knowing their students well enough to ensure each child had the support to participate in the learning engagements. Jordan explained how using low floor, high ceiling instructional approaches which are also associated with open and rich task approach provided multiple entry points for students (Boaler, 2016; Kaplinsky, 2015; Liljedahl, 2020; Zager, 2017). Multiple entry points refer to a student's ability to understand a math problem and create meaning based on their specific skill level. For example, a problem that has multiple entry points is often referred to as a low-floor, high-ceiling problem where there are multiple right answers. An example of this type of problem for elementary students might be:

Nick saw 12 legs walk by getting on a boat. How many creatures could he have seen? How many different answers can you find? Can you explain how you found these answers? (NRICH Maths, 2023).

What makes this problem particularly beneficial is it can be accessible to all students, allowing them to start at their own level of understanding while encouraging them to push their thinking to higher levels. This approach may promote critical thinking, problem-solving skills, and the development of mathematical reasoning by offering challenges that can be approached at different levels of complexity. Teachers may then select specific instructional strategies within the low floor high ceiling approach to support students' engagement, discussion, and reflection on these tasks. Such tasks frequently have multiple solutions and can stretch for the students who are more advanced. Similarly,

“open-middle” math problems as developed by Kaplinsky (2015) are examples of instructional strategies within the low floor high ceiling approach that allow students to use flexible strategies for reaching one solution, hence the idea of the “middle” of the problem being open for students to use various math strategies to reach the answer. These types of instructional approaches and strategies as highlighted by Jordan and Alex, may enable all students to actively participate in mathematical tasks.

Jordan and Alex, both highlighted the importance of helping students conceptually understand the concepts by offering math tools like fraction strips, counting blocks, and place value models to support visualization and modeling of the concepts. Pat and Jody agreed but emphasized the challenge of discerning which tools and structures work best to meet individual student needs. Thus, highlighting the challenge for teachers to make connections with students in order to provide the right type of individualized instruction. Research shows that teacher-student connections are established when teachers assess, analyze, and provide timely feedback on student work (Hattie & Timperley, 2007). Finally, as discussed in the literature (Boaler, 2016; Boaler & Dweck, 2015; Jilk, 2016; Kobett & Karp, 2020), teacher noticing is important in supporting individualization. By offering occasions for students to demonstrate their capabilities and employing formative assessment strategies, educators can acquire a more holistic comprehension of the individual strengths exhibited by each student.

These shared perspectives lead to two significant conclusions. Firstly, educators must acknowledge and appreciate the diversity of student needs within the classroom. Secondly, instructional practices need to be adapted to accommodate this diversity. The participants agreed that effective math instruction values each student's unique

understanding, skills, and starting points. These conclusions align with the insights from researchers like Boaler (2016), Gutiérrez (2009), Gay (2010) and Hattie (2009), who emphasized the importance of individualized and context-sensitive teaching.

### ***Equal Access and Opportunities***

A second sub-theme that emerged from the interviews, and is tied closely to the first, was that participants believed that all students should have equal access and opportunities to learning. Access focuses on removing barriers that may prevent students from fully participating and engaging in the learning process based on their individual needs. As described by participants, this meant having access and opportunities to use the resources students needed to learn. Some resources mentioned by participants included equal access to the teacher, technology integration, lesson materials, collaboration with peers, and tools for learning. Within this theme, some of the indicators of equal access and opportunity according to the participants was the ability to participate and feel included in the learning process, support diverse learning styles and abilities, offer opportunities for student choice, and provide additional support for struggling students along with extension opportunities for advanced learners.

Participants emphasized flexibility in pacing and support was important in promoting equity. Allowing students to have sufficient time to complete the task and tasks that offered entry points that match student's individual readiness for success in mathematics. Jamie's conceptualization of equity included the belief that equity in math included equal access and time with the teacher and the ability for students to work at their own pace. Jamie viewed equity as providing students with both equal access to the curriculum and opportunities for individualized attention from the teacher and allowing students to work at their own pace within the lesson sequence. Jamie and Quinn acknowledged the importance of addressing existing inequities, like

time given to complete a task and allocation of teacher time with students. It was important to ensuring that all students have meaningful engagement with math concepts, and no one is waiting around for others if they are ready to move on. These teachers considered personalized pacing to be a crucial component of equitable math instruction.

To support students with differing abilities, Alex emphasized the importance of showing students how to use math tools that provide support and understanding around complex math concepts. For example, offering students the choice to use tactile manipulatives offer students a visual model of complex math concepts like equivalent fractions of place values. Alex also noted the value of Number Talks which is an instructional strategy that fosters student participation through mathematical communication. Number Talks facilitate understanding of students' mathematical thinking through open-ended discussions. During these discussions, students articulate their thought processes and reasoning, enabling the teacher to assess their comprehension and customize instruction accordingly. This technique not only benefits the individual student sharing their reasoning, but also deepens understanding among peers, assisting teachers in identifying areas of strength and improvement among their students.

Quinn expressed a similar belief that equitable practices combine the supportive structure to help each learner but explained that it is “two-fold: it's equity and excellence, but excellence comes first. So, excellence sets the bar. And then equity is the support that you provide, to help all students achieve that goal.” The focus is on excellence first as the benchmark, and equity acts as a support system for students with varying levels and styles of learning to reach that standard. According to Quinn, this ensured that every student was engaged, motivated, and provided with adequate support. Ultimately, the participants viewed the role of the teacher as significant in creating this vision of equity within their math classrooms.

The participants noted the availability of learning materials was key to providing equitable access for learning. They recognized that enabling students to easily access materials from any location and at any time played a crucial role in promoting fairness. Pat emphasized the importance of having all the resources, support, and materials needed to foster equitable math practices. Pat highlighted the need for all students to have access to learning materials, equal opportunities to engage in collaborative activities, and individualized teacher support as needed. Taylor noted that the importance of math equity means students can effortlessly download materials or watch video lessons from any location and at any time, created equal access and opportunities for learning. Participants noted that this type of accessibility was particularly valuable during times when students had to be absent due to illness or when they had to adhere to COVID-19 safety protocols. The ability to access curriculum through online sources not only facilitated continued learning, but also made it easier for teachers to provide feedback from anywhere. The participants collectively shared that providing digital materials in a central place fostered equitable learning. The next sub-theme addresses inclusive learning environments.

### ***Inclusive Learning Environments***

Participants in the study noted the importance of cultivating an inclusive learning environment in which all students feel valued, safe, and engaged. This was viewed as a critical component, or structure, in mathematics classrooms. The term structures here refer to specific strategies, policies, and practices implemented in the classroom to create a positive, supportive community. In this case, these structures help students to identify as mathematicians and facilitate a climate that encourages collaboration, engagement, and empathy. For instance, Jordan highlighted structures in the classroom that included the establishment of clear and predictable routines that students can easily understand and follow, that contribute to a sense of safety and

stability. Jordan referenced cooperative learning strategies, where students work together in small random groups, each contributing to the group's understanding and solution of mathematical problems. The routine and structure of getting into random groups is created by the teacher and shared how each day students practiced problem solving in small random groups. What this means is that students are not grouped based on their ability or based on their friends, but instead configured groups by using a digital randomizer tool that creates learning groups in seconds.

Thus, according to the study participants, the aim of these structures and an inclusive learning environment was to nurture an atmosphere that promoted collaboration and equitable participation for all students. Jaime and Jody provided complementary insights into their conceptualizations of an inclusive classroom. Jaime maintained that supporting learners requires multiple avenues for teacher access, including video lessons, one-on-one conferences, and formative assessments. On a similar note, Jody shared that equitable instruction provides "everyone with an opportunity to succeed," noting that the path to success might look different for each individual. Expanding on this, Jody suggested that an equitable math classroom promotes opportunities for cooperative learning, allowing students to strengthen their skills, explore innovative approaches, and deepen their understanding of diverse perspectives and strategies in mathematics. Jody emphasized the value of collaboration, seeing it as a platform for students to engage in discussions and present creative solutions, which according to Jody, is an aspect often underemphasized in traditional math classrooms where math is perceived merely as a series of problems with predetermined solutions. In contrast, Jody contended, "math is highly creative and offers a variety of problem-solving approaches." An example given was the solving of an algebraic equation where one can opt to distribute, combine, or keep terms separate, among

other possible strategies. Ultimately, Jody affirmed that inclusive learning communities offer students a space to explore their creativity in mathematics, fostering critical thinking and honoring diverse perspectives.

Quinn agreed with the idea that less teacher-led instruction can give students more control and ownership over their learning. Quinn acknowledged that to make math teaching fair, we need to recognize and respond to the different ways students learn. This included acknowledging that students may need different amounts of time and different methods to understand math problems. Just like in the real world, math education often presents a clear "right" or "wrong" answer. However, the important part of teaching is showing students that there are many ways to get to the right answer. This idea is sometimes called the "open middle" concept. So, in this context, being equitable in teaching means understanding and supporting different ways of solving problems. Participants reported that creating an inclusive learning environment where all students feel valued, safe, and engaged was considered an important and highly valued structure in math classrooms.

The last theme within how the participants conceptualized equitable math practices involves encouraging a growth mindset. This means helping students understand that they can get better at math through hard work and practice.

