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## HIDDEN TEACHERS: STORIES OF ADULT BASIC MATH AND NUMERACY EDUCATORS IN THE UNITED STATES

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**HIDDEN TEACHERS: STORIES OF ADULT BASIC MATH AND NUMERACY**  
**EDUCATORS IN THE UNITED STATES**

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**HIDDEN TEACHERS: STORIES OF ADULT BASIC MATH AND NUMERACY  
EDUCATORS IN THE UNITED STATES**

A Dissertation Presented to the Graduate Faculty of the  
Simmons School of Education and Human Development

Southern Methodist University

in

Partial Fulfillment of the Requirements

for the degree of

Doctor of Philosophy

with a

Major in Education

by

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December 16, 2023

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**Brooke E. Ista**

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## ACKNOWLEDGMENTS

Given what I have heard, it seems that for most people I know, this page of my dissertation will likely be the only one they will delve into to read. Therefore, it is the perfect moment to express my gratitude to all of you who contributed to fulfilling my educational journey at Southern Methodist University and helping me develop into a research scientist. First, I want to thank my Lord and Savior, Jesus Christ. You set my feet on this path long before I was born. You knew I would achieve this goal, and I cannot wait to see where you take me with this achievement. Next, I thank my advisor, Candace Walkington, for taking a risk on an unknown woman from Kansas. You helped the little girl inside me believe I am worthy and capable of great things. I also want to thank my committee members, Maryann Cairns, Meredith Richards, Quentin Sedlacek, and Lynda Ginsburg, for devoting their time and energy to my growth as a scholar and for their willingness to share their intellect and expertise. I could not have created the same dissertation without each of you.

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and numeracy researcher. I will never forget the “big cannoli adventure.” Also, thank you to my peers in adult education for your support and for disseminating the recruitment information.

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Our deepest fear is not that we are inadequate. Our deepest fear is that we are powerful beyond measure. It is our light, not our darkness, that most frightens us. We ask ourselves, Who am I to be brilliant, gorgeous, talented, fabulous? Actually, who are you not to be? You are a child of God. Your playing small does not serve the world. There is nothing enlightened about shrinking so others will not feel insecure around you. We are all meant

to shine, as children do. We were born to manifest the glory of God that is within us. It is not just in some of us; it is in everyone. And as we let our light shine, we unconsciously permit other people to do the same. As we are liberated from our own fear, our presence automatically liberates others (Williamson, 1996, p.165)



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Hidden Teachers: Stories of Adult Basic Math and Numeracy Educators in the United States

Advisor: Professor Candace Walkington

Doctor of Philosophy conferred December 16, 2023

Dissertation completed December 6, 2023

This study is a narrative identity analysis using life history methodology. Thirty-eight Adult Basic mathematics and numeracy teachers shared their mathematical journey and their perceptions, beliefs, knowledge, and practices in their classrooms. Their stories were summarized and analyzed using narrative identity analysis. There were four themes that emerged from their stories that revealed their mathematical self-identity and four themes that described their mathematics instruction. The stories of ABE math instructors' math journey were linked to theories, studies, and research in the fields of psychology, anthropology, sociology, and education.

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## CHAPTER 1 - INTRODUCTION

Adult basic education (ABE) and English language acquisition (ELA) programs are critical for individuals lacking literacy, numeracy, critical thinking, and social success skills. Data shows that 62.7 million adults in the United States function at the lowest numeracy levels (Organization for Economic Cooperation and Development (OECD), 2013) Every year, thousands of adults seek out adult education programs to increase their understanding of literacy and numeracy and/or to obtain their secondary education credentials to continue their education .or obtain employment (U.S. Department of Commerce, 2020). The National Center for Education Statistics(2020) data further shows that participation in adult education programs varies across different states and regions within the United States. The more populous states, such as California, Texas, New York, and Florida, had some of highest numbers of participants in adult education programs in 2020, while some of the smaller populated spaces, Alaska, the District of Columbia, and Vermont, had the lowest (National Center for Educational Statistics (NCES), 2020). The low participation rates in adult education programs in the United States may have significant consequences for individuals and society. “It’s in our best interest to make sure that, regardless of why people didn’t get an education the first time around, they get one now,” said Amanda Bergson-Shilcock, a senior fellow at the National Skills Coalition who focuses on adult education and workforce policy (Waldman et al., 2022).

Adults who do not have a high school diploma or struggle with basic literacy and numeracy skills are more likely to face challenges in finding employment, earning a living wage, and accessing opportunities for further education and training (National Coalition for Literacy, 2020). Communities with lower literacy levels tend to have less economic investment, a smaller

tax base, and fewer resources to fund public services (Bardhan, 2002). These issues can create a vicious cycle of poverty and underdevelopment, where limited resources result in inadequate education and training opportunities, limiting economic growth and reducing resources for public services (Bradshaw, 2007). Low literacy and numeracy levels can also limit employment opportunities, as many jobs require basic skills. The Program for the International Assessment of Adult Competencies (PIACC) research shows a strong correlation between literacy levels and income. People with higher literacy skills tend to earn more over their lifetime (OECD, 2013). Furthermore, the average PIAAC literacy score for adults aged 16 to 65 was 272 (NCES, 2020). This number is above the international average of 261, but our numeracy scores had an average score of 204 compared to the international score of 267 (Versel, 2017).

The data tells us that literacy is less of a concern than numeracy. So, why is numeracy such a problem? From quantitative literature, we know that understanding how numbers work and applying them to everyday contexts is extremely important for health, work, finances, and overall well-being. Several health-related studies indicated that low numeracy skills negatively impacted diabetes control or weight loss for diabetes control (Bowen et al., 2013, 2016; Cavanaugh et al., 2008; Marden et al., 2012). Waldrop-Valverde et al.(2010) and Zamarian et al. (2021) also investigated health information and found that lower numeracy leads to lower comprehension of numerical information. The capacity of adults to comprehend and apply numerical information is necessary for occupations (Duchhardt et al., 2017; Sulak et al., 2020; Zevenbergen, 2011). Low numeracy skills can impact the employment status of adults (Sulak et al., 2020). It also impacts risky behavior (Darriet et al., 2020; Skagerlund et al., 2018). Adults

with low numeracy understanding tend to make risky decisions about their health and financial future (Darriet et al., 2020; Skagerlund et al., 2018; Wright et al., 2009). They also struggle with understanding numerical information reported in the media (Callison et al., 2009; Zillmann et al., 2009). These studies illustrate an adult numeracy problem within adult populations.

To address the problem of low skills, the United States enacted The Workforce Opportunity and Innovation Act (WIOA) of 2014 (Keenan, 2013). It created significant revisions to The Adult Education Family Literacy Act (AEFLA). The current AEFLA has four purposes: 1) to assist adults to become literate and gain knowledge and skills for employment and economic self-sufficiency, 2) to help adults who are parents to achieve the education and skills that are required in helping in the development of their children and lead to economic opportunities for their family, 3) support adults' acquisition of a high school equivalency diploma and continue to postsecondary education or training in a career pathway, and 4) support immigrants and others who are English-language learners improve their reading, writing, speaking and understanding of the English language, improve their mathematics skills, and gain an understanding of the American Government system, the responsibilities of citizenship, and individual freedoms (Keenan, 2013). It is only in one of the four items that mathematics is explicitly mentioned. However, in previous versions of these acts, quantitative literacy is subtended even if not mentioned explicitly.

The data collected from these programs focus primarily on students and their outcomes, with a small component on teachers. From K-12 research, we know that student achievement is influenced by teachers (A. Park et al., 2001; J. Y. Park, 2021; Rivkin et al., 2005; Rockoff, 2004;

Sanders et al., 1997; Sanders & Rivers, 1996; Wright et al., 2009). The teacher effect is potentially significant (Park et al., 2001; Rivkin et al., 1998; Rockoff, 2004; Sanders & Rivers, 1996; Wright et al., 2009). Yet, very little is known about the teachers of ABE.

### **1.1 ABE Math and Numeracy Teachers**

The NRS (2021) reported 50,504 adult education teachers in the United States (National Reporting System for Adult Education (NRS), 2021). This number only includes teachers working in programs that receive WIOA funds from the United States. Among these teachers, 63% work part-time, 19% are full-time, and 18% are volunteer teachers (NRS, 2021). The U.S. Bureau of Labor Statistics (2022) reports that a Bachelor's degree is required to become an ABE or ELA Teacher. Additional education, licenses, or certifications vary from state to state (United States Bureau of Labor Statistics, 2022).

Adult education teachers have many challenges to overcome outside the classroom. The federal, state, and local funds awarded to programs are limited, with most funds paying for teachers (NRS, 2021). Many programs struggle to find the necessary and age-appropriate classroom materials. ABE teachers are given minimal, if any, paid classroom preparation time, which may impact the kinds of learning activities used. Additionally, many teachers (71%) hold an educational certification, but only 28% of the 71% have a certification in adult education (National Reporting System for Adult Education (NRS, 2021).

Furthermore, research estimates that almost half of adult learners have undiagnosed learning difficulties, and nationally, less than 5% of adult educators hold a special education certification (Corley & Taymans, 2002; NRS, 2021). There are few state and national professional

development opportunities for ABE teachers looking to improve their content or teaching skills. AEFLA allows the U.S. Department of Education, Office of Career, Technical, and Adult Education (OCTAE) (NRS, 2023) to utilize national leadership funds to support each state in improving the effectiveness of adult education and literacy activities. Listed on the AEFLA Website are the most recent national activities available for all states. Only one of the six listed activities is math-related (Division of Adult Education and Literacy Office of Career, 2023).

Adult education teachers must balance teaching their learners skills for life and pushing students to obtain their high school diplomas quickly. Adult education programs receive funding based on measurable skill gains (MSG). There are five types of MSGs depending on the education or training program type (Pickard, 2021). The five are: a documented achievement of at least one educational functioning level, documented attainment of a high school credential, a transcript showing the learner is meeting the state unit's academic standards, satisfactory or better on milestones to complete on-the-job training or completion of one year of an apprenticeship program or similar milestone, and successfully passing an exam that is required for a specific occupation or evidence of achievement on a knowledge-based exam in a trades-related field (NRS, 2023). Obtaining these MSGs can put much pressure on a teacher, who must retain the student for these outcomes. Pickard (2021) found that teachers want to comply with federal mandates and, in doing so, focus primarily on rapid improvements to standardized test scores. These tactics do not focus on student learning (Pickard, 2021). Practitioners were likely to be deficient in the knowledge of how to teach reading (Pickard 2021). It was noted that

students who did not show progress on the standardized test were removed from the ABE program (Pickard, 2021).

## **1.2 Research Purpose**

More than half a million adults in the United States participate in state-administered ABE and ELA programs. This population is diverse in all aspects of identity. They are the most in need of educational services and the hardest to serve, with almost half of this population having undiagnosed learning difficulties (Corley & Taymans, 2002). Practitioners teach these learners with a minimum of a bachelor's degree, which may or may not be in math education (Division of Adult Education and Literacy Office of Career, 2023;NRS, 2021). However, limited research has been done on this hidden area of education.

My research utilized life story methodology and contributed to the body of educational systems knowledge by uncovering the mathematical experiences of ABE mathematics and numeracy instructors throughout their lives and how they developed their beliefs, perceptions, knowledge, and shared understanding of mathematics. These collaborative interviews allow me to research *with* my participants and not *on* them so that the retelling of their stories will reflect the development of their math identities (Moriña, 2020). These stories will resonate with other ABE math and numeracy practitioners. Perhaps math instructors are at all educational levels and learners, too.

ABE programs are unique. Little is known about the instructors or students beyond the information the United States Department of Education collected. The stories of these hidden teachers will be told using life history methodology. Life history methods are typically used on

populations that are difficult to research. Life history or life story allows the researcher to experience an intimate portrayal of lived experiences (Scott-Pollock, 2023). These first-hand accounts will allow policymakers and government agencies to make informed decisions and reveal this hidden world of adult basic mathematics education in the United States.



## **CHAPTER 2 – LITERATURE REVIEW/PILOT STUDY**

The following literature was reviewed to understand the gaps in the research for ABE learners. First, I review literature about the characteristics of ABE learners and on issues in the ABE math and numeracy. As I reviewed these articles, it became clear that the definitions of numeracy and quantitative literacy were obscure, so I next reviewed articles on their definitions. Next, I reviewed theories from adult education and journal articles on math anxiety/trauma. The literature reviewed and the theory investigation informed my research questions and designed for my pilot study.

### **2.1 Characteristics of Adult Basic Education Learners**

ABE learners represent a diverse population with unique characteristics distinguishing them from other adult learners. Some unique characteristics of ABE learners are low literacy levels, limited education, learning difficulties, non-native English, low income, and multiple responsibilities. A significant proportion of ABE learners have low literacy levels, which affect their ability to function in daily life and work (NCES, 2020). Generally, ABE learners have limited formal education and lack the basic skills required to perform well in the workplace or further education (Gal et al., 2020; Smith & Gillespie, 2007). They may have diagnosed or undiagnosed learning difficulties such as dyslexia, which can affect their ability to read and write, or dyscalculia, which can affect their mathematical ability (Corley & Taymans, 2002). Many ABE learners are non-native English speakers who must improve their English proficiency to access better education and employment opportunities (NCES, 2020). Some ABE learners often come from low-income households, which can limit their access to educational resources

and opportunities (Pickard, 2016). Moreover, ABE learners have multiple responsibilities, such as caring for children or aging parents, making attending classes challenging (Skilton-Sylvester, 2002).