### ***Cultivating a Growth Mindset***

Participants recognized the importance of fostering a growth mindset, promoting critical thinking and problem-solving skills, and addressing math anxiety to promote confidence and empower students in their math learning. Participants in the study emphasized the significance of fostering a growth mindset in both teachers and students, which is a concept that focuses on the belief that abilities and intelligence can be developed through dedication and hard work (Boaler

& Dweck, 2015; Dweck, 2006). By promoting a growth mindset, educators encourage students to perceive challenges as opportunities for learning and growth, rather than as insurmountable obstacles. This helps students to persist in the face of difficulties and promotes resilience.

Taylor shared, “When I think about equitable math instruction, I think that means I am encouraging all students to have both a good mindset, a positive attitude, developing, you know, grit and rigor, creating a climate where everyone feels confident.” Participants conceptualized equity as cultivating the principles of a growth mindset around mathematics.

Casey held the conviction that every student, regardless of their initial academic standing, should be afforded the chance to make a full year's growth in mathematics. What is means is that when student begins the year behind the grade band, Casey’s goal is to get them to grade level by the end of the year, and for the students who are more advanced, equity meant providing for their needs too. That the stronger students progressed one year beyond where they started. As Casey explained, "If a student comes in behind, I want them to get to grade level. If kids come in already ahead, I still think they should have the opportunity to grow a whole year." This sentiment aligns with the perspective that intelligence and skills can be nurtured and expanded through consistent effort and the application of effective strategies. By advocating for targeted assistance for students who are lagging and offering enriching activities for those who are ahead, Casey's conceptualization of equitable math practices underscores a belief in the potential for growth. This approach also emphasized the importance of continually challenging students to expand their abilities, regardless of their starting point. This conviction, consequently, demonstrates a commitment to a growth-oriented mindset in the context of equitable math instruction.

Jordan mentioned the importance of building students' confidence and growth mindset, helping them overcome any negative perceptions of their math abilities:

I feel like students can come into my classroom feeling like they are not successful mathematicians, but through building their confidence, growing their mindset, I think the most fulfilling thing is like watching them really change how they think about themselves as a mathematician.

The concepts of growth mindset (Dweck, 2006), grit (Duckworth, 2016), and the mathematics perspectives of Boaler (2016) contribute to the pursuit of educational equity. Growth mindset emphasizes the belief in the potential for intelligence and abilities to be developed through effort and effective strategies (Dweck, 2006). It encourages individuals to view challenges as growth opportunities and perceive improvement as a continuous process. Grit promotes the significance of perseverance and passion for long-term goals (Duckworth, 2016). Boaler (2016) focused on creating inclusive mathematics classrooms that foster deep understanding, conceptual learning, and the appreciation of diverse perspectives.

The next section will address the findings from the second research question on how participants implemented equitable math practices into their teaching during the many phases of the COVID-19 pandemic.

### **Implementation of Equitable Math Practices amid the COVID-19 Pandemic**

The implementation of equitable math practices during the COVID-19 pandemic presented unique challenges. The learning environment underwent a significant shift, with classes moving online and later adopting a hybrid model. This, combined with, students donning masks and face shields when attending in-person sessions made the learning environment challenging. While Oceanview Academy encouraged teachers to foster collaborative and

inclusive learning spaces, the sudden shift to remote and hybrid instruction posed obstacles. Teachers had to adapt quickly to the increased reliance on technology, despite limited training opportunities and the lack of prior experience in teaching within this new context. In response to student needs during the pandemic, teachers employed various instructional practices. This section of the findings explores how these practices were implemented, highlighting sub-themes such as individualized and differentiated instruction, technology integration, collaboration and communication, and formative assessment and feedback.

### ***Individualized and Differentiated Instruction***

According to Bray and McClaskey (2018), differentiation was a teaching approach that involves modifying and adjusting instruction to meet the diverse learning needs, interests, and abilities of all students in a classroom. The goal of differentiation is to create a learning environment that is responsive to the individual needs of each student, so that they can engage with the content at a level that is challenging but not overwhelming. At Oceanview participants shared how they supported the individual learners in their classrooms during the COVID-19 pandemic by providing targeted instruction, individualized practice, and resources to support struggling students. Extension or enrichment opportunities for students who finished early included math game stations, puzzle corners, and individualized practice using technology. Some participants mentioned that creating resources for advanced learners was a challenge during the pandemic.

Participants expressed the value of utilizing video lessons as a means of providing flexible and accessible instruction to students, both in-person and remotely. They emphasized that video lessons allowed students to engage with the curriculum at their own pace, pausing, rewinding, and taking notes as needed. This approach not only accommodated students' diverse

learning styles and processing times, but also freed teachers to provide individualized support and engage in one-on-one or small group discussions about students' understanding and misconceptions.

By curating math lessons into video format, teachers created a resource bank that students could access anytime, whether inside or outside of class. This proved especially beneficial for absent students or those needing to review the content. The availability of video lessons eliminated the need for teachers to repeatedly re-teach lessons for absent students and allowed students to finish missed work more efficiently. Participants recognized the value and potential of video lessons as an equitable instructional tool that may promote student autonomy, motivation, and meet the varied learning needs of students. About one-third of the teachers in this study created their own instructional videos for use during the pandemic. The remaining participants used video lessons from other sources to support student engagement and math understanding. Teachers expressed intentions to continue refining and improving this instructional practice, recognizing its value in facilitating student learning and fostering a positive learning environment.

Teachers adapted the curriculum to suit individual learning needs by using differentiation strategies aimed to adjust lesson materials and teaching approaches to meet students' unique abilities, interests, and learning styles. Differentiation strategies may involve considerations around time, process, or content (Bray & McClaskey, 2018). This proved to be true at Oceanview Academy where participants differentiated by adjusting the time, content, or process.

Teachers who created video lessons established a guided, self-paced model where the focus of differentiation was providing flexibility with time. This allowed students to learn at their own pace until they grasped the lesson's concept. To monitor progress, teachers used practice

problems, teacher-student meetings, peer discussions, and assessments of lesson objectives. Extra support was available through one-on-one teacher meetings or help from peers within learning communities. The main idea here was that students in this type of learning environment are not required to finish at a specific pace, for example by a predetermined test date. Instead in this model, all students had access to the same curriculum and problem sets, allowing them to work at their own pace. This led to variations in students' progress through the lessons. In the traditional direct instruction model, instruction was modified to keep all students on the same lesson. The guided, self-paced model had students do all the lessons and were supported by check-in meetings with the teacher after every lesson. Students who finished a unit, could move onto the next unit using the teacher created instructional videos.

In contrast, classrooms that did not adopt a guided self-paced learning model followed a different approach. They typically delivered one lesson to all students and then differentiated the content or process based on individual needs. As a result, students who needed more help received additional practice or reduced problem sets based on their processing needs. They differentiated so that each student's readiness level was accounted for, providing additional support to those who needed it. This support included one-on-one assistance, reducing the number of practice problems, offering extra study time or teacher meetings, or extending completion deadlines. When students finished quickly, they engaged in enrichment activities and projects until the unit was complete. Teachers offered a flexible menu of support or enrichment options within the unit to cater to individual learning needs. The decision on differentiation was made by the teacher, considering the specific needs of each student. In this model, classes were generally all on the same lesson and paced so that everyone could take the math assessment on

the same day. Teachers' choice of how they taught, whether by self-paced video lesson, direct instructional model, or some hybrid of the two, was at their professional discretion.

Many teachers used computer-assisted instruction and adaptive software programs to engage students with learning opportunities targeted at their individual level. One such tool, IXL, came up consistently as a digital platform used by teachers at Ocean View Academy within their math instructional routines. The platform's primary focus was to provide personalized learning experiences for students, allowing them to work at their own pace and level. IXL uses adaptive learning technology to adjust the difficulty of the exercises based on the student's performance. This helps to ensure that students are challenged enough to make progress, but not so much that they become frustrated. Participants explained how they used IXL as a tool for differentiation by recommending adaptive skills for individual students based on their areas of need. They shared how they used data from IXL to inform their instruction and provide students with targeted practice to help them meet their individual learning goals. Jordan integrated IXL into their daily lesson plan, linking it to their lesson objectives and assigning it as independent work for their students.

### ***Collaboration and Communication Strategies***

Collaboration and communication emerged as crucial elements in teaching and learning during the pandemic. In the fall of 2020, when campuses reopened, participants found themselves teaching students in-person and online simultaneously. This new "hybrid" teaching model brought unique challenges such as communication difficulties for students in both settings. Classroom setups had to incorporate various safety measures, including social distancing requirements, masks, shields, which all added to the difficulty of student-teacher interaction. Furthermore, teachers had to contend with navigating teaching online streaming

lessons to at-home learners while also providing instruction for students in person. Participants found creative ways to manage these issues by utilizing online tools like chat rooms, message boards, and video conferencing. These platforms served as virtual bridges, connecting students in-person and at home, and facilitating their communication and idea sharing despite the physical barriers. Jordan shared how using various digital tools helped students communicate during collaborative tasks like a chalk talk, which is a brainstorming activity. Before the pandemic, this same activity was accomplished using shared white boards or using post-it notes and paper. Instead, during this time teachers began using Padlet an online bulletin board where students can brainstorm ideas, share back and forth, and comment digitally in live time. Jordan's discovery highlighted how in-person collaborative tasks could be translated into the digital realm. However, Jordan noted that not all digital tools were effective or designed initially to have large groups of users synchronously working on them. Despite the challenges, and trial and error, teachers found technology helped them recreate classroom community spaces online to support collaboration among their students, whether they were in-person or learning remotely.

Jody took a similar approach, creating learning groups through WebEx. This software connected in-person students with their peers learning remotely. Group discussions no longer required students to raise their voices over physical barriers. Quinn did something similar by creating learning communities where students would position the laptop computer in a way that allowed them to see the person at the board. This arrangement enabled the student online to hear the discussions within the group while also being able to see the board and participant in the discussion. Following the scribe protocol, the group's collective output would be written on the board, with the designated person transcribing the group's instructions. By having one or two

students present on the screen, they could actively engage and be a valuable part of the group, observing the ongoing activities and contributing accordingly.

Pat described having to teach students how to individually navigate the smallest details like entering email addresses. Participants found it challenging to teach young students how to use features such as the "shift-2" key for typing in email addresses. They also had to teach students how to be effective online learners, including using features like "raise your hand" button, unmute to speak, and submitting work in the learning management systems like Seesaw, Google Classroom, or Canvas. Pat used Seesaw, a platform familiar to the students, to recreate formative and summative math assessments. While the initial transition to these digital tools posed some difficulties, these challenges became opportunities to innovate and improve accessibility to learning. For example, creative lesson delivery, individualized instruction, collaboration with diverse groups using break-out rooms, and students' advancement in technological understanding. Further, shy and quiet students may have found online and remote learning more comfortable as virtual classrooms allowed for alternative ways of participation. Shy or quiet students could actively engage in discussions through text-based chats, forums, or messaging tools. This period of adaptation helped teachers understand what strategies worked well and how to navigate potential obstacles.

Despite safety precautions requiring physical distancing and non-sharing of supplies, teachers found ways to foster collaborative learning in the classroom. Teachers established routines for group work and provided clear guidelines for how students could work together in this new normal. Teachers monitored physical proximity so that the students maintained a safe distance from each other and did not touch the same pen, whiteboard, or iPads, but were able to work together by sharing their ideas and looking at each other's work.

Quinn recalled, “I remember being annoying about six feet, when they huddled around boards, and I’d be like, okay, six feet, six feet.” This quote highlights one of the challenges that teachers faced during the COVID-19 pandemic, which was maintaining social distancing protocols while still facilitating group work and collaboration among students. Quinn's comment about being "annoying" suggests that enforcing the six-foot distance rule was not always easy, but necessary to ensure the safety of students and staff. The quote also implies that teachers had to develop solutions to overcome these challenges, such as finding alternative ways for students to collaborate that did not require them to huddle around a shared space. Casey expressed a similar desire to balance safety guidelines with allowing students to resume school "as normal" once they were back in person. Casey kept things simple by having students use their own individual supplies and avoiding shared materials. It allowed for a safer classroom environment while still maintaining a sense of familiarity for students during their return to in-person instruction.

Jordan described establishing a routine for collaborative work in the classroom. Students knew that they would be participating in group work as soon as they entered the classroom. The predictability of the routine was crucial, as it ensured that students knew what to expect. They were randomly assigned to groups, which provided them with the opportunity to work with a diverse range of classmates without labels or barriers to forming groups. According to Alex, her approach to collaboration involved giving students a choice in their partners and encouraging collaboration among many students.

During the COVID-19 pandemic, teachers at Ocean View Academy found ways to foster collaborative learning both in-person and online, despite the challenges created by increased safety precautions and physical barriers. By providing clear guidelines, establishing routines, and

leveraging online tools, teachers were able to facilitate group work among students, continue moving forward in the curriculum, and provide much-needed opportunities for students to develop important social and emotional skills. The next section explores the ways in which technology was utilized by teachers at the school to further enhance their teaching and student learning during the pandemic.

### ***Technology Integration***

Technology had a crucial role in providing access and opportunity during the pandemic. Participants at Oceanview Academy reported that technology was fundamental in connecting discussions between in-person and at-home learners during the pandemic. To protect the anonymity of participants, the term "Learning Management System" or LMS will be used interchangeably to refer to Seesaw, Google Classroom, or Canvas. Overall, these platforms enabled teachers to organize their materials and provide meaningful feedback to their students, whether they were learning from home or at school.

In the fall of 2020, Oceanview Academy offered hybrid learning options for students, which gave families the choice to keep their child at home to learn online, or to send them to the campus for face-to-face instruction. As noted by many teachers in the study, teleconferencing applications like WebEx allowed teachers to lead lessons with groups at remotely at home and on-site at school.

The teachers who participated in this study generally had positive experiences using technology in teaching and learning. This section highlights how they used various digital tools and platforms, such as computer-assisted instructional programs, learning management systems, and online curriculum resources, to support both remote and in-person learning during the pandemic.

Teachers at Ocean View Academy employed a variety of digital platforms such as Seesaw, Google Classroom, and Canvas, acting as learning management systems from grades three through eight. These platforms facilitated a wide range of academic tasks, including creating assignments, curating student portfolios, and providing both formative and summative feedback. The use of these digital tools was grade-dependent; Seesaw found predominant usage in grades three to five, whereas Canvas was utilized for grades six to eight. Google Classroom and its associated tools, namely Docs, Slides, and Sheets, were embraced across all grades.

The Desmos online graphing calculator was particularly instrumental, as reported by Quinn. Participants highlighted its dual functionality, aiding effective teaching both in-person and online. The versatility of Desmos facilitated real-time monitoring of student progress, identification of learning hurdles, and the formation of small group discussions. Importantly, Desmos enabled Quinn to simultaneously conduct sessions with both in-person and remote students, thus harmonizing the two teaching modes. Moreover, Desmos promoted a sense of community within the classroom by fostering collaboration and facilitating the sharing of work among students. Consequently, it was a key tool in Quinn's toolbox to easily unify the online and in-person teaching realms, ensuring comprehensive student support and access to necessary resources. Participants in the study noted that Google Slides was an effective tool for delivering daily lessons to students, both at home and in-person. The suite served as a crucial resource for designing and managing lessons, further demonstrating the integral role of these digital platforms in contemporary educational practices.

### ***Feedback***

Feedback was a crucial aspect of the learning process, and participants found that learning management systems were helpful for providing students with ongoing and support.

Taylor noted how the use of an LMS improved feedback for students. Prior to the pandemic, students would present their workbooks during transitions, leaving little time for thorough review. However, with the shift to remote learning, students began submitting their work online, giving Taylor more time and opportunity to review their work and provide personalized feedback. Although time was still a consideration, Taylor was able to provide feedback on common mistakes and areas for improvement on future assignments or tests. By previewing pictures of student work online, Taylor was able to approach grading and feedback more thoughtfully and deliberately since the start of the pandemic.

According to Pat, who also continued to use an LMS after students returned to in-person learning, students were asked to take pictures of their work and upload them to the LMS for feedback. This method not only allowed parents to view their child's math work, but also provided a mostly germ-free way of giving feedback during a time when teachers and students were trying to avoid direct contact with each other's supplies. By using the LMS to post student work, Pat described being able to provide timely feedback without having to handle physical books, which could potentially spread germs during the seeming height of an international health pandemic. The teachers in this study had mostly positive experiences using technology in teaching and learning.

Just like digital platforms gave students access to their learning materials, assignments, and wayfinding, it also provided teachers with the same access which helped teachers provide meaningful feedback to their students. For example, Pat shared that because students had to upload a picture of their work to Seesaw, or that the practice work was now consolidated in one central area, teachers could provide quick feedback from home or while in transit. Taylor emphasized this benefit as well in expressing as a middle school teacher there is no way to take

home 100 math journals each day, so the ability to provide meaningful feedback in class often felt rushed. However, due to the pandemic the using a LMS like Canvas, Taylor could see student work and spend more time providing formative feedback on daily practice. Likewise, teachers reported that checking on work completion was a helpful way to plan for the next day's lesson. Further, teachers shared the ease in providing quicker, more personalized feedback by using voice recordings or screen recording software like Loom to send personalized videos or messages to students on their work. The ability for teachers to respond to student work in such an efficient way allowed them to quickly pivot and provide personalized next steps directly on the LMS.

Many participants expressed one drawback to this 24-hour access to student work and digital classroom environment; the lack of a "pause button." Taylor noted that with significant online context, caused increased pressure to maintain pace with giving feedback. Other teachers expressed the same sort of "burnout" with Seesaw, Canvas, and Google Classroom. Leaving feedback was easier but having everything online left teachers feeling at times obligated to comment on each post, were previously before the pandemic, student work was contained in workbooks, math journals, or handouts in the classroom. Plus, parents having access to their child's Seesaw or online work added an additional layer of pressure to respond quickly and leave feedback on all assignments.

### ***Challenges in Implementing Equity***

The analysis of the interview data provided by the eight teachers from Oceanview Academy revealed several challenges that teachers faced in implementing equitable math teaching practices during the COVID-19 pandemic. Several participants mentioned challenges related to limited time and resources. The demands of teaching a complex curriculum online and

in a hybrid setting made it difficult to fully address individual student needs and provide adequate support. Plus, resourcing materials, technology, and support for both struggling and advanced learners was a challenge for participants. Participants expressed the challenge of addressing the diverse needs of students within the classroom. This included accommodating different learning styles, supporting students with varying levels of prior knowledge, and addressing learning differences. On top of this, engaging, and motivating students emerged as a common challenge, particularly in the context of remote or hybrid learning environments. Participants expressed the need to address varying levels of student engagement and motivation, particularly when faced with potential barriers such as math anxiety or a lack of connection to the subject matter. The nature of the challenges and the need to address the challenges as best as possible suggest that for some, math equity was less of a priority, particularly during times of transition.