ABE learners enroll in learning programs to improve their educational gaps, obtain their high school diploma, are court-mandated, or wish to transition to vocational or college for further education (Smith & Locke, 1999). For some learners, it is the first step to a fresh start toward a better life, or perhaps they seek to honor a promise of obtaining a high school diploma made to a family member. Whatever the reason, ABE learners are not the same as students in traditional K-12 educational settings.

ABE math learners in the United States come from diverse cultural, ethnic, and socioeconomic backgrounds (Broderick et al., 2001). This diversity may impact their prior educational experience. They have varying math skills/educational levels that may impact their foundational math skills and knowledge. They have adult responsibilities that affect their ability to dedicate time and effort to learning math (Skilton-Sylvester, 2002). In addition, some learners may have math anxiety or negative attitudes toward math due to past experiences (Ashcraft, 2002; Ashcraft & Krause, 2007). They may prefer to understand mathematics in a real-world context and require math instruction that is practical, relevant, and applicable to their daily lives (Hansman, 2001). Their level of motivation and goals for learning math are each different. Some may seek to improve their employment prospects, others pursue personal enrichment or fulfill personal goals, and a few are there to meet a court-ordered requirement (Smith & Locke, 1999).

Instructors must amalgamate these unique characteristics to create a positive and meaningful learning experience where learners and programs achieve their learning goals.

## **2.2 Issues in Adult Basic Education Mathematics and Numeracy**

Many US adults struggle to recognize and solve math problems requiring multiple steps and decision-making strategies. The 2017 PIACC (U.S. Department of Education, 2020) follow-up study found that 63% of US adults aged 16 to 65 had difficulty solving problems involving pattern recognition, relationships, and proportions. This discovery is startling, as these are the essential skills required to follow medical instructions and personal and financial decision-making. The PIACC Survey of Adult Skills ranks American adults as twenty-second in numeracy skills out of twenty-four participating countries (Ginsburg, 2017).

In the United States, adult numeracy creates challenges that must be addressed. Low numeracy skills, equity and access, limited awareness and motivation, the digital divide, workforce demands, and quality of numeracy programs are all areas of concern (Bowen et al., 2013, 2016; Callison et al., 2009; Comings et al., 2002; Duchhardt et al., 2017; Gal et al., 2020; Marden et al., 2012; Northcote & Marshall, 2016; Office of Educational Technology & U.S. Department of Education, 2022; Osborn et al., 2013; Skagerlund et al., 2018; Sulak et al., 2020; The Organization for Economic Co-operation and Development (OECD), 2019; Zamarian et al., 2021; Zevenbergen, 2011; Zillmann et al., 2009). Understanding these areas and how they relate to adult numeracy can be challenging, so let us review them individually.

First, low numeracy skills can influence an adult's everyday life. Research finds that low numeracy skills can impact an adult's ability to make informed financial decisions, manage

household budgets, understand medical dosages, and engage in everyday problem-solving activities that require mathematical reasoning (Bowen et al., 2013; Bowen et al., 2016; Callison et al., 2009; Duchhardt et al., 2017; Gal et al., 2020; Marden et al., 2012; Northcote & Marshall, 2016; Osborn et al., 2013; Skagerlund et al., 2018; Sulak et al., 2020; Zamarian et al., 2021; Zevenbergen, 2011; Zillmann et al., 2009). Many adults lack basic numeracy skills, such as understanding fractions, percentages, and decimals, which can hinder their ability to participate fully in the workforce and society (Gal et al., 2020).

Second, adult numeracy education has significant equity and access issues. Specific populations, such as communities of color, have self-reported income in the lowest income level, and immigrants and emergent bilingual individuals face barriers to quality numeracy education (Comings et al., 2002). These individuals may lack access to affordable, high-quality numeracy programs, resources, and support services, which can perpetuate the cycle of low numeracy skills and limit their opportunities for economic and social advancement (Comings et al., 2002).

Third, according to reports conducted outside the United States, many adults are not aware of the importance of numeracy skills, nor are they motivated to improve them (Gal et al., 2020). A report published in the United Kingdom found that adults may not fully recognize numeracy's real-world applications and benefits (Mallows & Litster, 2013). Additionally, some adults may face challenges finding the time and motivation to engage in numeracy education due to competing responsibilities like work, family, and other commitments (Gal et al., 2020).

Fourth, the increasing reliance on technology and digital tools in many aspects of daily life, including numeracy skills, presents challenges for adults who lack digital literacy skills or

access to technology (Office of Educational Technology & U.S. Department of Education, 2022). The digital divide, or the gap in access to and use of technology, disproportionately affects low-income individuals, older adults, and rural populations, limiting their ability to access online numeracy resources and participate in digital numeracy programs (Office of Educational Technology & U.S. Department of Education, 2022).

Fifth, the changing nature of work and the increasing demand for numeracy skills pose challenges for adults who lack adequate numeracy skills (Mallows & Litster, 2013). Many jobs require numeracy skills, such as data analysis, financial management, and problem-solving (Mallows & Litster, 2013). Adults with low numeracy skills may face difficulties finding and retaining employment, which can perpetuate economic inequality and hinder their full participation in the workforce (Mallows & Litster, 2013; OECD, 2019).

Sixth, the quality of numeracy programs and instruction can vary widely, leading to inconsistent outcomes for adult learners (Condelli et al., 2006). Many numeracy programs lack standardized curriculum, assessment, and instructional practices, which makes it challenging to ensure consistent quality across different programs and settings (Condelli et al., 2006; Gal et al., 2020). Additionally, there may be a shortage of qualified numeracy instructors and limited professional development opportunities, which can impact the effectiveness of numeracy instruction for adult learners (Gal et al., 2020).

Addressing these issues requires a variety of approaches that include policy efforts, increased funding for numeracy programs, raising awareness about the importance of numeracy skills, improving access to quality numeracy education, addressing equity gaps, integrating

digital literacy into numeracy programs, and promoting workforce development initiatives that prioritize numeracy skills. By addressing the problem of adult numeracy, we can help adults in the United States develop the numeracy skills they need to thrive personally and professionally. These challenges are especially pronounced for specific demographic groups. Policymakers and educators must prioritize improving numeracy skills in the adult population to promote economic and social mobility.

### **2.3 Numeracy vs. Quantitative Literacy**

According to Lynn Steen, a leading national voice for Quantitative Literacy and numeracy issues, "...numeracy is not the same as mathematics, nor is it an alternative to mathematics. Today's students need both mathematics and numeracy. Whereas mathematics asks students to rise above context, quantitative literacy is anchored in real data that reflect engagement with life's diverse contexts and situations."(Stein, 2000, p. 58).

The term numeracy was introduced in the Crowther Report 1959 about educating youths aged 15 - 18 in the United Kingdom by the Ministry of Education. The report defined "numeracy" as "not only the ability to reason quantitatively but also some understanding of the scientific method and some acquaintance with the achievement of science" (Ministry of Education, 1959, p. 282). It was introduced and defined as parallel to literacy, but scholars still debate the meaning of numeracy. The concept of numeracy does not have a widely accepted meaning, nor is there an explanation for how it diverges from mathematics (Gal & Schmitt, 2003). In the United States, numeracy appeared for the first time in the National Research Council's *Everybody Counts* (1989). This report uses quantitative literacy and numeracy

interchangeably, but some researchers claim they are also two separate entities (Mayes et al., 2013).

Quantitative literacy and numeracy are very similar terms. Vacher (2014) used an online English lexical database to compare and contrast quantitative literacy and numeracy. Vacher (2014) offered four major parts corresponding to these terms: “ a. skill with numbers and mathematics, b. ability to read, write, and understand material that includes quantitative information, c. coherent and logical thinking involving quantitative information, and d. disposition to engage rather than avoid quantitative information” (Vacher, 2014, p.11). Numeracy included a, while quantitative literacy included c. Both numeracy and quantitative literacy share letters b and d (Vacher, 2014). The National Numeracy Network (NNN) website describes numeracy and quantitative literacy as positions in ranking with numeracy at the bottom and quantitative literacy above it (Madison & Steen, 2008). This understanding implies that you should learn numeracy first and become comfortable working with numbers and arithmetic before moving to quantitative literacy and comprehending quantitative information (Madison & Steen, 2008). Karaali et al. (2016) agree with the NNN and relate it to literacy, and a person must understand letters before they are able to read.

These discussions about defining the construct of numeracy continue to happen in international communities where numeracy research is being conducted. However, without a well-defined construct to research, it is not easy to form a solid theoretical base. Without a well-established definition for numeracy, I use the PIACC definition since this is a well-known and respected assessment of adults’ basic literacy, numeracy, and digital problem-solving skills.

PIAAC defines numeracy as “the ability to use, apply, interpret, and communicate mathematical information and ideas” (OECD, 2013).

## **2.4 Theories from Adult Education**

Malcolm Knowles (1977) is known for his theory of andragogy, "the art and science of helping adults learn." Knowles believed that adults were lifelong learners who needed to know why they learned something and how it impacted their lives. Andragogy is one of the main theories used in ABE instruction. Knowles (1977) proposed four assumptions about how adults learn. These assumptions are: 1) mature adults become more self-directing, 2) the experiences of an adult over time are an asset for learning, 3) an adult’s willingness to learn is aligned with their needs in their life, 4) an adult’s focus is on the immediacy of learning and not on future application (Knowles, 1977). In 1984, two other assumptions were added: 5) the motivation to learn is internal, and 6) adults need to know the application or the purpose of learning a task (Merriam & Bierema, 2014).

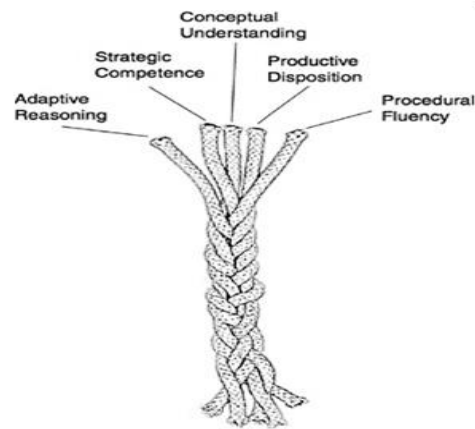
In 2006, Ginsburg et al. published the *Components of Numeracy*, which specifically related to learning mathematics as an adult. This document developed its philosophy from the National Academies Report, “*Adding it up: Helping children learn mathematics*” (Kilpatrick & Swafford, 2001). The Kilpatrick & Swafford (2001) report defined mathematical proficiency as strands or components. Figure 1 shows these strands as interwoven and not independent of themselves. The strands are conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition (Kilpatrick & Swafford., 2001). Conceptual understanding is more than just the steps; it is understanding the meaning of the mathematical



concept (Kilpatrick & Swafford, 2001). Procedural fluency is knowing how to solve math problems accurately and efficiently (Kilpatrick & Swafford, 2001). Strategic Competence is similar to having a toolbox of methods that learners use to help figure out the best way to solve a problem (Kilpatrick & Swafford, 2001). Adaptive Reasoning is the ability to be flexible and adjust one's thinking when faced with new math problems, and it connects different math ideas to new experiences (Kilpatrick & Swafford, 2001). A productive disposition allows the learner to embrace mistakes and be open to challenging math ideas with a positive attitude (Kilpatrick & Swafford, 2001). Productive disposition is the propensity to believe that mathematics is beneficial and meaningful (Kilpatrick & Swafford, 2001). All strands are needed for a learner to be mathematically proficient. The braid falls apart if one strand is missing (Kilpatrick & Swafford, 2001). Using the same language from the "*Adding it up: Helping children learn mathematics*" report (Kilpatrick & Swafford, 2001), Ginsburg et al. (2006) utilized this research done in K-12 settings by addressing how adults learn mathematics. This report was called "*The Components of Numeracy*" and focused on how adults utilize numeracy. The three main numeracy components developed by Ginsburg et al. (2006) are context, content, and cognitive and affective; every component has several subcomponents. The context piece states that adults use math in the following ways: family or personal, workplace, community, and further learning (Ginsburg et al., 2006). The content section says the knowledge needed for mathematical understanding falls into four categories: number and operation sense; patterns, functions, and algebra; measurement and shape; and data, statistics, and probability (Ginsburg et al., 2006). The final component, cognitive and affective, has five subcomponents that utilize the identical language from Kilpatrick et al. (2001) paper. These five subcomponents are conceptual

understanding, adaptive reasoning, strategic competence, procedural fluency, and productive disposition (Ginsburg et al., 2006). All components, context, content, cognitive and affective, and their subcomponents are required for a person to numerate (Ginsburg et al., 2006).

Figure 1: The intertwined strands of mathematical proficiency



*Note.* Adapted from *Adding it up: Helping children learn mathematics*. National Academy Press. 2001( <https://nap.nationalacademies.org/read/9822/chapter/2#5>). In the public domain.