### **Summary of Findings**

In this study, the eight teacher participants' conceptualizations of equitable math practices centered around addressing individual needs, ensuring equal access and opportunities, creating inclusive learning environments, and cultivating a growth mindset, for all students. They emphasized the importance of differentiated instruction, small-group work, and individualized support to meet the diverse needs of students. They expressed desires to cultivate a growth mindset, foster perseverance, and build student confidence in mathematics.

The teachers pointed out several strategies they utilized during the pandemic to align with these equity principles. However, implementing all these strategies was not without challenges, largely due to the constraints posed by the pandemic. The time required for tasks such as giving feedback, creating video lessons, and developing both online and in-person content was

considerable. Moreover, setting up and maintaining a collaborative community, meeting with students individually, and finding resources to both support and extend learners in this new educational model presented additional difficulties. Despite the challenges, these educators strived to provide equitable learning experiences for all their students and under the most challenging circumstances found creative ways to reinvent the classroom in online, hybrid, and in-person learning amid a global pandemic. A key takeaway from this research is the central role of teachers in fostering and implementing equity within their classrooms, a topic that will be discussed in Chapter 5.

## CHAPTER 5: DISCUSSION, IMPLICATIONS, AND CONCLUSION

In this chapter, I will answer the two research questions, discuss their implications, reflect on my learning process, explore potential avenues for future research, and conclude with key insights from the study. The findings are organized in terms of the research questions. To answer the first question, I analyzed the four-themes: individualism, access and opportunity, inclusive learning communities, and growth mindset in relation to the concept of equity using Gutierrez's four-domains: access, achievement, identity, and power as a framework. To address the second research question, I conducted an analysis on the day-to-day instructional approaches reported by the research participants and how these practices aligned with the same four-domains of equity. Instructional practices refer to the various ways in which the participants delivered instruction and facilitated learning in the mathematics classroom or online setting. These instructional approaches include strategies, adaptations, challenges, and opportunities that teachers encountered in their efforts to promote equity in math education under these unprecedented circumstances.

### **Research Question 1: How did upper elementary and middle school teachers at Oceanview Academy conceptualize equitable math teaching practices?**

The analysis of qualitative interviews conducted with eight upper elementary and middle school teachers at Oceanview Academy revealed four key themes in relation to how their conception of math equity. These themes as presented in Chapter 4 were: individualization, access and opportunities, inclusive learning environments, and growth mindset. This discussion is designed to establish the connections between the teachers' conceptualization of math equity at Oceanview Academy, and the framework outlined in the literature by Gutierrez surrounding

access, achievement, identity, and power, contributing to a deeper understanding of the field of equity in mathematics.

***Analysis: Theme of Individualization***

An important theme that emerged from the data analysis highlighted individualization, which refers to a teachers' efforts to tailor instruction to meet specific needs of each student. Participants recognized that learners have different strengths, challenges, and ways of gaining knowledge so in order for everyone to participate the teacher should provide a personalized and equitable math learning experience. They recognized the need for instructional approaches that could align with the current curriculum and adapt and respond to the diverse learning needs and paces of their students. Participants highlighted the intention to cater to each student's individual pace of learning and cultivate a learning environment conducive to individual progress. As they described, individualized learning seeks to fulfill the varied educational requirements of students. Nevertheless, it's customized support. It is important to note that this concept of individualization is one of three instructional strategies that aims for equitable student support in classrooms. Differentiation and personalized learning are two other approaches that echo a belief that optimal learning occurs when instruction is specifically designed to students' unique needs (Bray & McCaskey, 2018; Tomlinson, 2014).

All three strategies have a similar goal but differ in their organization and implementation (Bray & McCaskey, 2018; Tomlinson, 2001). Individualized learning typically refers to instruction that is paced to the learning needs of different learners. In these scenarios, learning objectives, instructional approaches, and instructional content may all vary based on learner needs. In other words, individualized learning implies instruction is paced to the learner's speed of learning.

Differentiated instruction is a blend of group and individual instruction that accommodates diverse learning needs within a single classroom. It modifies content, process, product, and a learning environment based on students' abilities, learning styles, and preferences. The teacher proactively plans differentiation to address a variety of learning needs—as opposed to adjusting a lesson plan when it becomes clear that it's not working for some students (Tomlinson, 2001). This method provides varied resources, instructional strategies, and expression modes for learning, while also optimizing the learning environment. It encourages a flexible, continually assessed, and adjusted teaching approach. In this study, many teachers described instructional practices relating to differentiation.

Personalized learning, on the other hand, involves tailoring the learning experience to the preferences and interests of different learners, as well as providing remediation and enrichment as needed to meet individual learning goals (Bray & McClaskey, 2013). In personalized learning situations, learning objectives, instructional approaches, and instructional content may also vary. The learning process is driven by the learner, and the learner also has a choice in what to learn and how to learn it (Bray & McClaskey, 2013, 2019; McClaskey, 2020).

The concept of individualization goes beyond merely offering different tasks to each student or customizing learning materials. It is about truly understanding a student's strengths, interests, and areas for improvement, and then tailoring the learning experiences to meet these unique aspects (Bray & McClaskey, 2013). Boaler (2019) further emphasized that although it is crucial to tailor education to meet each student at their level and support their growth, teachers must also ensure that all students can access standard grade-level content. This access may afford opportunities for students to develop critical mathematical skills in tandem with their peers.

During the research, participants elaborated on how they applied this theory in their classrooms. They personalized their instruction by offering tailored support or extension tasks based on their students' distinct needs. These needs were determined through formative assessments and observational understanding of students' performance during lessons. Further, participants detailed how they balanced the readiness of individual students with whole group instruction. For example, Jaime incorporated both into the daily math routine. There was a designated time for self-paced 5th-grade math lessons and a segment to use IXL for individual learning needs. This arrangement facilitated students' learning at their own pace while staying within the standard curriculum. Conversely, Jordan, Alex, Taylor, and Casey pursued a different approach. They taught the same lesson to all students simultaneously, subsequently providing tailored activities based on the unique needs of individual students.

The participants emphasized that meeting the needs of all their students was an important consideration in equitable learning, however the findings suggest that although the teachers expressed equity meaning individualized attention, the approaches and strategies differed between grades and teachers. This variation may suggest that while the concept of individualized learning is widely agreed upon, its implementation might differ depending on context and individual teaching styles. For example, individualization for some teachers was allowing students extra time to complete their work, while others it was decreasing problems or providing extra work to complete outside of the main lesson in class. Other classrooms provided individualization by meeting with students in groups or some did so one-on-one with a teacher. During the pandemic, the participants described working in break out groups with small groups of students.

### *Analysis: Theme of Access and Opportunity*

The theme of access and opportunity highlights the teachers' belief and acknowledgment that equity means all students have opportunities to engage in quality math learning with recognition and support of their needs. The participants emphasized it was key that all students have access to appropriate resources, instructional support, and sufficient time to meet the high expectations of the curriculum. This connects to my definition of equitable math practices which is similar and posits that equitable math practices are instructional approaches designed so that every student can access the curriculum, receive quality learning, personalized support, and sufficient time to meet the high expectations of the curriculum. These instructional approaches are rooted in the belief that all students possess the capacity for advanced mathematical thinking, emphasizing the importance of inclusivity and providing support to nurture students' mathematical potential. Both definitions converge on the shared objective that for equity to exist in math, teachers are critical orchestrators of an equitable learning environment where students are given access and time to process and master their learning. Further, it is not just that teachers provide access, support, and individualized materials, but also that they believe all their students have the capacity to do the work, engage in the discussions, and fully participate in the math learning.

The data from the interviews revealed that teachers at Oceanview Academy leveraged online platforms and digital resources to provide equitable access to instruction and learning materials during the COVID-19 pandemic. The participants found that access to cooperative learning, which enhanced mutual understanding of mathematical concepts, was an important component of equity because it allowed students to learn from one another and develop a deeper understanding of mathematical concepts through discussion and collaboration. Gutiérrez (2002,

2012) asserted that access means not only having tangible resources like qualified teachers, technology, and classroom supplies, but also encompasses a rigorous curriculum and a classroom environment that fosters participation. In addition, participants emphasized that working in groups provided opportunities for students to foster their social-emotional growth. Their conceptualization of access and opportunity being an important component of math equity aligned with my definition as mentioned earlier, but also with the literature, which emphasized the importance of removing barriers to learning and providing equitable opportunities for all students (Cintron et al., 2021). This finding may suggest that equitable practices involve creating a flexible curriculum that accommodates the diverse learning needs and life situations of students. This approach supports the idea that technology and digital materials can play a crucial role in facilitating personalized learning experiences, where students can advance at a pace that suits them best. This finding may imply that the teachers at Oceanview embraced the use of technology to enhance access and opportunity to learn.

However, limitations were also acknowledged, such as disparities in technology access and the need for additional support to address advanced learners' needs. During the remote learning phase of the COVID-19 pandemic, barriers to learning came in various forms: students not having access to teacher, lesson materials, or peer support. In this case study, teachers shared this was often the result of inconsistent connectivity, unstructured learning environments, and shared learning spaces with many family members while learning math at home. When returning to campus, students' barriers to learning to being absent from school for up to 10 days due to safety protocols around COVID-19 exposure or choosing to do hybrid learning from home. Further, for those students on campus for face-to-face learning, the opportunities to collaborate and working in groups were limited due to CDC safety protocols for schools that required six

foot spacing, masking, and face shields. Participants expressed that removing barriers during the pandemic meant teachers had to use tools such as learning management systems to post work in one place, allow for differentiated learning paths, and reimagine instructional approaches that made curriculum more open and flexible to handle these challenges. On top of that, teachers had to orchestrate and plan for learner collaboration either online in breakout groups or in-person behind masks and face shields using technology to support the activities.

Although Oceanview provided each student with a technology tool in the form of an iPad or MacBook, along with access to mobile hotspots for those without consistent internet, for some students, access to a distraction-free learning space or the ability to remain online for synchronous learning was not always possible. Furthermore, some students adopted the role of caregiver while their parents worked, and younger siblings were home. As pandemic-weary families were eager to return to school, not all systems were aligned. When Oceanview Academy was able to open their campus earlier than the Hawai'i Department of Education (HIDOE) schools, some families with children in both systems opted for hybrid learning so that the older child could stay home with the younger ones. These all were barriers to access teachers had to grapple with during the pandemic.

The findings may suggest that during this period, the primary focus for Oceanview Academy was on addressing the challenges posed by the pandemic, rather than prioritizing math equity. Efforts were primarily directed towards student instruction, engagement, and adapting to the new learning environment. While Oceanview Academy provided technology tools and resources to students, various factors such as limited access to suitable learning spaces, caregiver responsibilities, and the need for hybrid learning arrangements presented obstacles to achieving

equitable math instruction. The immediate demands and adaptations necessitated by the pandemic influenced the level of emphasis placed on math equity during this time.

***Analysis: Theme of Inclusive Learning Environment***

Creating an inclusive learning environment was another central theme in how participants conceptualized equitable math. The participants emphasized the importance of fostering a classroom climate where all students felt valued, respected, and comfortable to engage in mathematical learning. The teachers reported implementing various strategies to promote student engagement and participation, encouraging collaboration and peer interaction, and incorporating culturally relevant examples and materials. Another strategy highlighted by the participants was the need to strategically plan for varied learner entry points to stimulate student engagement, collaboration, and student belonging. They acknowledged the diverse learning styles and abilities of their students and aimed to design learning engagements that allowed all students to meaningfully participate with the mathematical content. One example from the findings was several teachers described creating random heterogeneous groups and established routines and protocols for working where all students added ideas to the problem solving, not just those who are historically deemed as “good at math.” This approach aimed to create a more inclusive learning environment where every student could actively participate and contribute. This aligns strongly with literature around Thinking Classrooms that promote equitable practices in mathematics education (Liljedahl, 2020). This approach is an instructional method designed to promote deep thinking and problem-solving skills among students. The structure primarily revolves around three key elements: visibly random groups, vertical non-permanent surfaces, and rich open-ended tasks. Students are assigned to random groups to foster a wide range of perspectives, and work on vertical surfaces like whiteboards to make thinking visible. The tasks

given are open-ended, allowing for multiple entry points and solutions, which encourages students to engage in deep thinking and dialogue within their groups. Quinn, Jaime, and Jordan described using this instructional approach for their problem-solving protocols. By emphasizing collaboration, student-centered learning, and fostering mathematical thinking skills, this approach aims to provide equitable opportunities for all students to engage in meaningful learning experiences. The participants' emphasis on encouraging collaboration and peer interaction as part of their instructional practices may have enhanced access to learning opportunities. Moreover, by promoting collaboration, students have the opportunity to engage in meaningful discussions, exchange ideas, and learn from each other.

A comparison with existing literature suggests some alignment between the practices reported by teachers in the study and recommendations for creating inclusive learning environments. The National Council of Teachers of Mathematics (NCTM, 2014) emphasized the importance of establishing classroom norms that promote student engagement, value multiple contributions, and create a supportive and inclusive learning climate. The teachers' focus on collaboration, student voice, and a positive classroom culture supports these principles. However, it is important to recognize that creating inclusive learning environments is an ongoing process that requires continuous reflection and adaptation. There is also a deeper commitment involved with creating inclusive teaching environments through culturally responsive practices that create a culture that invites and includes the cultural differences between learners into one social-emotional learning dynamic. According to Gay (2010) to be a culturally responsive educator required mindful and critical self-reflection of their own biases and assumptions, engagement in personal learning that enhances their cultural competence, and actively seeking resources and perspectives that challenge the status quo. This commitment to self-reflection and

growth is so important for creating truly inclusive learning environments that address the needs and experiences of all students.

***Analysis: Theme of Growth Mindset***

The theme of growth mindset emerged as a prominent finding from the data analysis. The participating teachers recognized the significance of cultivating a growth mindset in their students' mathematical learning. Several participants expressed their desire to support students in cultivating a positive mindset and identity towards mathematics by offering them chances to face challenges, make mistakes, and experience the rewards of perseverance. Taylor specifically shared that observing the fruits of students' hard work stood out as a fulfilling aspect of teaching mathematics. Taylor found satisfaction in seeing students invest time and effort into their studies, completing quality assignments and practice problems. And, mentioned it is disheartening when students fail to recognize the value of hard work or exhibit a lack of effort, especially when hard work does not immediately yield results. Taylor believed in fostering a growth mindset and aimed to change students' negative perceptions of math, emphasizing that there was ample time for them to develop a positive attitude towards the subject. This perspective aligns with the work of Dweck, who advocated for the development of a growth mindset that emphasizes effort, persistence, and the belief that abilities can be developed (Boaler & Dweck, 2015; Dweck, 2006). Taylor, Alex, and Jaime shared a unified approach such as encouraging student explanations and reasoning and building student confidence through positive reinforcement, reflected their conceptualization of growth mindset. Boaler (2019) recommended investing time in changing students' mindsets and perceptions about themselves, as it can have significant long-term benefits. By creating a classroom culture that values mistakes as learning opportunities and

emphasizes the role of effort in achieving success, the teachers encouraged students to embrace challenges and develop a belief in their own ability to grow and improve in mathematics.

A comparison with existing literature confirms alignment between the teachers' conceptualization of equity and the recommendations for fostering a growth mindset. The National Council of Teachers of Mathematics (NCTM, 2000) stated the importance of nurturing a positive disposition towards mathematics and creating opportunities for students to engage in problem-solving, reasoning, and sense-making. The teachers' focus on praising effort, promoting reflection, and valuing students' strategies supports these principles.

The theme of growth mindset in the participating teachers' conceptualization of equitable math practices underscored their commitment to nurturing students' belief in their own potential to learn and grow in mathematics. By fostering resilience, promoting a positive attitude towards challenges, and celebrating students' efforts and progress, the teachers were contributing to the development of a growth mindset among their students. Plus, it is important to recognize that developing a growth mindset is an ongoing process that requires intentional and explicit instruction. This suggests that teachers provided students with explicit feedback that highlighted their growth and progress, modeled a growth mindset themselves, and helped students develop strategies for overcoming challenges and setbacks. It was important to create a safe and supportive classroom environment where students felt comfortable taking risks and asking questions.

**Research Question 2: How did upper elementary and middle school teachers implement their conceptions of equity in their day-to-day instructional activities, particularly amid the ongoing COVID-19 pandemic?**

The second research question explored how teachers implemented their conceptions of equity in their day-to-day instructional practices during the COVID-19 pandemic. Several key findings emerged which provided insights into the strategies, adaptations, challenges, and opportunities that teachers encountered in their efforts to implement equitable math practices. The findings suggest that teachers implemented instructional strategies in creative and innovative ways that were designed to support their students during this challenging time.

***Technology Integration***

Integration of technology emerged as a common strategy among the participants. Teachers recognized the potential of technology to facilitate remote learning and provide equitable access to math instruction. They utilized various digital tools, online platforms, and virtual resources to engage students, deliver instruction, and facilitate communication. The integration of technology allowed for personalized learning experiences, interactive activities, and collaborative opportunities, which helped to bridge the gap between in-person and remote learning.

Similarly, in the middle grades, Quinn demonstrated a deep commitment to meeting students' learning needs by regularly conducting formative assessments to gauge student understanding and provide timely feedback. Each day they also implemented flexible grouping strategies, allowing students to collaborate in small groups based on their learning preferences and needs. In the lower grades, Pat exemplified care by creating a safe and inclusive classroom environment, actively addressing students' social-emotional well-being, and providing

individualized support during remote learning through regular check-ins and personalized learning plans. These examples highlighted the teachers' efforts to personalize instruction, foster a sense of belonging, and support students' academic growth. These practices align with the literature on culturally responsive teaching, differentiation, and student-centered learning, emphasizing the importance of recognizing and addressing students' diverse needs and creating inclusive learning environments (Bray & McClaskey, 2018; Cohen & Lotan, 2014; Gay, 2010; Hattie & Clarke, 2018; Liljedahl, 2020; Zager, 2017)

Differentiated instruction was another prominent strategy employed by teachers to address the diverse needs of students in a remote or hybrid learning environment. They recognized the importance of individualized support, tailored assignments, and flexible pacing to meet the varied learning needs of their students. By providing differentiated instruction, teachers aimed to ensure that each student had equitable opportunities to succeed and grow in their mathematical abilities. Although the teachers described equitable math practices as an environment that supports the individual student their approaches and strategies differed between grades and teachers. This variation may suggest that while the concept of individualized learning is widely agreed upon, its implementation might differ depending on context and individual teaching styles. The variance may also be related to philosophical differences that naturally exist between teachers at a school like Oceanview where teachers have more autonomy and control over their instructional approaches. It further suggests that teachers at Oceanview believe their role is to plan for and provide individualized learning options for their students.