## 2.5 Math Anxiety/Trauma

Mathematics anxiety is a phenomenon that has intrigued researchers since the early 1970s. Math anxiety and math trauma are related concepts that refer to the psychological experiences of distress, fear, and anxiety related to mathematics (Ufuktepe & Ozel, 2002). While math anxiety generally refers to the fear and anxiety experienced in math-related situations, math trauma encompasses a broader and more severe emotional response that may be associated with past negative experiences related to math (F. C. Richardson & Suinn, 1972). The development of

the Mathematics Anxiety Rating Scale (MARS) provided researchers with a tool to measure the severity of mathematics anxiety in individuals. Despite revisions and refinements to the MARS over the years, the correlations between high levels of mathematics anxiety and lower mathematical knowledge, understanding, and motivation to study mathematics remain consistent (Ashcraft and Krause, 2007).

Despite decades of research, the underlying causes of mathematics anxiety and how it shifts from a positive and enjoyable subject for children to a negative and anxiety-inducing one for adults remain largely unknown. However, researchers have observed that individuals with high levels of mathematics anxiety exhibit physiological signs, such as changes in heart rate and increased perspiration, when performing math tasks (Faust & Johnson, 1992). These physical reactions are often more noticeable than emotional or psychological ones, which may be hidden within a person.

Furthermore, individuals with high levels of mathematics anxiety often engage in avoidance behaviors to distance themselves from math-related tasks (Ashcraft, 2002). In 1990, Hembree conducted a systematic review and found that poor performance on mathematics tests was directly linked to negative attitudes toward mathematics and avoidance of the subject. A more recent meta-analysis was conducted by Barroso et al. (2021). They started from 1992 to 2018, reviewing the effect sizes ( $n=747$ ) from studies conducted during that time (Barroso et al., 2021). Their results were consistent with Hembree's (Hembree, 1990) findings that a significant relationship exists between math anxiety and math achievement. Barroso et al. (2021) further concluded that this association begins in childhood through adulthood and is more prominent for

math anxiety than statistics anxiety. Wu et al. (2014) observed children at the earliest stages of formal math learning with a negative association between math anxiety and math achievement.

Math anxiety may seriously affect a person's attitudes, emotions, and behaviors related to math. Ashcraft (2002) discusses math anxiety as a unique form of anxiety that can have personal, educational, and cognitive consequences. Math anxiety has been affiliated with avoidance behavior and attentional difficulties (Krinzinger et al., 2009; Wu et al., 2014). Math anxiety negatively impacts performance, cognitive processing, and self-perception (Ashcroft, 2002). In their study, Ashcraft (2002) provides insights into how math anxiety can affect an individual's overall well-being, including academic performance, brain function, and emotional well-being.

We have already discussed how math anxiety may impact academic performance but can impair overall brain function and emotional well-being (Ashcraft & Moore, 2009; Luttenberger et al., 2018; Maloney & Beilock, 2012). Math anxiety interferes with the ability to focus, logically reason, and problem-solve because it creates added work from the working memory to function (Luttenberger et al., 2018). Math anxiety is much like a parasite living off the host and pulling resources away from other areas of the body. This inability to think or perform causes more stress (Young et al., 2012). Emotional distress adds to the belief of self-doubt and low self-esteem (Maloney & Belick 2012). These negative emotions can cause more stress, which causes even more self-doubt.

Adult learners and teachers may feel math anxiety. Individuals may typically experience higher levels of math anxiety when working on math tasks (Barroso et al., 2021; Maloney & Beilock, 2012; Wu et al., 2014). A teacher with math anxiety may avoid teaching the content and

focus on the subject where they feel the most comfortable (Jensen & L, 2018). But, at some point, the teacher may be pressured to teach math for students to complete their GED successfully

## **2.6 Summary**

The information gathered on the characteristics of ABE students and their unique challenges, the relevant issues of adult numeracy faced by ABE teachers, along with deepening my understanding of the differences between numeracy and quantitative literacy, theories on adult education and math anxiety/trauma braided together to form my pilot research on adult basic education learners. The information presented was found in peer-reviewed journals and has been utilized in other educational studies. The personal experiences that develop an individual's perception and knowledge about mathematics, specifically those who have been enrolled in an ABE program in the United States, were not located after a long and lengthy search. Therefore, a pilot study was conducted to investigate these perceptions.

## **2.7 Purpose of Pilot Study**

Along with knowing the differences between quantitative literacy and numeracy, a review of adult learning theories and math anxiety/trauma created a curiosity in me about ABE learners' perceptions of mathematics and numeracy. With little published research on this topic, I began to consider how experiences with mathematics and numeracy may influence perceptions and created a pilot study. Five research questions were developed to guide my understanding of ABE learners' perceptions of mathematics and numeracy.

A pilot study was conducted in Spring 2019 on adult learners' perceptions of mathematics. I was interested in the role that math memories played in learning mathematics and whether there were any shared negative experiences. Also, I was curious whether adult learners saw math as applicable in the real world and if they had support. As an ABE math practitioner, I was interested in how this information might inform my decisions about motivating learners in my program. This pilot study gave me exposure to the process of research. I started with the design of qualitative research methods, obtaining the Institution Review Board (IRB), creating surveys, finding subjects to study, adjusting my research design when a global health emergency happened, collecting data, cleaning and analyzing data, and reporting results. This study also informed my decisions for this dissertation prospectus, including methodology and population. Therefore, to fulfill the *Introduction to Qualitative Methods* class requirement, EDU 7305, taken at Southern Methodist University, I designed a qualitative research project that would become my first research project. Under the guidance of my advisor, Candace Walkington, IRB approval was granted on June 26, 2019. The study aimed to understand how the memories, experiences, and feelings about mathematics shape the perceptions of mathematical learning and change ABE or General Education Diploma (GED) students' relationship to mathematics.

## **2.8 Pilot Study Research Questions**

The pilot study addressed a research gap in adult basic education learners' perception of mathematics. The following questions were used to navigate this study:

1. What role do negative mathematical memories play in adults learning mathematics?
2. What are the shared negative math experiences of adult learners?

3. How do adult learners understand the use of mathematics in the world around them?
4. What are the perceived supports for adults learning math?

## **2.9 Pilot Study Methods**

The intended plan was to use surveys and interviews of ABE students at a South-Central Kansas adult education program. In the Fall of 2019, five students completed the survey information. However, no interviews were collected from this group. The COVID-19 global pandemic began to make news around this time, and the adult education program was shut down. This pandemic stalled this project for quite some time.

The decision was made to transition from a South-Central adult education program to social media. Additionally, I was awarded the Commission on Adult Basic Education (COABE) Incentive 2020 award to fund this research. After receiving IRB approval for recruitment using social media, a Twitter influencer was hired for \$300 to post, retweet, and share the link to the survey, which began on February 2, 2021, and again on September 13, 2021. The February 2 original post acquired 86 likes and 35 retweets with ten comments, three quotes, and four bookmarks. The second post on September 13 received 810 likes and 54 comments, with six comments, two quotes, and three bookmarks.

The study proposed having two main data-collection instruments. The individuals taking part in the study were provided with a web link to access a Qualtrics survey. The survey consisted of 31 questions and, on average, took participants around 20 minutes to complete. The survey can be found in Appendix A. The median time to complete the survey was about 16 minutes. All respondents completed more than 50% of the survey. The second part of the study

was to be interviewing participants over ZOOM. Participants who indicated they would like to be interviewed on the survey were contacted three times using the email or phone number given. The emails went unanswered, and messages left on phones were not returned for all 20 participants. Therefore, only the data collected from the survey will be presented.

### ***2.9.1 Sample***

Purposive sampling was used on the 225 respondents to the survey to identify the population for this study. Specific criteria were used for inclusion in the study. The criteria for selection included:

- Participants were over 18 years old.
- Participants signed the necessary consent form.
- Participants were currently enrolled or had been enrolled in an adult education program in the United States.
- Participants completed the survey using English.
- Participants were not bots or other artificial intelligence.

After the data had been cleaned, the sample yielded 20 respondents.

### ***2.9.2 Demographics***

After applying the criteria for inclusion in the study, there were 20 respondents. Twelve indicated that they were female, and seven were male, with one other. The demographic characteristics are summarized below in Table 1.



### ***2.9.3 Ethical Considerations and Limitations***

Consent was sought and obtained for each participant digitally in Qualtrics. Participants were allowed to stop the survey at any stage. The data collected has been securely kept in password-protected cloud storage; only my advisor and I can access it. In Appendix B, pseudonyms are used in these results to protect each participant's anonymity. The small sample size is a limitation of this pilot study, but the qualitative findings reveal the participants' perceptions of mathematics.

Another limitation of this qualitative investigation is generalizability. The information collected may not be representative of the entire population of learners who have or have been in an ABE program. The collected narratives may also have inaccuracies or distortions about the actual events. This type of recall bias can impact the accuracy of the emerging themes and my interpretations of these events. Additionally, the subjective nature of these reported narratives was not verified. The lack of verification of the findings challenges the validity of the data collected.

Table 1: Sociodemographic Characteristics of Participants at Baseline

Baseline characteristic	Currently Enrolled in an ABE Program		Not Currently Enrolled in an ABE Program		Full sample	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
GED complete						
Yes	8	40	6	30	14	70
No	5	25			5	25
No Response	1	5			1	5
Gender						
Female	7	35	5	25	12	60
Male	6	30	1	5	7	35
Other	1	5			1	5
Ethnicity						
Hispanic	12	60	6	30	18	90
Non-Hispanic	2	10			2	10
Race						
White	12	60	4	20	16	80
Black	1	5			1	5
Native American			1	5	1	5
Other	1	5			1	5
Two Races			1	5	1	5
Primary language						
English	14	70	5	25	19	95
Dutch			1	5	1	5
Age						
18-24	8	40	1	5	9	45
25-34	3	15	2	10	5	25
35-44	1	5	1	5	2	10
45-54	1	5	2	10	3	15
No Response	1	5			1	5
Highest educational level						
Elementary school	1	5	1	5	2	10
Middle school	1	5			1	5
Some High school	11	55	5	25	16	80
Post-Secondary	1	5			1	5
Employment						
Unemployed	2	10	1	5	3	15
Student	2	10			2	10
Employed	9	45	3	15	12	60
Homeless	1	5			1	5
Disabled			1	5	1	5

### 2.9.4 Analyzing the data

The analysis of the survey’s open-ended responses to survey questions was coded thematically (Braun & Clarke, 2006). As shown in Table 3.2, a thematic analysis follows six phases. A thematic framework was created for each of the open responses. Participants were open and candid and revealed their perceptions of mathematics.

Table 2: Phases of thematic analysis

Phase	Description of the process
1. Familiarizing yourself with your data	Transcribing data (if necessary), reading and re-reading the data, and noting down initial ideas.
2. Generating initial codes	Coding interesting features of the data systematically across the entire data set, collating data relevant to each code.
3. Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis.
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6. Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, the final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

*Note.* Reprinted from “Using thematic analysis in psychology,” by V. Braun and V. Clarke, 2006, *Qualitative Research in Psychology*, 3, p. 77-101

(<https://doi.org/10.1191/1478088706qp0630a>). Copyright 2006 by the American Psychological Association.

#### **2.9.4.1 Open-ended questionnaire-results.**

The 20 responses provided by participants in the survey were analyzed using open coding. Their responses are informative about how adult learners perceive mathematics. We first look at their perception of education

#### **2.9.4.2 Reasons Participants left school.**

Participants left traditional school for many reasons. Table 3.2 identifies some reasons participants left school, including work-related or money issues. Others left because of teaching, being bullied, or a disruption in the individual's life that caused them to stop attending school. No matter their reason for stopping out of school, all participants have returned to an adult education program/GED to obtain their high school credentials. Thirty percent indicated they were seeking their diploma for jobs, 25% said they wanted their GED, 20% said it was a goal, or they had plans for the future, 10% indicated it was mandatory or because they were disabled, and 15% did not respond.

#### **2.9.4.3 Plans to enroll in additional math courses.**

More than half of the respondents indicated they are or might enroll in additional math courses. The reasons they gave were coded into two types: further education requirements or emotions about math. Fifty-five percent indicated they were enrolling because of further education requirements. "Bob," (White male, undisclosed age), who gave no age, said, "Possibly. Im planning on going back to school to obtain LPN liscense." "Tom" (35-34-year-old, White man) responded,

I took more math classes than I needed for my degree. Though I am no longer in college or require any more skills than I have for my current job, I do still study math and physics for my benefit.

Those responses were coded as further education, whereas, “Sarah” ( White female, age 25-34) commented, the following, which had been coded as emotions,

That's a big phobia of mine. I understand a lot of people have a hard time with math and that's normal and I'm not the only one but I really really struggle and doesn't really sink in. So I don't know unless I have to do some math for my career choice. But even with what I learned I should possibly practice often just in case my kids have a problem with it later on when they're in school and they need help I'll do the best I can.

The majority of participants understand that mathematics is a requirement for further education but from their responses, there is apprehension. “Danny” (18-24-year-old White male) stated, “No Bc math is a horrible subject for me.” “Fred” (35-44-year-old White male) declared, “no i hate math.” Both were coded no to the question plans to enroll in additional math courses.