The teaching approaches mentioned by participants align with the insights from researchers who emphasize the importance of individualized and context-sensitive teaching. This diversity in implementation, which is supported by NCTM may showcase the teachers'

dedication to meeting their students' unique needs within the constraints of their individual classrooms (Boaler, 2016, 2019; Bray & McClaskey, 2018; Hattie & Clarke, 2018; Liljedahl, 2020; NCTM, 2014; Tomlinson, 2001).

### ***Collaboration***

Teachers emphasized collaboration and engagement as crucial elements in promoting equity in math classrooms. Alex implemented a unique approach to collaboration by giving students the freedom to choose their partners, encouraging collaboration among a diverse group of students rather than assigning leveled math partners. This student choice in collaboration empowered students with a sense of agency in their learning, which Alex believed would significantly enhance their engagement and motivation. Furthermore, this strategy also fostered an inclusive learning environment, reducing self-consciousness as students naturally gravitated towards partnering with compatible peers (Zager, 2017). By prioritizing collaboration and student choice, Alex aimed to create an equitable and supportive math classroom environment. Teachers fostered collaboration among students through virtual discussions, group projects, and interactive activities. They sought to create inclusive and engaging math learning experiences that encouraged active participation and meaningful interactions among students. By fostering a sense of belonging and encouraging collaboration, teachers aimed to create an equitable learning environment where all students felt valued and supported.

The participants also faced several challenges in implementing equitable math practices during the pandemic. Limited access to technology and internet connectivity, especially for students from disadvantaged backgrounds, posed significant barriers to equitable participation. Teachers acknowledged the need to address these disparities and sought alternative ways to provide learning materials and support. They also encountered challenges in maintaining student

engagement and motivation in remote and hybrid learning settings, as the absence of face-to-face interactions and the overall impact of the pandemic on students' well-being posed additional hurdles.

Overall, the findings highlighted the complex and multifaceted nature of implementing equitable math practices during the COVID-19 pandemic. The integration of technology, differentiated instruction, and fostering collaboration and engagement were common strategies employed by teachers to promote equity. However, the challenges of limited access to technology, internet connectivity, and maintaining student engagement underscore the ongoing need for support, resources, and professional development to ensure equitable math instruction in challenging circumstances.

Throughout the study, one consistent aspect that stood out was the teachers' deep care for their students and their commitment to meeting their learning needs, particularly during the pandemic when everything was rapidly changing. In the lower grades, for example, Jamie demonstrated this care by regularly checking in with individual students during virtual learning sessions, providing personalized feedback, and offering additional support through one-on-one virtual conferences. Taylor, in the upper grades, showed a similar level of care by creating opportunities for students to share their thoughts and concerns in class meetings, actively listening to their perspectives, and implementing flexible assignment deadlines to accommodate students' unique circumstances. These examples described the teachers' proactive efforts to establish and maintain strong connections with their students and support their well-being and academic progress. Such caring actions align with the literature on student-centered and relationship-driven approaches, emphasizing the importance that building positive teacher-

student relationships may promote engagement, motivation, and achievement (Boaler, 2016, 2019; Hattie & Clarke, 2018; Zager 2017).

Teachers' implementation of equitable math practices during the pandemic may have been connected to their conceptualizations of equity. This finding informs us that participants at Oceanview Academy made attempts to implement their conceptions of equitable math practices by integrating technology, using differentiated instruction, providing opportunities to collaborate, and using formative assessment and feedback. However, the implementation of these strategies faced certain challenges, making it difficult to consistently practice these methods.

Teachers struggled with implementing equitable math teaching practices due to the constraints of online and hybrid learning settings. It was hard to notice student learning like in a face-to-face setting. The challenge of meeting diverse learning needs, accommodating various learning styles, and engaging students were common among the teachers. Furthermore, the challenges teachers faced in maintaining student engagement and implementing equitable teaching practices reflect the complexity of the teaching and learning process, as underscored by Hattie's (2017) concept of "visible learning." This theory emphasizes the teacher's role in being aware of the students' understanding and learning process, which can be particularly challenging in remote or hybrid learning settings. Despite these challenges, the resilience and adaptability demonstrated by teachers at Oceanview academy during the pandemic serve to provide helpful insights for future instructional strategies in diverse learning environments.

### **Literature Alignment with Research Findings: Gutiérrez's Framework**

Gutiérrez suggests equity as a balance between four dimensions: access, achievement, identity, and power. Using this framework, I analyzed how teachers conceptualized equitable math practices within Gutierrez's framework.

### *Access*

Gutiérrez (2009) described this dimension as having access to high-quality content, resources, and teaching. The teachers' focus on providing different types and levels of support to cater to individual students' unique learning needs aligns well with this dimension. The use of low floor, high ceiling instructional approaches and open-middle math problems can be seen as an effort to provide access to quality learning experiences for all students. This dimension is well represented by the teachers' belief in removing barriers to students' full participation in learning and their emphasis on equal access to resources such as the teacher, technology, lesson materials, and tools. The use of Number Talks to facilitate understanding through open-ended discussions also promotes access to high-quality math discourse and learning. Teachers in the study used structures to facilitate students' access to math learning, such as establishing predictable routines and using cooperative learning strategies. Jaime's suggestion of multiple avenues for teacher access, including video lessons, one-on-one conferences, and formative assessments, also works towards ensuring accessibility.

Teachers unanimously emphasized the importance of access to resources and opportunities to learn as a key aspect of equity. They recognized the need for differentiated instruction, providing additional support for struggling students, and extension opportunities for advanced learners. They acknowledged the importance of technology integration and ensuring equal access to the teacher, materials, and collaborative learning opportunities. Their conceptualization of access was comprehensive and closely aligned with Gutiérrez's dimension.

### *Achievement*

This dimension refers to the development of students' skills and understanding in mathematics (Gutiérrez, 2009). Participants' perspectives that each student should grow at least

one year beyond where they started, along with the use of formative assessment strategies to understand each student's capabilities, align with this dimension. The idea of excellence setting the bar and equity acting as a support system aligns with the achievement dimension. The participants' belief that all students should have the chance to excel in mathematics is echoed here. Furthermore, allowing students to work at their own pace supports achievement in that it permits each student to reach their full potential. The teachers emphasized inclusive and collaborative learning environments that allowed every student an opportunity to succeed. They noted that different students might have different paths to success, indicating a recognition that achievement is multifaceted and can look different for each individual. However, the discussion on achievement seemed to be more focused on academic performance and less on holistic student development within the interview responses. Gutiérrez's framework suggested an understanding of achievement that not only involves academic success but also students' ability to participate in society as empowered individuals. This broader view of achievement may have been underemphasized in the teachers' narratives.

### ***Identity***

Gutiérrez (2009) described this concept as students developing a positive identity with mathematics. Participants' emphasis on knowing their students well, creating an environment that supports their unique pace of learning, and helping students to conceptually understand math concepts, all contribute to this dimension. Encouraging a growth mindset helps to positively shape students' math identities. As students persist through challenges and grow their confidence, they start to perceive themselves as successful mathematicians, as Jordan highlighted. The participants' emphasis on supporting diverse learning styles and abilities, providing opportunities for student choice, and offering personalized pacing, all contribute to the development of a

positive math identity. The belief that every student should be engaged, motivated, and adequately supported also aligns with this dimension. The practices mentioned, like cooperative learning and allowing for creativity in problem-solving, may enhance students' sense of belonging and confidence in their abilities as mathematicians.

Teachers highlighted the significance of fostering a positive math identity among students. Practices like creating an inclusive learning environment, promoting participation, and cultivating a growth mindset contribute to positive identity formation. Participants noted equitable strategies existed beyond instructional practices through community building, strategies to elevating voices of quieter students, and teaching students to empathetically explain different perspectives and problem-solving strategies. Gutierrez (2009) asserted that the formation of a math identity involves not only a positive attitude towards mathematics, but also students seeing themselves as competent, capable mathematicians.

### *Power*

This dimension refers to students' ability to influence their learning environment and the broader world using mathematical skills and knowledge (Gutiérrez, 2009). The power dimension was echoed in Quinn's belief in less teacher-led instruction to give students more control over their learning. Acknowledging the "open middle" concept and supporting diverse problem-solving methods can also empower students by validating their individual thinking and strategies.

While some of the teaching practices described do empower students by giving them multiple entry points to engage with math problems, there is not a clear emphasis on students using their mathematical knowledge to influence their environment. The ability for students to download materials or watch video lessons from any location and at any time potentially

empowers students by giving them greater control over their learning. However, the power dimension could benefit from more explicit consideration in the teachers' practices. There was limited explicit discussion about addressing the socio-political aspects of power, such as challenging societal norms or teacher biases that could influence the educational process. Further attention to the wider socio-political context could provide a more comprehensive understanding of power dynamics in the math classroom.