Table 3: Reasons Participants Left School (N=20)

Reason for interest	Example Quote	Frequencies, n (%)
Work	<p>“Because I have to work”</p> <p>“Father died. Went to work full-time “</p>	3 (15%)
Money	<p>“My family couldn't afford to go to a traditional school.”</p>	1 (5%)
Teaching	<p>“some environments, traditional schools, make me unable to adapt to study”</p> <p>“the academics were too much for me to mentally keep up with”</p>	5 (20%)
Being Bullied	<p>“I was bullied to the point where I attempted suicide. My parents attempted alternative charter schools but by then I was so anxious I would have a panic attack at the sight of a school, so I completely dropped out and was out of all education from the age of 16 to about 18”</p> <p>“I was pulled out of school by my mom because the teachers were toxic. When I moved a year later I was just too afraid to go back.”</p>	5 (20%)

Disruption	“Got pregnant, made poor choices, running with wrong crowd”	5 (20%)
	“ Medical issues”	
	“alternative sentencing”	
	“Don't want to on.”	

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#### **2.9.4.4 Perceptions of mathematical confidence in the classroom.**

The perception of mathematical confidence in a math classroom had some interesting results. Two survey items were given about their perceptions. In the first, participants were given a slider and asked about their confidence level in a math class. They were asked to move the slider from 0, being the least confident, to 100, meaning extremely confident. Sixty-five percent indicated a level below 50, and twenty-five percent indicated below 5. There were 2 participants at both extremes, one indicating 100 and the other indicating 0.

The second survey item asked if they considered themselves knowledgeable about mathematics. Only 35% of the respondents indicated yes they considered themselves knowledgeable. “Tom” said, “I consider myself more knowledgeable than the average person, but that doesn't say much.” Whereas “Pat” (a non-gender specific person, age 18-24) said, “With some knowledge of mathematics, I'm still very good at arithmetic, but I don't understand any mathematics such as functions.” “Tasha” (female, Black, age 25-34) indicated that she learned math early in life and was confident, stating, “yes, I learned as a child.”

However, not everyone was confident in their math response. “Scott” (White Hispanic male, age 18-24) responded to the math confidence question, “Mysterious and difficult to learn.”

And “Kim” (Native American/Pakistani Female, age 45-54) declared, “No, I failed so miserably that it causes me flashbackd.” Sharing this sentiment, “Tiffany” (45-54-year-old White female) said, “No, Feel like I'm not smart enough.”

#### **2.9.4.5 Early memories of mathematics.**

Participants shared their early memories of learning about mathematics. Some participants (30%) indicated they remember learning traditional computational skills such as addition, subtraction, multiplication, and division. “Jennifer” (35-44-year-old, White female) said, "In second grade, learning the times tables and playing a speed game wherein you'd have to sit down if you couldn't answer the multiplication question within 3 seconds. Last one standing won.” “Tom” recalled,

When I was young I could do typical addition/subtraction, multiplication, and long division easily, but I struggled with fractions - they were always my Achilles heel. After I dropped elementary school, I briefly tried "American School" (essentially a mail-order homeschooling company) but I couldn't get past even the pre-algebra section because I couldn't comprehend the work given to me in the book; the fractions were a brick wall. And because my mom had no clue how to do anything other than addition and subtraction, I was left without a teacher. because of this, my self confidence tanked and I completely gave up my schoolwork. I did essentially no official school work from the time I was about 10 until I got my GED.

While other respondents had more emotional memories, “Terri” (White female, age 18-24) responded by saying,



I always didn't like math as a kid. Even though I was told I was good at it I hated it with a passion. I believe some of my teachers may have played a part in that. I believe I finally started to enjoy math around the 8th grade.

“Cara” (Native American female, age 18-24) said this about her early memories of math, “Being embarrassed for not catching on as quickly as others.” “Danny” said his memories were “Always struggling to understand how to do math.” “Michelle’s” detailed memory was,

I was an exceptional student before I was 12 or so; I excelled in all of my classes in elementary and early middle school without trying or studying. However, once the coursework intensified and puberty/clinical depression struck I continued excelling in subjects that interested me naturally (English and science) and I fell behind in math.

When I was 12 I almost failed my math standardized test, and when I entered high school I was in advanced placement English and science, while I took remedial math and still struggled. The anxiety and pressure after having experienced so many years of excelling easily only made it worse. I often felt like I must have been broken somehow, because the "easy" explanations the teacher used that everyone else seemed to get, still didn't click for me.

These early memories are a combination of both positive and negative experiences. In the next sections, I will report specific memories that were shared that the respondents identified as either their proudest or worst math memory.

#### **2.9.4.6 Proudest math memory.**

Many of the proudest math memories centered around assessments. Assessments were completed in a mathematics class, a school setting, or a gatekeeper test, such as the GED. In Table 3.3, the themes that arose were related to assessment, number facts, and application. Respondents talked about how they felt proud by correctly answering a question and completing an assessment or GED examination successfully. Some memories that made others proud centered around learning their multiplication facts or being taught a “trick” by the teacher. Only one person felt proud that they could relate math to their vocation.

Table 4: Proudest Math Memory

Memory	Example Quote	Frequencies, n (%)
Assessment	<p>“Passing the GED”</p> <p>“Acing an algebra test in 8th grade”</p> <p>”Answer the questions correctly in class”</p> <p>“...My first college class was remedial math. I was cajoled into going by my then-girlfriend (now wife). I was convinced it was a fool's errand because I figured I was too stupid to finish *any* course, let alone math. The first exam was full of fractions and I had an anxiety attack after seeing them. I got a 98 on the exam. After talking to the professor after the exam, I realized that it wasn't a fluke; I really did understand the material. That was my proudest moment.”</p>	13 (65)
Number Facts	<p>“Learning my times table”</p> <p>“My proudest math memory was when my teacher Miss cross had showed me how to do multiplication tricks”</p> <p>“When I memorized my multiplication.”</p>	3 (15)
Application	<p>“Anything relating to math I've done in my job. Because the math required to be a vet tech is fairly straightforward, it's taken some work but I've been able to grasp dosages and fluid rates easily enough. I've even corrected doctors a couple of times -- that makes me very proud.”</p>	1 (5)

#### **2.9.4.7 Worst math memory.**

Some of the memories that are the worst about mathematics involve failure (n=11, 55%). Failing a test, class, and semester were all recalled memories. “Michelle” (White female, age 25-34) recounted her worst memory,

I started to seriously struggle in school around 11-12 years old. I hadn't set up any good study habits and my parents were mostly absent so I had no support system; I'd been sort of abrasive and rude to the other kids since I was small and alienated them, so my entire personality was wrapped up in being "the smart kid". Being told I had nearly failed my standardized math test (the TAKS at that time I think?) was not only humiliating, it was really the first time my mental health and anxiety began to spiral out of control. If I wasn't "the smart kid", what was I?

“Christi” (White female, age 18-24 years old, responded, “Thinking about some math problems for a long time also makes it difficult to get the right answer.”

A few of the respondents tied their memories to failure on assessments or a course (n=10, 50%). “Karen” (18-24 years old, White female) said her worst math memory was “when i failed the math test i studied so hard for.” Similarly, “Tara” (White, female, age 18-24 said, “failing tests.” “Mark” (White male, 18-24 years old) said, “failing math every year.” Whereas “Holly” (White female, age 45-54) stated that her worst memory of math was “Everything else.” Three respondents were coded for everything (15%). The other categories were topics (n=2, 10%) for participants who listed off or described content topics found in math, none (n=1, 5%) who had “nothing bad,” medical (n=1, 5%) because of the “migraine headaches,” time (n=1, 5%) for

“thinking about some math problems...” and NA (n=2, 10%) for a nonsense answer “age finally” and a blank response.

#### **2.9.4.8 Mathematics anxiety.**

With memories like these, it is easy to understand why 70% of participants indicated they experience math anxiety. They describe their experience as having physical symptoms. Sarah described her math anxiety symptoms as follows, “I get a migraine headache I get fidgety I get frustrated and I feel so dumb with it sometimes honestly it makes me just want to cry.”

“Michelle” said this about experiencing math anxiety,

Taking the midterm for my remedial math course in college. I had studied hard, done the online practice tests. I warned my psychiatrist ahead of time, who advised me to take a double dose of the Xanax I'd been prescribed for panic attacks. I did so, and still broke down sobbing in the "quiet" testing area and had to leave.

Other descriptors that respondents used to detail their math anxiety were, “i get anxious and feel like i'm gonna get the answer wrong,” said by “Karen.” While “Cara,” described an incident that causes her math anxiety, “I have memories from middle school where we would have to solve problems on the board.”

It is no wonder that only 25% indicated that they even like math, but 48% value learning math, the themes for this category were yes, no, and sometimes. “Sarah” said this about the value of learning math,

Yes I do because believe it or not working it really helps especially when say if you work in retail and you mess up or something happens with your register and it automatically locks the cash drawer until you put the code in for a CSM to come and help you punch the code in and all that to save time for an example you could write stuff down on paper you know like have little scratch paper or whatever and to where you can maybe help the CSM ahead of time so they don't have to take a while trying to figure out what you messed up on.

“Holly” mentioned,

I think it's important to teach kids all kinds of subjects so they use all parts of their brain. It's also important to expose them to things that they might have a real penchant for, but wouldn't know it without exposure. I guess I don't see the value in trigonometry if your goal is to be a zookeeper or something, but I won't lose any sleep over it. I do wish they taught actual life skills math to kids, like taxes, budgeting, balancing your accts, retirement goals, etc.

Valuing the usefulness of math in daily life was also said by “Jennifer,” “ Yes. Its something that i want to learn but sometimes feel it is not necessary to put things in math that are never gonna be used in everyday life. Somewhat,” and by, “Scott,” “... mathematics plays a very important role in our daily life.” “Tom,” said the most about the value of math,

I absolutely value learning math. Learning in general, really. Knowledge for knowledge's sake and all that. But more to the point, math is the basic gateway to understanding everything. It's like that one XKCD comic: once boiled down, everything is just applied

math. If one has a good understanding of math and the basic principles behind it, they can solve many problems in their day-to-day life that they would have otherwise given up on. Fixing cars, making a budget, figuring out how many juices boxes for the field trip, baking, you name it: most every day-to-day task requires math in some form. It's important to know math in order to navigate the world and make the most of the short lives we have. Sounds like hyperbole, I know, but learning how math could help me was a revelation that changed my life. Plus, double-checking the math on invoices has stopped me from getting ripped off many a time.

“Cara’s” statement, “There's value to math you literally can't do anything without a tiny amount of knowledge of math. That is why I struggle almost on a day-to-day basis,” speaks to why she feels defended by math.

### ***2.9.5 Implications***

Researchers will gain insight into why adults stop out of school so that interventions can be developed to prevent someone from leaving traditional K-12 school settings. These interviews could add to the growing literature on mathematics anxiety or perceptions of mathematical ability. Researchers may identify with the memories told and consider ways to mitigate the negative memories or enhance the positive experiences.

Similarly, math practitioners may find the stories told about worst memories as cautionary tales to empathize and help learners process and work through tasks where they might see failure. Practitioners may consider developing math lessons that match the real-life places where participants recognized they were doing mathematical thinking. Instructors may also find

why students stopped out of traditional school interesting so that they may better advocate for their learners who may not know how.

Policymakers may be informed of how constituents view mathematics. If the goal is to have citizens who are informed about democracy and the workings of our country, then they must understand mathematics (Gal et al., 2020). Additionally, policymakers may find this research interesting and would be willing to budget research monies for further investigation.

The powerful statements shared in this survey help reveal the perceptions of mathematics and the impact of memories on mathematical learning. This group of adults believed that being able to think mathematically is beneficial, though there is a lack of confidence in their ability. The shared stories were from experiences many years ago, and participants could recall them in some detail, indicating an impression had been made. Some of the impressions were positive such as passing an assessment or being able to answer a question. But, memories were not always positive. Failing an assessment or course were memories that many recalled as bad. There is so much more to uncover from asking adults their stories of mathematics. This survey illustrates the need to speak with adults to uncover these stories, to go in-depth, and to learn more about their perceptions and experiences.

## **2.10 Conceptual and Theoretical Framework**

I will now present a framework using the information obtained by conducting the pilot study on ABE learners' perceptions including the literature review that was conducted for my previous study. Additionally, to support my understanding, I reviewed quantitative studies to understand the impact of numeracy on adults. Pressing deeper into the ABE classroom, I



reviewed literature on math identity and teacher beliefs, perceptions, and knowledge. All of these tasks contributed to developing my research questions for this study. To address my questions, I did a deep dive into qualitative methods and found life history methodology. This methodology appears to be a pathway to achieve answers to my proposed research questions.

### ***2.10.1 Math Identity***

Defining math identity has been a difficult task for math researchers. Identity is a construct that has roots in psychology, sociology, social psychology, anthropology, cultural studies, and education (Holland et al., 1998). Identity includes a sense of self that includes how one is perceived and relates to others (Holland et al., 1998). History, culture, ethnicity, gender, sexual orientation, socioeconomic status, religion, personal interests, and experiences shape one's identity (Holland et al., 1998).

Math identity is a complex idea that needs specific explanations about individuals instead of generalizations about larger groups (Darragh, 2016). The work of Wenger (1998) and/or Lave and Wenger (1991) has had the most influence on how math researchers operationalized identity (Darragh, 2016). Wenger (1998) believes that learning is before human identity. Identity is developed in communities or through cooperative learning with a shared area of interest requiring collaboration to develop knowledge (Lave & Wenger, 1991). Drawing from the work of Wenger (1998) and/or Lave and Wenger (1991), some math education researchers have adopted Sfard and Prusak's (2005) definition of mathematical identity (Darragh, 2016; Heyd-Metzuyanim, 2013; Latterell & Wilson, 2017). Math identity is "a set of reifying, significant, endorsable stories about a person" (Sfard and Prusak, 2005, p. 14). Generally, researchers

believe that a person's math identity is not static and is evolving and changing due to the impact of many factors and experiences (Latterell & Wilson, 2017).

Boaler and Greeno (2000) drew their definition of math identity from Holland et al. (1998), who were anthropologists. In Holland et al.'s book, *"Identity and Agency in Cultural Worlds"* (1998), terms such as "figured worlds," "positioning," and "authoring" are used in defining the theory of self and identity. Holland et al. pulled their terms from other theories in anthropology. "Figured worlds" are the socially constructed spaces in which people live their lives (Holland et al., 1998). These spaces are constantly being shaped by the interactions of the people in them (Park, 2021). In education, "figured worlds" have been associated with communities of practice, classrooms, and teaching practices (D'Souza, 2014). "Positioning or positional identity" relates to structures in the "figured worlds" such as gender, race, ethnicity, age, religion, socioeconomic status, power, etc. (Boaler & Greeno, 2002; Moore, 2008) and "authoring" is how a person responds to this positioning (Holland et al., 1998; Stubbing et al., 2018). In Boaler and Greeno's (2002) study, they said the following about identity in the mathematics classroom, "figured worlds of many mathematics classrooms, particularly those at higher levels, are unusually narrow and ritualistic, leading able students to reject the discipline at a sensitive stage of their identity development" (p.171). This notion suggests that learners refuse to develop their mathematical identity.

Individuals with a strong math identity typically have a positive attitude toward mathematics, feel confident in their ability to succeed in math, and view themselves as mathematically competent (Bong & Skaalvik, 2003). Research has shown that math identity is

closely linked to math achievement and motivation. Students with a positive math identity tend to be more engaged, motivated, and successful than those with a negative math identity (Boaler, 2013; Boaler & Greeno, 2002). It encompasses cognitive and affective aspects and is shaped by various factors, including cultural and societal messages, interactions with teachers and peers, and experiences with math (Boaler, 2013; Dweck, 2016). In contrast, students with a weak or negative math identity will likely experience math anxiety, avoid math-related activities, and perform poorly in math (Barroso et al., 2021; Hembree, 1990; Ma & Kishor, 1997). A strong math identity is associated with higher engagement, motivation, and achievement in mathematics (Ma & Kishor, 1997).

### ***2.10.2 Teacher Beliefs, Perceptions, and Knowledge***

Teachers must decide how to instruct their learners in each class. However, how is this decision made? Research suggests that teachers' beliefs on how mathematics should be taught impact their instructional practices and content design. Stipek et al. (2001) found that teachers' beliefs about the nature of mathematics, mathematics learning, and the value of acquired rewards were associated with their classroom practices. They found that teachers who view mathematics as creative and fun created activities encouraging students to explore and seek answers.

Conversely, teachers who viewed math as a set of algorithms utilized lectures or worksheets in their classes. The lessons were not engaging and were less enjoyable for the students. This research is further supported by a study by Cross (2009). They found that teachers' beliefs about the nature of mathematics determined their pedagogical decisions for student learning. Johnson et al. (Johnson et al., 2019) studied factors influencing a teacher's decision to

lecture in a mathematics class and other approaches to teaching mathematics. They found that how a teacher thinks and feels about how math should be taught played the biggest role. Teachers want to feel confident and comfortable speaking about math, and lecturing is their way of achieving it (Johnson et al., 2019).

Teachers' perceptions of how to grow and improve their teaching skills appear to impact their thoughts and teaching practices positively (Polettini, 2000). Polettini (2000) conducted a study on teachers' perceptions and found that teachers who reflect on their teaching craft, look for ways to improve, and are supported by colleagues were likelier to improve their teaching practice and knowledge. A teacher's perception of how much support they had from administrators is critical even in improving their mathematics content knowledge (Polettini, 2000). In another study about teacher perceptions, Saenz et al. (2023) concluded that mathematics teachers' perceptions influence learners' motivation, beliefs, and achievement in mathematics.

Another area that can have implications on learning is teacher knowledge. Teachers who are less confident about their mathematical content knowledge may significantly impact student achievement and engagement (Horne, 2022). Saenz et al. (2023) examined the impact of mathematics teacher qualifications on learner math achievement and attitudes. The team found a significant main effect among students who were taught by teachers with degrees in mathematics, suggesting the importance of knowledge (Saenz et al., 2023). Saenz et al. (2023) concluded that there were negative effects on learner achievement if the state did not require certification, especially if the degree was not in mathematics.

The studies on teachers' beliefs, perceptions, and knowledge reveal their importance in teaching practices. Each of the studies investigated teachers who were not ABE teachers. It is imaginable that these factors influence the lessons that ABE teachers create, and the impact on adult learners would be similar based on an instructor's beliefs, perceptions, and knowledge. But, there is a dearth of evidence to say for sure in this area.

### ***2.10.3 Mathematical Autobiographical Research***

Wilder and West (2023) published a study using mathematical autobiographies that post-secondary education professors wrote. Their study investigated 61 faculty members' mathematical stories that were told in response to a prompt as part of an online course on quantitative reasoning. Then, they identified central themes to the shared stories using Achievement Goal Theory (AGT) (Wilder & West, 2023).

AGT is a psychological framework that suggests that a person's goals influence their motivation to learn mathematics (Elliott, 2007). AGT implies that a person's willingness to master a mathematical concept is better at predicting how much a person will enjoy learning while wanting to achieve the best score or grade aligns more with a person's performance in the math course (Wilder & West, 2023). Wilder and West (2023) found these major themes in the autobiographies; they collected negative experiences, positive experiences, and making math meaningful.

Twenty-five participants told negative stories, 25 told positive stories and 11 told stories about contextualized mathematics instruction (Wilder & West, 2023). Negative experiences aligned with stories about mathematics trauma, teachers who taught poorly, fear of bad grades,

abstract concepts, fixed mindset, ethnic and gender discrimination, and overall difficulties in math courses. Conversely, stories about positive experiences centered around seeing mathematics as a tool, success in math classes, supportive learning environments, general interest in learning mathematics, and overcoming obstacles. The remaining stories aligned with ideas about using real-world problems for learning.

Wilder and West (2023) concluded that the mathematical stories from post-secondary education faculty illustrated how their early experiences contributed to their success in other mathematical courses or tasks. Additionally, these lived experiences, whether positive or negative, shape how a person perceives their mathematical ability. Another factor contributing to a person's belief about their mathematical ability is how others view their mathematical ability (Wilder & West, 2023).

### ***2.10.3 Life History Research***

There are a variety of standards that are used when doing autobiographies or biographical research. These standards are genuineness, personal, historical, and fictional truths (Denzin, 1989). It is assumed that a person who has agreed to tell their story will be genuine about the personal truths in their life. Whereas historical truth can be verified with factual information about an event or experience, fictional truth may contain the “real” truth but is told with some inconsistencies (Denzin, 1989). People tell stories from their experiences and understanding. Therefore, truth is on a continuum between fact and fiction. Facts are proven to be true. They either have occurred or will occur. Facticity is a term to describe “how facts were lived and experienced by interacting individuals” (Denzin, 1989, p. 23), and according to Pierce (1959),

fiction contains both real and unreal facts and facticities in the story being told. The truth can be found in the context of the facts and facticities (Denzin, 1989).

#### ***2.10.4 Life History Methodology in Adult Basic Education***

Life history methodology is a qualitative narrative inquiry research application that has proven its value in understanding the lived realities of individuals by gathering in-depth and detailed accounts of their experiences. The person is the focus, and their story is the data. Their lived experiences and interpretations of those experiences are vital to life history methods (N. Denzin & Lincoln, 2011).

After reviewing four international studies that have utilized life history methodology on adult basic mathematics and numeracy learners, I understand how they interpreted this methodology. Life history methodology is not prescriptive in the way the research is conducted. It is a way to elicit stories that reveal important data points that qualitative research questions can address. Two of the studies investigated learning theories and how they might apply to the stories of their participants. Wedege(1999) was interested in how Lave’s theory on situated learning did not align with propositional learning with adult learners since adults use math daily. However, few identify the activities as being mathematical. The mathematical journey of a 75-year-old woman, Ruth, was captured using life history methods (Wedege, 1999). Her story was then analyzed through the lens of both Lave’s situated learning theory and Bourdieu’s habitus to explain the knowing and not knowing mathematics in different contexts (Wedege, 1999). Bourdieu’s habitus is a sociological idea that looks at how social factors and beliefs may have influenced Ruth’s dislike for mathematics since Ruth was a draughtsman and utilized math

frequently with her job (Wedeg, 1999). Additionally, it was revealed that Ruth was the researcher's mother, which speaks to the personal relationship that must be developed to garner an in-depth story.

Siivonen (2012) was interested in investigating the social constructs of Finnish adult learners. The beliefs of an adult's ability to study and learn mathematics appear to have consequences that extend beyond the acquisition of learning (Siivonen, 2012). Their study found that Finnish adult learners believe that mathematics is something you are gifted with knowing. Furthermore, society associates masculine characteristics with being good at mathematics (Siivonen, 2012). This conclusion was reached after conducting life history research on twenty adult learners. It is unclear if these stories were collected during one meeting or throughout several interviews.

The following two journals were different in their design. Ryan and Fitzmaurice (2017) used a mixed methods approach using life history methods as the qualitative portion of their study on mathematics anxiety among adult learners. Coben and Thumpston (1995) conducted a case study investigating mathematics in people's lives using life history methods with one participant, William. Both studies utilized interviews as their tool of measure over some time. Ryan and Fitzmaurice (2017) utilized McAdam's framework for conducting their interviews and analysis, which is a tool that can be used to understand personality. McAdam's framework draws from psychology theories and investigates how stories are told. Coben and Thumpston (1995) told the story of William's perception of mathematics throughout his life. Both were investigating perceptions, and both found that a negative perception appears to have negative



effects on mathematical learning. Furthermore, Coben and Thumpston (1995) coined the phrase ‘invisible mathematics,’ which refers to the math that a person can do but does not recognize as math.

These four studies used different life history methods to elicit mathematics stories from adult learners. Their goals were all different. Some tried to explain phenomena (Ryan & Fitzmaurice, 2017; Siivonen, 2012; Wedege, 1999), and one was retelling the story of one adult learner to understand his perception (Coben & Thumpston, 1995). By reviewing these studies, I can build upon the work that has been done.

### ***2.10.5 Assumptions***

The several assumptions for this study. First, application of the life history method will discover the perceptions of others that have been filtered through prior memories and experiences (Langness & Frank, 1981). Second, the interviewee can recall, structure, and communicate the lived experience through a life history review (Field & Morse, 1985; Watson & Watson-Franke, 1985). Third, I must recognize and control for preconceptions of my biases (Burns, 1989). Last, through writing, I will be able to express the lived experience of ABE mathematics instructors.

### **2.11 Summary**

A culmination of my literature review for my pilot study, a deeper dive into math identity, teacher beliefs, perception and knowledge, and life history methodology, inform me of constructs used in my pilot and proposed studies. This information is grounded in peer-review journals and utilized in other studies. The subjective experiences shape a person’s beliefs,

perceptions, and knowledge about numeracy and mathematics. In a pilot study, I investigated the perceptions of adult learners who were currently in or had been in an ABE program. This study focused on students. In my proposed research, I will focus on teachers.

The literature and theories on adult learning, math identity, math anxiety/trauma, teacher beliefs, perceptions, and knowledge, along with the pilot study on adult learners, have left me wondering what are the perceptions of ABE math and numeracy educators based on their personal experiences with mathematics. Two research questions have to address this area of interest been developed to pinpoint and guide me to learn more about ABE math and numeracy instructors. Their subject experiences of learning and teaching mathematics through a historical examination will reveal vital information about this little-known world of teachers.

## **2.12 Research Questions**

This study seeks to address a research gap by telling the stories of adult basic mathematics and numeracy educators to understand the following questions better:

1. What events in ABE math instructors' life histories contribute to their mathematical self-identity?
2. How do ABE math instructors' life histories contribute to and reveal their knowledge, perceptions, beliefs, and practices about mathematics instruction?

### CHAPTER 3 – RESEARCH METHODOLOGY

Education research is a well-established scientific field investigating learning processes and their impact on human development and outcomes. The field seeks to provide a comprehensive understanding of how learning occurs throughout an individual's life and how different educational contexts and factors, such as human attributes, interactions, organizations, and institutions, can influence learning outcomes (J. Green et al., 2012). Education research employs rigorous research methods appropriate for addressing the research questions to achieve its goals. These methods may include qualitative approaches such as interviews, case studies, ethnography, and quantitative methods such as experiments, surveys, and meta-analyses (Creswell & Creswell, 2017).