Overall, teachers' conceptualizations of equitable math practices aligned with Gutiérrez's dimensions of equity. Teachers described practices that aligned with the four dimensions of Gutiérrez's (2009) framework of access, achievement, identity, and power within their classrooms, and they had implemented practices to promote equity in each of these dimensions. However, their emphasis and depth of understanding varied across these dimensions, revealing some gaps in their conceptualizations. While the teachers' conceptualizations of equitable math practices were generally aligned with Gutiérrez's dimensions of equity, a more balanced and comprehensive emphasis across all dimensions may strengthen their practices. Further attention to holistic student development in achievement, fostering mathematical confidence for identity formation, and addressing socio-political aspects to truly empower students in the context of power dynamics.

### **Implications for School Leadership**

The findings from this research may provide an opportunity for school leadership to collaborate towards creating a shared understanding of equity among all stakeholders, including teachers, staff, students, and parents. This may involve working groups or grade level teams establishing clarity on what equity means within the specific context of the school and how it might guide decision-making and actions. By fostering a common understanding of equity,

school leaders may begin to promote a cohesive and collaborative approach to advancing equitable math practices throughout the institution. This finding may provide an opportunity to open and expand conversations around equity that specifically addresses issues of systemic inequity and cultural responsiveness. Possible opportunities include training to recognize and address our own implicit biases and holding discussions around culturally responsive practices and the impact of current inequalities in math may positively affect students' experiences at Oceanview Academy.

### **Implications for Math Teachers**

The findings of this study suggest implications for math teachers in promoting equitable math practices. Developing a shared understanding of equity through professional discussions and collaborative learning opportunities is important. Math teams have the opportunity to work together 3-4 times per month to discuss curriculum scope and sequence. During these collaborative sessions, team members may have the opportunity to engage in open dialogues and establish shared norms around math equity theory and practice. By actively participating in these discussions, team members may foster a deeper understanding of the principles and practices necessary to promote equitable mathematics instruction. This collaborative approach may allow for the exploration of diverse perspectives, sharing of experiences, and collective problem-solving.

Furthermore, teachers within these teams may have opportunities to share their successful instructional strategies and learn from one another. Creating a culture of collaboration and continuous improvement supports the implementation of effective equitable math practices. This ongoing collaboration may help to align team members' beliefs, strategies, and instructional practices, ultimately fostering a cohesive and equitable approach to teaching mathematics.

## **What I Learned from this Study**

Before embarking on this study, my understanding of equitable math practices centered around a core belief: providing each student with what they needed to succeed. As I deepened my understanding through research and peer interaction, I started to see that equity in math education was a complex, spiraling journey. Now, my refined definition for equitable math practices ensures access to quality learning, personalized support, and sufficient time for each student to meet the high expectations of the curriculum. These practices must be individualized to cater to the diverse needs of all learners, providing necessary structures to support the learning process. I have always held these beliefs about equity, but lacked the nuanced understanding of barriers and effective strategies to overcome them. This study and the process of self-reflection have the potential for even further, deeper development.

One of the key findings of my research revolved around the critical role of the teacher in establishing an equitable learning environment. As supported by Hattie's research, the teacher emerged as one of the most influential factors impacting a child's learning experience (Hattie, 2009). One example of this was the finding of the blended learning model or guided self-paced learning. By differentiating instruction according to student readiness and time, I saw how a teacher could provide equitable access to high-quality math instruction through a model that did not rush the learner, while also providing access to the teacher daily for all students. It was a powerful realization that equity was not just about having the resources, but also included creating resources. It shifted my perspective and emphasized my responsibility as a teacher to establish a conducive structure for learning.

Unexpected insights emerged for me particularly surrounding the use of video lessons and workbooks in the blended learning environment. The teacher's ability to virtually duplicate

themselves, to provide more one-on-one time with students, enhanced my preconceptions about video-based learning. Likewise, the value of using physical workbooks over the digital practice online, proved to be a clear way for me to observe students' work and misconceptions.

Engaging with the teachers at Oceanview Academy positively influenced my conceptions of equity. They helped to shape my definition and vision of equity by providing concrete examples that aligned with the literature. One teacher's blended learning approach, featuring instructional videos and a structure that promoted student accountability and agency, was especially inspiring. Furthermore, one teachers' dedication during the COVID-19 pandemic, that included their creation of culturally responsive assessment tools, reinforced my belief in the power of personalizing and adapting education to students' experiences.

Navigating my teaching roles through the pandemic was indeed a challenge. It demanded quick wit and patience in tackling unexpected pivots to instruction, but also keeping sight of long-term equity goals I found myself in a triage mode as my students and I figured out how to solve online learning challenges. I sought new resources like Pear Deck to support real-time student engagement and provided Google slide decks for students to fill in as we navigated the barriers to collaboration. These instructional tools allowed me the ability to notice student learning and provide feedback.

As a math practitioner, I have many ideas for the classroom after the process, but an important one is to truly know and understand each of my students as mathematicians. I aim to seek student feedback through ongoing learning questionnaires in order to support this, as well as continually to strive to see and support every student by creating instructional systems that allow me to meet with students systemically to provide the support they need. This system is built around routines that foster student agency, personalized learning, formative feedback which

further builds on my existing work in creating an inclusive and collaborative learning environment. Addressing the immediacy of needs should not overshadow the necessity of giving all students time and attention. Equity is about ensuring that everyone gets what they need, and to achieve this, I must understand my students needs on an individual and holistic level.

Looking forward, I have a learning grant set for this summer, titled *Enhancing Envision 2.0: Developing a Thinking Classroom Curriculum for 5th Grade Math*. Working collaboratively with my fifth-grade math colleague, the goal is to create a library of 10-15 lesson activities that focus on inclusive grouping and culturally relevant materials, promoting communication, collaboration, and critical thinking. Although the grant's execution has not begun, the preparation and planning for it are aligning with my evolving understanding of equity in the classroom. Going into the future with the upcoming implementation of my learning grant, I anticipate these insights will guide me. The aim is to create a curriculum that integrates communication, collaboration, and critical thinking while centering diversity, equity, inclusion, and belonging (DEIB). These lesson activities are inspired from the work of researchers who emphasize open and rich tasks, heterogenous random grouping, collaboration, and problem solving. As we develop this library of collaborative lesson activities, the focus will be on bridging the gap between the curriculum that is more individualistic and more social-emotional and problem solving based instructional approach. We do not intend to eliminate the current curriculum, but instead create activities that enhance the existing one with more collaborative activities that focus on school wide initiatives around communication, collaboration, culturally responsive teaching, and belonging.

Equity in education is a complex, ongoing journey. It requires reflexive and iterative approaches, continual growth, and adaptation. I am eager to continue this journey, learning,

implementing, and refining my practices to support each student's success. As I continue to grow and learn in my role, my understanding of equity will likely continue to evolve, and I look forward to that continued journey of learning and adaptation.

### **For Me as the Researcher**

As a researcher, the findings of this study have significant implications for my future work and professional development. These implications include thinking about my research methods used, staying informed about the latest research, being aware of personal biases, collaborating with others, and sharing the findings with the wider community.

In terms of research methods, it is important for me to carefully consider the approaches I employ to study equitable math practices. By exploring different methods and seeking innovative ways to gather information, I can gain deeper insights into teachers' perspectives and practices. For example, incorporating qualitative interviews and classroom observations may provide a richer understanding of how teachers implement equitable math practices. Staying current with the latest research on math pedagogy and overall learning development is another way to tighten my understanding of this topic. By regularly reviewing relevant literature and staying informed about current trends and best practices, I can feel more confident that my professional practice is in concert with the most current knowledge in the field. This might involve subscribing to academic journals, attending conferences, and engaging with professional networks to stay abreast of the latest findings and theories.

Being aware of personal biases is a critical aspect of conducting research and something I have learned to consider through this process. It is important for me to reflect on my own perspectives and assumptions in order to acknowledge any unintended influence on the research process or the interpretation of findings. This allows me to maintain the objectivity and rigor of

the study. For example, I can employ reflexivity techniques, such as journaling or seeking input from colleagues, to critically reflect on my own biases and challenge my assumptions.

Collaborating with other researchers, practitioners, and experts in the field is something I can do and is important in the field of social sciences. By engaging in collaborative endeavors, such as joint research projects or participation in professional communities, I can benefit from diverse perspectives and experiences. This collaboration can lead to the generation of new ideas, cross-validation of findings, and the sharing of resources and expertise. For instance, forming a research group or joining professional associations may facilitate meaningful collaborations with like-minded individuals. Finally, sharing the findings of my study is important to contribute to the broader understanding of equitable math practices, especially during the COVID-19 pandemic. This can be achieved through various means, such as writing articles for academic journals, presenting at local Schools of the Future conferences, or organizing workshops for educators. By disseminating the findings, I can inspire further research, inform educational practices, and promote dialogue among scholars, practitioners, and policymakers.

### **What I Might Have Done Differently**

Reflecting on my journey as a novice researcher, I see the value of hindsight in refining my approach. As I look back on my initial steps, I appreciate how every stumble and success shaped my understanding of the research process. Reflecting on these experiences and the challenges I encountered, along with the insights I have gained help shape my approach if I were to conduct this study again.

Firstly, I would put more emphasis on refining my research and interview questions. While my overarching research questions provided a well-rounded framework for the study, I could have thought about how the findings would have emerged, and how I might address the

implications. Further, my interview questions could have been more focused. Instead of asking broad questions, I may have considered a specific question that gets to teachers' intentional practices. For example, I would specifically ask, "Given your described vision of equitable math practices, which of those did you purposely implement into your practice?" and "How did you balance the short term needs of students with the longer-term goal of equitable math practices?" These questions would have possibly yielded data that communicated a deeper reflection into the teachers' beliefs and intentions.