Story-telling is a natural way of speaking about events in a person's life. Most stories have a beginning, middle, and end that lead to a new beginning, middle, and end, repeating in one big loop throughout our lives. Life histories are recalled experiences of undocumented authenticity in which the narrator depicts how they perceive past events. It is how the narrator depicts the events. The life history method has some strengths over quantitative methods. According to Plummer (2001), life history interviews are "a kind of autobiography which can be narrated or witnessed and which allows for the exploration of the life experiences of the person interviewed" (p. 4). The development of a person's mathematics understanding has boggled educational researchers. By allowing people to show how mathematical events unfold and are interwoven into their lives, we can gain insights that cannot be captured by completing assessments. As Braun & Clarke (2013) note, life history interviews "offer an opportunity to

access the rich and complex lives of research participants" (p. 9). Many life histories have been published in the study of sociology and anthropology. The stories may be as captivating as a thriller, a mystery, or a tragedy. They are personal and real. These lived experiences of people who were once students have important things to teach practitioners and researchers.

Little is known of the adult basic educator. How did they find their way to this profession? What classes have they taken to prepare them to teach ABE? Life history methods are a way in which researchers may gain insight into ABE that is not readily accessible by quantitative methods (Goodwin, 2012). Life history methodology is a qualitative narrative inquiry whose purpose is to collect stories and perceptions through in-depth and detailed accounts of the lived experiences of adult basic mathematics and numeracy instructors currently teaching in ABE programs. My research will also explore the teachers' perspectives on mathematics from their subjective experiences.

This study sought to tell the story of the mathematical journey of these hidden teachers by collecting their lived experiences. I used topical, researched life history methods. I collected their real-life experiences, and the data was the stand-alone stories. Then, I looked at the stories holistically. In Chapters 4 and 5, I reported and interpreted the meaning of these stories.

### **3.1 Overview of Research Design**

This study was conducted using the life history methodology. Life history methodology is a qualitative narrative inquiry research application that has proven its value in understanding the lived realities of individuals by gathering in-depth and detailed accounts of their experiences.

The person is the focus, and their story is the data. Their lived experiences and interpretations of those experiences are vital to life history methods (Denzin & Lincoln, 2011)

In the early 1900s, autobiographies about indigenous American leaders were some of the first life histories. These stories help researchers understand the experiences of the population of interest (Atkinson, 1998). Sociologists and psychologists have utilized this methodology. Polish peasants telling their stories about moving to the United States, gangs in Chicago, and life in the ghetto were some of the first studies published using this narrative method (Atkinson, 1998; Goodson & Sikes, 2001). Life histories or stories allow researchers to experience a living embodiment of a lived event (Scott-Pollock, 2023).

When medical professionals collect historical medical information, they do so to learn and understand how to address any medical problems. The narratives collected allow for the professional to diagnose or treat their patient. Similarly, this study aims to collect lived experiences to learn and understand the mathematical journey of adult basic math and numeracy educators. These stories allow researchers a unique perspective beyond a survey, assessment, or structured interview. Stories are woven together over a lifetime, and these stories will inform policymakers, researchers, and other practitioners of their beliefs and how they create meaning about mathematics.

The research design of this study is ethnographic. It portrays the mathematical journey of ABE mathematics teachers to gain insight into their perceptions, beliefs, and knowledge of mathematics. The life history method is selected to view these lived experiences comprehensively. This methodology requires extensive interviewing techniques to uncover the

personal perspective of each teacher, as they are currently trying to understand their own experiences (Watson & Watson-Franke, 1985). A comprehensive review of each instructor's life provides data for identifying shared experiences (Dobbert, 1982; Field & Morse, 1985).

### **3.2 Research Questions**

This study sought to address a research gap by telling the stories of adult basic mathematics and numeracy educators to understand the following questions better:

1. What events in ABE math instructors' life histories contribute to their mathematical self-identity?
2. How do ABE math instructors' life histories contribute to and reveal their knowledge, perceptions, beliefs, and practices about mathematics instruction?

Life history interviews were gathered, summarized, and evaluated to understand the stories of ABE math instructors' mathematical journey and the experiences that had a bearing on their teaching practices.

This chapter opened with the suitability of using life history methodology for this study, then the stated research questions that directed this study, followed by my reflexive autoethnography. Then, there is a small section on data collection describing information about the participants and the recruitment process. Also, in the data collection section are details about the preparation process used in conducting interviews, along with the process used in data management and organization for analysis.

### **3.3 Reflexive Autoethnography**

Reflexivity in qualitative research is important for ensuring rigor. An ongoing self-scrutiny occurs at every moment of this study (Finlay, 2002). Traditionally, a researcher's positionality may assist in identifying biases to ensure that decisions made in our study have a limited impact on the outcome (Pillow, 2003). However, this endeavor may fail to reveal implicit insights that may impact my research rigor since I am exploring an area where I "possess a priori intimate knowledge of the community and its members" (Hellowell, 2006, p.282); thus, making my reflexivity more challenging to achieve through traditional protocols (Greene, 2014). Therefore, I addressed how my personal and professional experiences may have influenced this study by retelling my own math journey. My reflexive autoethnography acted like a mirror of my own experiences and offered a unique view of an otherwise private area of my life (Scott-Pollock, 2022). Since my story was to become intertwined with the participants' stories in this study, I had to be keenly aware of my internal monologue, responses, mannerisms, and questions as I actively engaged in conversations with participants of this study (Scott-Pollock, 2022). The re-telling of my story before conducting any data collection allowed me to be aware of my biases and experiences that I brought to this study. My story is now a part of the data. Being a part of the data allowed a more complex level of understanding of these stories (Scott-Pollock, 2022). The following questions guided my reflexive autoethnography: How do my personal and professional mathematical background contribute to my perception of other mathematics educators' stories? How might these new experiences influence my reasoning and attitude as a researcher?

### ***3.3.1 My Story***

Growing up, I never considered myself a mathematician. My earliest memory of numbers was in pre-school. I attended a Montessori School. I vividly recall telling my mom with jubilation that I could count to 33. I must have been four years old at the time. I was proud of the fact that I was able to count that high. It was higher than most of the other kids.

In the 1980s, the first gaming systems were created. My parents bought us an Intellivision gaming console. It came with educational games. My brother and I would play a game called “Math Fun.” Any chance we could, we would ask to play this game. We would turn on a big console RCA computer, switch it to Channel 3, then flip the switch on the back of the television and turn on the console. We would eagerly await the question, “How many players?” Sometimes, we would play against each other, and other times, we would play against the computer. We would select the difficulty level and the number of problems we were willing to work on before the game began. When the game started, the vibrant colors on the screen showed two gorillas walking along a river to carnival-like music, and they encountered animals with an arithmetic problem. To get by the creature, you had to answer the problem correctly. The problems ranged from simple addition to two-digit long division. If you got the problem wrong, you would be thrown into the river and have to fight off alligators by answering their problems correctly. Whoever correctly answered the most questions the quickest would be designated the winner, and their gorilla would jump up and down as the celebration music played. At the time, neither my brother nor I realized that this was teaching us math facts. It was entertaining and the only video game we had at the time.



Another game that we owned was a handheld Texas Instruments, “Little Professor.” It was a device that would present computations that you would answer. It was yellow plastic, with the face of the professor holding an open book. The professor has a mortarboard for a hat and a white mustache with black glasses on his face. He was a white male with no mouth because it was hidden behind the book. There were yellow buttons for each of the numbers and operations on the front face, similar to a simple calculator. You would select the difficulty level, and he would begin displaying a problem on his forehead in red digital numbers, a problem for you to solve. If you got it right, it would move to the next problem, but if you got it wrong, you would see “EEE” across the screen. You would have three attempts to answer correctly before revealing the correct response. Once again, I did not realize this toy was yet another way to practice math facts. Both of these games reinforced my computational fluency. At the time, I saw it as a way to play and have fun. It was competitive, and I liked solving the problems.

My primary school memory of mathematics was in third-grade. We were introduced to multiplication facts. I quickly picked up on the pattern, but I remember struggling with six times eight. I remember knowing the facts before and after that one, so I would either count up six from six times seven, or I could count backward by six from six times nine. I enjoyed the timed math facts tests. I remember completing over one hundred single-digit multiplication facts in three minutes. To this day, I find multiplying in my head relatively easy and push myself to multiply two-digit numbers by two-digit numbers.

I remember being moved down in math in middle school around the seventh grade. I cannot remember precisely why I was moved, but I was in an accelerated math course and was

moved back to the standard course mid-semester. It was at this point that I began to doubt my math ability. In high school, I was bullied by a younger classmate in geometry class. I do not remember learning math, although I did feel like I was not good at math because I was in the same class as a freshman. In my junior year, I remember my teacher bullying me. He thought he motivated me but consistently called on me to answer questions. I did not know the answer to the questions he asked. I would copy my homework from others before class because I despised math. One specific memory from high school was a lesson on complex numbers. For some reason, I liked the idea of these numbers, so I received a 100% on a test on this concept. The teacher had written, "It must be a Christmas Miracle" on the top by 100%. His comment hurt me; that was the last math course I took until college.

After graduation, I enrolled at our local community college and was placed into College Algebra. I do not remember much about that class except that I passed with a B. I know that I was not a model student in my youth. I did not have to work to pass classes, and my parents did not push me to do more, nor was I reprimanded when I failed a test like my peers were. I floated through school doing enough to pass, and then I stopped going to school and entered the workforce.

After a ten-year break, I returned to school determined to achieve a degree in engineering to provide for my son. I was a newly divorced single mother who had been in a toxic marriage. My lifestyle had ended abruptly, and a new path was forged due to losing this relationship. I had lost my assistant bank manager job in an urban city, I had lost my marriage, and I had lost myself. I remember being enrolled in trigonometry and that the instructor was also my advisor.

He met with me and my little son. He asked if I needed a job and told me about a part-time opportunity to tutor math at the college. I told him that I did not think I was good enough to tutor math, but he convinced me to try. He said that tutoring algebra would help me in my trigonometry course and was one of the highest-paying jobs for students on-campus. I needed a job. I was an unemployed, single mother who was 28 years old and was trying to create a future for my son.

I believe I was the worst tutor that first year. I remember telling students misinformation about concepts they were learning, but I tried to relearn algebra while tutoring them. My advisor/teacher told me I could call him day or night if I needed guidance, and I did. His wife had to put up with me calling during dinner time or interrupting their family time. Nevertheless, he always took my call. He always helped me. I earned my first A in math that I can remember. I remember seeing the final grade and going to his office to ask if he had recorded the grade correctly. At that moment, because of him, I began believing I could do math.

I had that instructor for another three semesters. I took my entire Calculus sequence with him. I was growing and developing my learning. I continued as a math tutor for the next six years. The college hired me as a professional tutor while working on my bachelor's degree. They even allowed me to teach a class one semester in the evening because they were short-staffed. It was in developmental math, but I did not care.

After graduating with my bachelor's degree in math, I knew all the negative things my ex-husband said about me being dumb were false. Math gave me self-esteem and self-confidence. Having a degree in a topic that many people find difficult was terrific. I kept in touch

with my advisor, and after earning my degree, he convinced me to continue my education in mathematics. I asked him what to do with a Master of Science in Mathematics; he said teach. I remember telling him I could not be a teacher because teachers were paid poorly, and I wanted to provide well for my son. Later that Summer, I bumped into a woman I tutored privately at the grocery store. The TRIO program, a federally funded service designed to help students graduate or transfer to four-year universities, had hired me to tutor her in math at home under a few conditions. First, if her husband was home, I had to pretend not to know her if I saw her in public or say I was there to tutor her should I encounter him at home. Second, I had to keep our meetings secret. She was in an abusive relationship. He would not allow her to attend school, but she was determined to create a better life. She stopped me and said, "I want to introduce you to my kids. Kids, I want you to meet the woman who made it possible for momma to leave and create this better life we have." I stood there stunned, and tears welled up in my eyes (they still do when I retell this story). That is when I knew I wanted to be a teacher. I wanted to provide a better life for all who seek it.

After being away at graduate school for a year and a half, I found the Cowley College Adult Education and College Preparation (ABE) Program. My son was eight years old, and we lived far away from friends or family. I found that going to graduate school in math was a nightmare. Once again, I was met with professors who made me believe that I would never graduate. The department chair told me I do not think logically enough to be a mathematician. I could feel the doubt growing and the confidence waning. I was miserable. So, I thought back to when I was the happiest, and that happiest time was when I was at Cowley College, helping

people learn math by tutoring them. I decided to leave the university I attended before achieving my master's credential, but I had earned more than 25 graduate hours in math and my bachelor's degree. Those credentials would allow me to teach at a community college. Unfortunately, Cowley was not hiring math instructors at that time. Nevertheless, the ABE program was hiring for a part-time math instructor. I applied for the job in 2005 and was given the position. I worked part-time for one year, then moved to full-time.

I worked in the ABE program from 2005 to 2014 as a math instructor and then as ABE Coordinator. This role worked directly with the director on designing, training, and implementing instruction for all teachers, writing grants, and inputting data. During this time, I gave my first national conference presentation, "Mathematical Metaphors." This presentation introduced me to Literacy Information and Communication System (LINCS), a group affiliated with the United States Department of Education, Office of Career, Technical, and Adult Education. They interviewed me for a listserv moderator position in their newly formed Math and Numeracy Community. I was given that position in 2010 and was hired as a national trainer for them. I have met some extraordinary people in the ABE Math and Numeracy field. They have been very impactful in my life. The instructors and students are why I am interested in researching ABE. Over my hundreds of training events, I have heard teachers talk about their math stories and classroom students share their stories.

My teaching philosophy is deeply rooted in humanism. My life experiences have shown me that addressing emotional, intellectual, and personal growth is key to teaching adult learners. It can be seen in my own story. I was thrown away by my ex-husband and made to feel unworthy

as a person. However, I did not stay knocked down. I rose up because I was encouraged by a positive, relatable teacher who pushed me to learn independently and take ownership of my learning. In 2018, I was allowed to achieve the highest level of education and become a researcher. It was difficult to leap back into school, but I am glad I took this journey. I have learned many ways to conduct research. The model I use for this study is an example of that knowledge. I always knew that I was interested in the stories people told me, and now I know how to make these stories into research that will benefit the field.

Now that I had addressed my biases and experiences and become aware of my internal dialogue and mannerisms, I was ready to begin data collection for this study. Retelling my math journey was important for me to understand the emotions I encountered during the data collection process. It allowed me to heal in some ways and become part of the collective.

### **3.4 Data Collection**

After receiving Southern Methodist University IRB approval, I began with the data collection for this study. This process started with me. I read several books on life history interviews and interviewing procedures as a qualitative method. I reflected on why these stories must be collected and told and how they will benefit researchers, practitioners, policymakers, and other audiences (Atkinson, 1998; Merriam & Tisdale, 2016; Scott-Pollock, 2023). I considered how I would establish a rapport with the participants and create a space for the participants to feel safe. I created a plan on how I would manage and store the data, obtain data sufficiency, and follow life history protocols to ensure the validity of the data (Creswell & Creswell, 2017; Reissman, 2008; van Manen, 2016).

Life history interviews were the data source for this study. The interviews were recorded, transcribed, summarized, and analyzed continuously starting in August 2023. This sample of participants was purposive. ABE math and numeracy instructors are a hidden population that may be difficult to locate using traditional sampling methods. Therefore, I used snowball sampling. Snowball sampling provided a way to identify and recruit this population by leveraging the social networks of existing instructors. This method has been used successfully in previous research studies to identify and recruit hidden populations (Campbell & Soeken, 1999; Watters & Biernacki, 1989). Participants were recruited in three ways. First, I reached out to my colleagues in the field of adult basic education. Second, I contacted the national organization known as the Adult Numeracy Network, and lastly, I requested that each interviewed participant refer a person to this study. I created a recruitment letter (Appendix D) that contained a link to an initial demographic survey (Appendix C), containing the informed consent (Appendix G) and availability to meet to be interviewed. The recruitment letter reminds participants that recalling memories may be difficult, and they may choose to stop the interview at any time. Participants were given mental health resources in the informed consent that are free of charge to anyone who felt like they may need mental health support.

Fifty-three people responded to the survey; however, only 38 individuals completed the informed consent and set up a time to be interviewed. Participants were contacted in the order they responded to the initial survey. Then, participants were sent a ZOOM invite and the potential interview questions (Appendix E) after confirming their availability.

### ***3.4.1 Surveys***

Two surveys were made using Qualtrics. One survey was sent out with my initial recruitment email. The survey contained informed consent, collected demographic information, and asked for availability to set-up their interview time. See Appendix C for a detailed list of items that were placed on the initial survey. The survey invited the respondent to take part in narrating their professional and personal math journeys. After the IRB form, participants were asked if they agreed to be video-recorded and keep their cameras on as part of their participation in the research study. The options were “No, I do not consent” and “Yes, I also consent for my video recordings to be played for scientific or educational audiences. Participants can contact the principal investigator if they change their minds about their video recordings being played for scientific or educational audiences.”

The post-survey was sent to each participant’s email after their interview. In the email, participants were encouraged to complete the survey and also were asked to refer another instructor to participant in the study. This survey asked for information about their education, work-related items, and an autobiography about their journey to become an adult education mathematics teacher (Appendix F). Sixty-eight percent of the participants completed the post-survey.

### ***3.4.2 Participants***

During August 2023, I interviewed 38 ABE math instructors who had taught an ABE math class in the past 18 months. The majority of respondents self-reported their gender as female (n=32), their ethnicity as non-Hispanic (n=30), and their race as White (n=31). The age



range was 45 years, with the youngest participant reporting their age at 27 years old and the oldest at 72 years old. The mean and median age was 50.5 years old. Table 5 contains the reported demographic information and the assigned pseudonym given to each participant. Figure 2 illustrates the age of each participant in this study. Twenty-six respondents completed a post-survey about their highest degree and whether they teach full-time or part-time, as shown in Figure 3. Only eight reported that they only teach math, while 12 reported teaching math, science, history, reading, and writing. The remaining five teachers reported that they teach a combination of three of the five subjects for their program, with one not responding. The post-survey completers were also asked how many days they taught math each week and how many hours each week were dedicated to the subject in their classrooms. The median days that math is taught were reported as 4, and the mean was 3.5. The median number of hours math is taught each week was 9, and the mean was 10 hours.

Figure 2: Age of Participants (n = 38)

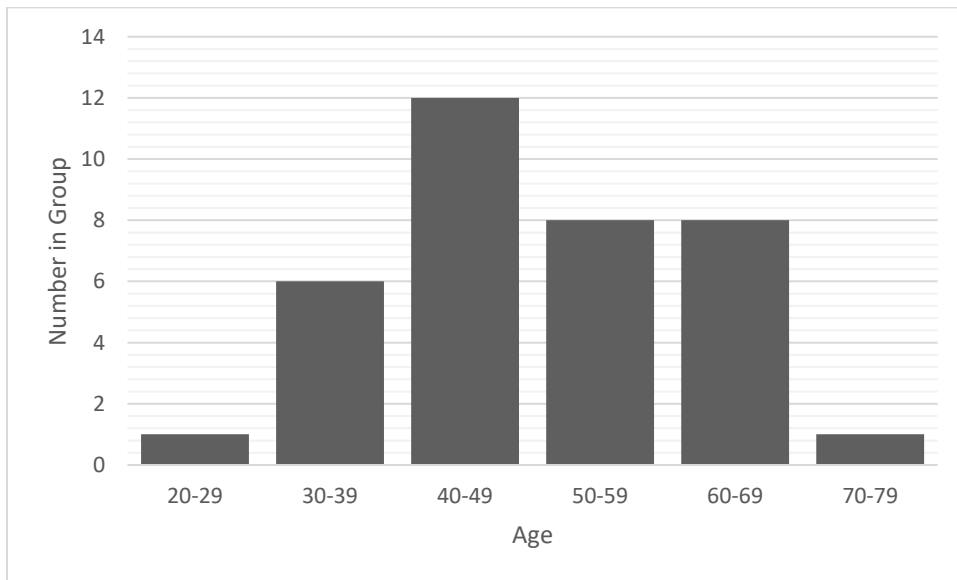


Figure 3: Highest Degree and Employment (n=26)

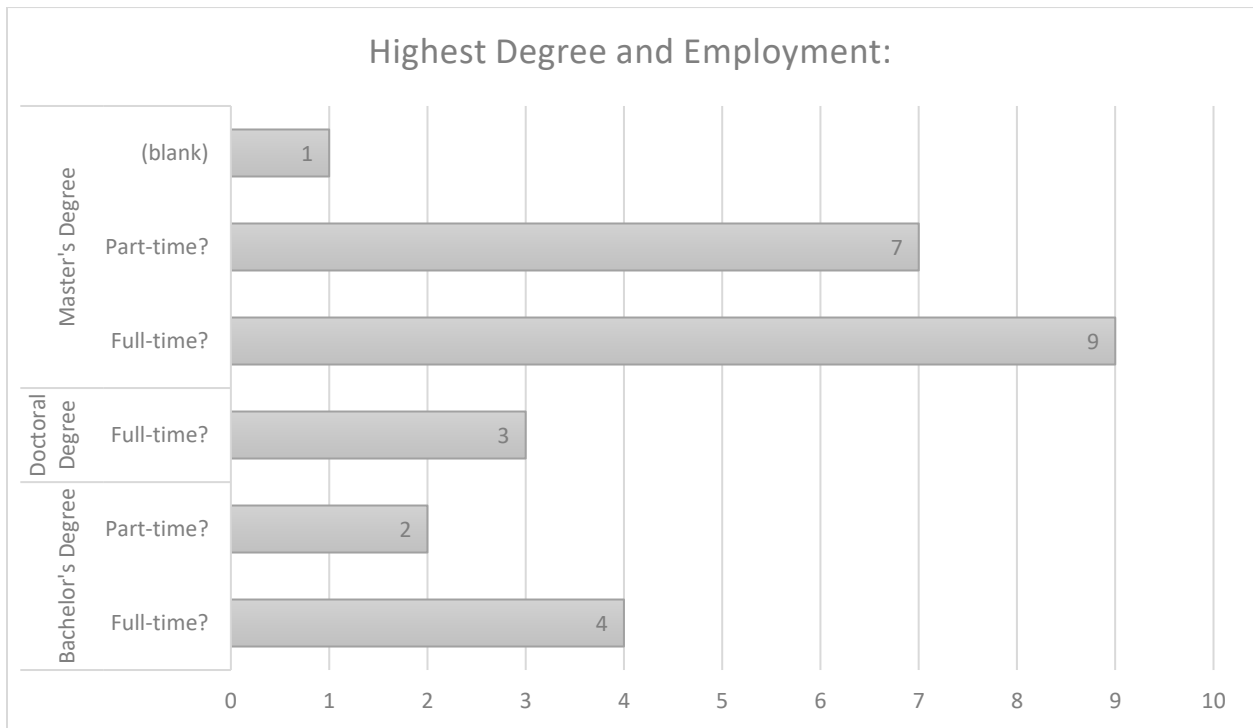


Table 5: Demographic Information and Pseudonyms

Name	Age	Gender	Race	Ethnicity
Abby	61	Female	White	Non-Hispanic
Betty	44	Female	White	Non-Hispanic
Cathy	49	Female	White	Non-Hispanic
Denise	60	Female	White	Non-Hispanic
Edith	63	Female	White	Non-Hispanic
Francis	45	Female	White	Non-Hispanic
Greta	57	Female	White	Non-Hispanic
Harry	32	Nonbinary	Black	Non-Hispanic
Ida	45	Female	White	Non-Hispanic
Jenny	64	Female	White	Non-Hispanic
Karen	54	Female	Black	Non-Hispanic
Lori	46	Female	White	Non-Hispanic
Monica	39	Female	White	Non-Hispanic
Nikki	37	Female	White	Non-Hispanic
Ophelia	27	Female	White	Non-Hispanic
Paula	58	Female	White	Non-Hispanic
Quincy	57	Male	White	Non-Hispanic
Rhonda	44	Female	Black	Non-Hispanic
Shannon	52	Female	White	Non-Hispanic
Tom	48	Male	White	Non-Hispanic
Urias	37	Female	White	Non-Hispanic
Victor	54	Male	White	Non-Hispanic
Wilma	54	Female	White	Non-Hispanic
Xena	41	Female	Other: Puerto Rican	Hispanic
Yolanda	61	Female	White	Non-Hispanic
Zoey	43	Female	Black	Hispanic
Aashi	62	Female	White	Non-Hispanic
Bianca	48	Female	Black	Non-Hispanic
Candy	63	Female	White	Non-Hispanic
Danielle	40	Female	White	Non-Hispanic
Elizabeth	39	Female	White	Non-Hispanic
Sarah	57	Female	White	Non-Hispanic
Tracey	32	Female	Black	Non-Hispanic
April	44	Female	White	Non-Hispanic
Pam	60	Female	White	Non-Hispanic
Meg	72	Female	White	Non-Hispanic
Rachel	62	Female	White	Non-Hispanic

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### 3.4.3 Interviews

Interviews were the primary collection tool, with myself serving as the instrument. It is common practice for the researcher to be the instrument used in data collection in sociological and anthropological fields (Lincoln & Guba, 1985; Seidman, 1998). Life history interviews take considerable time (Goodson & Sikes, 2001). The interviews were open-ended and structured by the narrator rather than the interviewer (Hawkins, 1989; Seidman, 1998). Some respondents were talkative, while others were reserved. Nevertheless, I had prepared for the interviews by reviewing the literature on interviewing in qualitative research, methodological books, articles, and videos on interview techniques (Bernard et al., 2017; Cole & Knowles, 2001; de Chesnay & Fisher, 2015; M. de Chesney, 2015b, 2015a; Langellier & Peterson, 2004; Peterson & Langellier, 1997; Scott-Pollock, 2023). Additionally, I have developed strong interpersonal communication skills from years of experience interviewing adult education students about their lives and goals. Also, as a graduate research assistant, I was responsible for several field interviews of individuals from all walks of life. These interviews were not conversations, but some were pretty personal. Therefore, during the interviews, I remained a supportive and focused audience, listening to the information being told and writing clarifying questions about segments that were not complete. I asked clarifying questions to ensure a complete story was told without missing pieces and allowed the informant to lead and disclose any story they deemed meaningful to share (Cole & Knowles, 2001). An accurate and truthful account of their experiences and perceptions, rather than fictional story-telling, was the objective of these interviews (Bernard et al., 2017; Cole & Knowles, 2001; Goodson & Sikes, 2001).