Secondly, in future studies, I would like to look more closely at how a teacher's personal beliefs and past training shape the way they teach math. My study showed that there can be misalignment between implementing equitable math practices and the teacher's actual goal behind these actions. For future research, it could be interesting to examine how much teachers purposefully try to implement equitable practices into their teaching, and how their past experiences and training affect this effort. Thirdly, the sample size of my study was a limitation. In retrospect, I would have started my interviews earlier and then I would aim to double the sample by including two teachers from each grade level. Adding more participants may then prompt me to consider a mixed methods approach where some of my data can be collected through questionnaires. This would not only enhance the diversity and richness of the data but would also potentially provide more robust findings.

Concerning my literature review and looking at broader perspectives and contrasting viewpoints about equity, I have to note that my understanding of equity was already biased so my literature review was focused on scholars that I was familiar with whereas I may have needed to expand to counter perspectives to get a broader viewpoint on equity.

Concerning the methodology, the qualitative single case study approach allowed me to gain deep insights into teachers' conceptions and practices. However, I wonder if in future research I might consider conducting individual case studies and do cross case analyses to see patterns that emerged. With a single case study of a bounded system all conceptions and practices were combined to give a holistic view of the case. Individual case studies might offer the ability to compare and contrast teachers' practices across different variables like years teaching and grade level taught. Another key lesson I learned from this research experience is the importance of immersing oneself in the data. As a researcher, it is essential to become an expert on your data set and ensure your interview questions and coding strategy align with your research objectives. Although I field tested my interview questions in advance, I think that also doing a mock coding of a transcript before diving into actual data collection would have been beneficial, an approach I may consider in future research.

This study has offered me a wealth of learning opportunities. I have gained a better understanding of the complexity of researching equitable math practices, a deeper appreciation for meticulous planning and questioning, and the importance of being flexible and responsive to the needs of the research. The development of findings into implications was a step that I would approach differently. Knowing now the value of translating raw data into actionable suggestions, I will prioritize this process in future work as I learned it takes a long time. In essence, looking back allows me to look forward more effectively.

### **Ideas on Future Research.**

Based on my research conducted at Oceanview Academy, several potential avenues for future studies emerge. First, I propose exploring the impact of professional development on teachers' conceptualizations and practices of equity in math instruction. This research would

delve into the types of professional development experiences that have shaped our understanding and implementation of equitable practices. Such insights would be valuable as we strive for continuous growth and improvement in our teaching practices.

Second, I believe it is important to gain a deeper understanding of what approaches lead to student achievement in math instruction. An example of this is comparing the outcomes of guided self-paced mathematics and traditional direct instruction approaches. By analyzing data on assessments and considering student learning perspectives, we can gain a comprehensive understanding of the effectiveness of these instructional approaches in promoting equitable math learning experiences. These research projects would not only deepen our understanding of equitable math instruction at Oceanview Academy, but also inform our practice, contribute to the broader academic literature, and support our strategic initiatives around diversity, equity, inclusion, and belonging.

## **Conclusion**

In conclusion, this dissertation explored how eight teachers at Oceanview Academy, conceptualized and implemented equitable math practices during the unprecedented challenges of the COVID-19 pandemic. The teachers' commitment to their students emerged as a key theme, as they worked tirelessly to ensure learning continuity. They demonstrated this commitment to equitable teaching, revealing a steadfast belief in their students, and a learner-center approach to their teaching methods. These educators sought to support their students in feasible ways to ensure continued growth, even amid challenging circumstances. The conclusion of this research study, therefore, underlines two crucial points. First, teachers are fundamental to promoting equity in their classrooms, a role that demands a firm belief in the capacity of all students to engage with complex math problems. Second, the conception of equity is dynamic

and may evolve based on the changing needs and learning environments of students. The findings from this research emphasized the importance of a teacher's role in fostering an equitable mindset among students and their peers, which further strengthens the importance of teachers in shaping learners' attitudes towards mathematics. Their unique position enables them to encourage students to take on challenges, fostering resilience and growth.

The implications of this study highlighted the value of teachers as leaders, innovators, and champions of equity in the classroom. My hope is these teachers shared experiences may shed light on the importance of perseverance, adaptability, and the continual development of math practices to support student learning in an ever-evolving landscape. The pandemic, while posing considerable challenges, has catalyzed opportunities for growth and innovation in teaching practices. Amidst the challenges of the COVID-19 pandemic, the teachers in this independent school in Hawai‘i demonstrated that with resilience, innovation, and commitment, it is possible to successfully implement equitable math practices and provide each student with an opportunity to succeed.

## APPENDIX A: HUMAN SUBJECT RESEARCH



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SYSTEM

Office of Research Compliance  
Human Studies Program

**DATE:** May 31, 2022

**TO:** Heck, Ronald, PhD, University of  
Hawaii at Manoa, Educational  
Administration  
Schofield, Nicole, College of Education,  
University of Hawaii at Manoa, Shiraki,  
Steven, PhD, College of Education,  
University of Hawaii at Manoa

**FROM:** Rivera, Victoria, Dir, Ofc of Rsch  
Compliance, Social&Behav Exempt

**PROTOCOL TITLE:** AN EXPLORATION OF EQUITABLE  
MATH PRACTICES IN UPPER  
ELEMENTARY AND MIDDLE  
SCHOOL CLASSROOMS DURING  
THE COVID-19 PANDEMIC

**FUNDING SOURCE:** None

**PROTOCOL NUMBER:** 2022-00229

**APPROVAL DATE:** May 31, 2022

### NOTICE OF APPROVAL FOR HUMAN RESEARCH

This letter is your record of the Human Studies Program approval of this study as exempt.

On May 31, 2022, the University of Hawaii (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45 CFR 46.104(d) 2.

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at the OHRP Website [www.hhs.gov/ohrp/humansubjects/guidance/belmont.html](http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html).

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via the UH eProtocol application. The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your

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## APPENDIX B: CONSENT FORM



### University of Hawai'i Consent to Participate in a Research Project

Ronald Heck, Principal Investigator

*Project title: An exploration of equitable math practices in upper elementary and middle school classrooms during the COVID-19 pandemic.*

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Aloha! My name Nicole Schofield and you are invited to take part in a research study. I am a doctoral candidate at the University of Hawai'i at Mānoa in the Education Doctorate in Professional Educational Practice (EdD) program. I am doing a research project as part of the requirements for earning my EdD degree.

***What am I being asked to do?***

If you participate in this project, I will ask you to share your ideas about equity in math classrooms and your experiences teaching mathematics during the COVID-19 pandemic. I will meet with you for an interview on Zoom or WebEx at a date and time convenient for you.

***Taking part in this study is your choice.***

Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you. Your choice to participate or not will not affect employment, instruction, or other involvement at Punahou School.

***Why is this study being done?***

The purpose of this research study is to explore how math teachers at Punahou School conceptualize equitable math practices in their classrooms, and how they incorporate these conceptions into their day-to-day teaching practices. I am asking you to participate in this study to learn how you approach teaching math to all students, and how you may have adjusted your teaching in response to the COVID-19 pandemic. This study aims to explore the changes teachers made in how they deliver instruction due to the COVID-19 pandemic and the benefits of these changes for students' learning and engagement.

***What will happen if I decide to take part in this study?***

The interview will consist of 7-8 open ended questions. It will take 45 minutes to an hour. The interview questions will include questions like, "How do you define equity in your own words? How would you define equitable teaching in terms of math education? Thinking back to the fall of 2020 where you simultaneously taught at home and in-person learners, please share some of the ways you were able to accommodate learning differences in your math classes?"

Only you and I will be present during the interview. With your permission, I will audio-record the interview so that I can later transcribe the interview and analyze the responses. You will be one of about 8 people I will interview for this study.

***What are the risks and benefits of taking part in this study?***

I believe there is little risk to you for participating in this research project. You may become stressed or uncomfortable answering any of the interview questions or discussing topics with me during the interview. If you do become stressed or uncomfortable, you can skip the question or take a break. You can also stop the interview, or you can withdraw from the project altogether.

There will be no direct benefit to you for participating in this interview. The results of this project may provide school administrators and policymakers with an awareness and insights into

## APPENDIX C: INTERVIEW QUESTIONS



*An exploration of equitable math practices in upper elementary and middle school classrooms during the COVID-19 pandemic.*

### Interview Questions for Teachers

Researcher name: Nicole Schofield

1. Please share with me how long you have been teaching math and what you find the most fulfilling and challenging thing about teaching this topic?
2. When you think of equitable math instruction, describe what that might look like in a classroom?
3. Walk me through a typical math lesson in your classroom, what is your style and approach?
4. Thinking back to the fall of 2020, when you simultaneously taught learners in person and at home, please share two or three ways you were able to accommodate learning differences in your math classroom?
5. During the COVID-19 pandemic when students returned to in person learning, please describe ways you planned for collaboration and shared thinking?
6. Please share how you are able to accommodate students who have been absent for long periods of time due COVID-19 protocols?
7. What support do you provide a student who is struggling and not achieving according to the specified learning goals?
8. Of the new instructional strategies that you may have developed during the pandemic, what is one strategy that improved student achievement that you will continue to use?
9. Thinking about your vision of equitable math practices, please share any challenges to implementing equitable math practices in your classroom.

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