At the beginning of the interview, I took a few minutes to introduce myself and thanked each participant for their willingness to share their math journey with me. I explained the purpose of the study, how their information would be stored, and who would have access to it. I also reminded each participant that I would be video recording our interaction, and these recordings may be played for scientific or educational audiences. Furthermore, if they were more comfortable with not being on camera, they could turn it off before the recording started. Then, before I began recording, I would ask them if they had any questions, and I would answer them. This short interaction seemed best for them to build trust with me. After all, trust is an essential element in life history research. Then, I would let them know I was starting the recording. I needed to remind each participant that I wanted to hear about their math journey first, and then we would talk about their work as an ABE math teacher. They would acknowledge they understood, so I would ask them to tell me the story of their math journey from their earliest memory to where they are now. I remained an active listener during their stories. I allowed each participant to talk the majority of the time. The amount of time each interview took is reported in Table 6, along with the percentage of time that each interviewee talked. The percentage was calculated using Otter.ai.

Table 6: Length of Interview and Percentage Interviewee Spoke

Interviewee number	Length of Interview (hh:mm:ss)	Interviewee Spoke
1	36:31	75%
2	51:36	79%
3	30:35	91%
4	51:00	86%
5	39:00	84%
6	36:00	90%
7	32:10	87%
8	30:42	76%
9	29:28	86%
10	36:55	64%
11	41:10	84%
12	26:47	88%
13	1:11:27	96%
14	49:33	85%
15	35:11	83%
16	38:58	70%
17	36:17	82%
18	33:47	86%
19	34:13	95%

Interviewee number	Length of Interview (hh:mm:ss)	Interviewee Spoke
20	43:02	84%
21	55:34	75%
22	43:02	84%
23	38:07	86%
24	51:35	90%
25	48:22	79%
26	24:43	77%
27	38:22	64%
28	31:41	82%
29	28:18	75%
30	55:00	66%
31	59:12	51%
32	1:14:18	55%
33	41:55	96%
34	38:41	57%
35	37:39	69%
36	36:03	61%
37	58:25	78%
38	16:08	67%
<b>Total</b>	<b>26:01:27</b>	

Interviewee number	Length of Interview (hh:mm:ss)	Interviewee Spoke
Mean (SD)	00:41:06 (00:12:17)	78%(12%)

After each participant has shared their story with me about their mathematical journey and told me about their current mathematical instruction, I would ask them if they had any other questions for me. I would wait for them to ask and answer any questions they had thought of while being interviewed. Every interviewee asked if they could read my final paper. I would tell them that when it became available online I would let them know or if it was published in a journal I would make sure they would receive a copy, too. Next, I would tell them that I was going to have their interview transcribed and I would summarize the story that they told me. I asked each one if I needed further clarification would they be willing to speak with me again. Everyone said they would. Then I told them I would be sending them a post-survey within 24-hours. I asked if they would complete it for me. The session would end with me thanking them for their time.

#### ***3.4.4 Data Storage***

Each ZOOM file was uploaded to a password-encrypted cloud storage. There were anywhere from three files per interview: an audio file, a video file, and a transcript. The ZOOM transcript was not accurate enough for this study; therefore, I had all video files transcribed by Otter.ai. Once a file was transcribed it was moved into the password-encrypted cloud storage, along with the survey information from Qualtrics. All participants were given pseudonyms to protect their identity. The identity of each participant is not in the same file as the transcript and



ZOOM files. They are labeled in the order in which they were collected starting with number one. Transcripts were verified by listening to each interview again, corrections were made during this process in preparation for the data analysis.

### **3.5 Data Analysis**

There were three stages of this study. The first stage consisted of emailing colleagues and a professional organization asking for help in identifying participants. The email sent out had a letter (Appendix D) detailing the study and asking for participants to sign-up by completing an online survey (Appendix C). Participants were then contacted in the order in which their survey was submitted for a time to be interviewed. Interview times were set, and the interview questions (Appendix E) were emailed along with their scheduled ZOOM time.

Stage two was the collection of the qualitative data transcribed from open-ended interviews. After their interview, participants would receive an email thanking them for their time, asking them to complete a post-survey, and requesting they recommend a colleague to participate. A copy of the initial invitation letter (Appendix D) was attached to this email. As a researcher, I found checking each interview for correctness and summarizing each story overwhelming. The volume of collected information was more than what was needed for this study. A constant reminder about the purpose of this study and the questions that were being addressed assisted me in summarizing each story. Additionally, it was important to remind myself to remain unbiased in my summaries and to do my best to re-tell the stories I was told.

The third stage was the formal data analysis. The summaries of the stories told to me and the repeated reading and listening to each story, whether transcription or audio files, helped to

allow the data to come together into categories and retell a shared story (Merriam & Tisdell, 2015). Patterns took shape in this iterative process. During this stage of my analysis, I performed the principle of triangulation using different theories. This theory triangulation allowed me to analyze and interpret the data with theories from my conceptual and theoretical framework to support my findings (N. Carter et al., 2014). To address confidentiality and privacy, I created pseudonyms for each participant, and the list was moved into an encrypted password-protected cloud storage. In the final stage, I knew data saturation had been achieved for the group of educators that did not experience struggle in their mathematical journey. Although one common story was not told, there were shared beliefs about positive emotions about mathematics from 16 of the 38 instructors (Glaser & Strauss, 1967). The stories about struggling in elementary school with timed assessments or math facts mad minute tests seemed to be shared with the 10 of the 38 instructors. This shared experience of timed assessments in the stories about struggle at the primary school level suggests that data saturation was achieved (Glaser & Strauss, 1967). I concluded that data saturation was not achieved at the middle school and high school levels because no one unified story was told at those levels. These common narratives were told with emotional responses and a desire to help themselves and their learners (Glaser & Strauss. 1967). Multiple reviews of the data were done, and specific vignettes were used to authenticate my findings.

### ***3.5.1 Stage 3***

There are several approaches that researchers may use to analyze narratives, such as: thematic analysis, grounded theory, analytic induction, and narrative analysis (Bryman et al.,

2021). I chose to use narrative analysis for this study. Similar to other things in qualitative research, narrative analysis has multiple approaches to examining the data or stories told in an interview (Langellier & Peterson, 2004; Peterson & Langellier, 1997; Riessman, 2008; Wells, 2011). Some more familiar ways of analysis are narrative structure, sequence, poetic structure, critical narrative analysis, discursive contextual, dialogic/performance, and identity. (Creswell & Creswell, 2017; Gee, 2000; Gregg, 2006; McAdams, 1993; Patterson, 2008; Riessman, 2008; Wells, 2011).

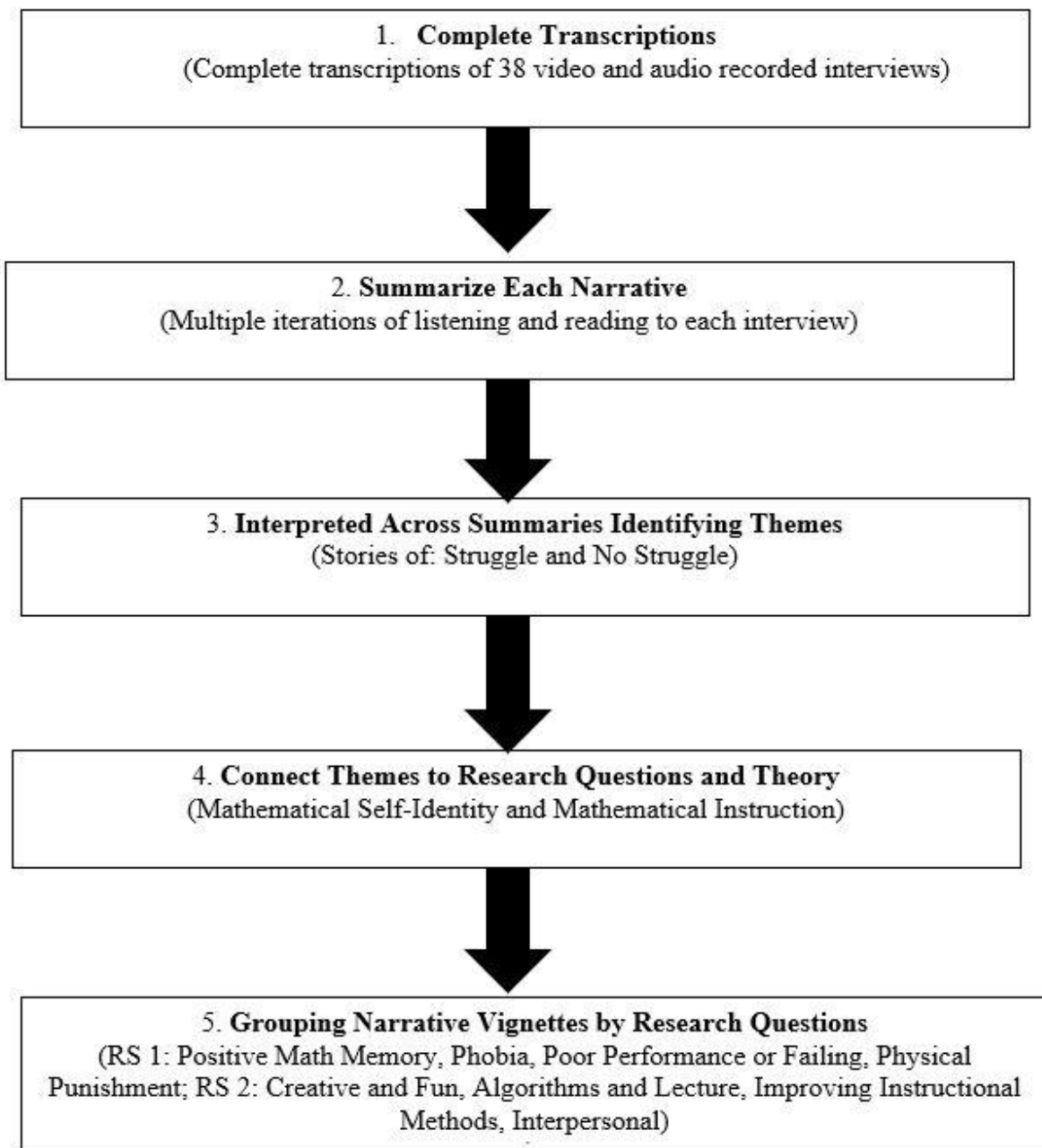
### **3.5.1.1 Narrative Identity Analysis.**

My research for this study focuses on the mathematical journey of ABE math instructors and understanding how this journey contributes to their mathematical self-identity and their mathematical knowledge, perceptions, beliefs, and practices. Hence, my examination employed an analysis of narrative identity. There are two types of narrative identity analysis: Gregg's (2006) methods and McAdams' method (1993). The method that Gregg (2006) advanced is better suited for studies where the individual's identity may be challenging to explain, or the participant might be unaware of their identity. Whereas, McAdams' theoretical framework explains how individuals construct their identities through the narratives they articulate (McAdams, 1993b; Vassilieva, 2016). Patterson (2008) suggests that a narrative analysis endeavor involves listening for what the story reveals about the person telling it, understanding their environment and reflecting on how their narrative can be construed, which provides a deeper understanding and insights into their life. The narrative identity does not dwell in the words but where the reader interprets the story (Well, 2011). I used the McAdams' model

(1993) design for interpreting narratives as identity. The process that I used is illustrated in Figure 3.

This type of analysis is traditionally used in psychological studies on identity. A person's identity is a complex concept that evolves from a lived event. These events impact the nature of a person's identity and may change it (McAdams, 1993). Events are often thought about as complete experiences or stories. These stories are told entirely. If the narrative is not told completely, then it may change the meaning or outcome of the stories (Litchman, 2006; McAdams, 1993). Therefore, the holistic view of the told experience allowed me to optimize the lived experience and see the complete picture. Viewing each statement within the story may prove meaningful, but it may also minimize the meaning of what was said or the context in which it was said (Litchman, 2006). Therefore, the categories that emerged from the stories told were exclusive.

Figure 4: Narrative Analysis Process



Each interview was summarized by first listening to the entire story while following along with the transcript. Since some people do not tell stories linearly, I highlighted pieces of their mathematical journey stories and made notes on a timeline from their earliest memory to their current position as ABE math instructors. Then I wrote up a summary of their story using both the notes that I had taken and the audio files. I listened to each interview multiple times to ensure that my retelling of their story was accurate. Once these summaries were done, I listened again to the pieces of their interview where they had told their story. Listening to these interviews multiple times allowed me to immerse myself into their lived experience. Their emotions and tonality while speaking became clearer with each iteration.

Next, I printed off each summarized transcript and grouped them into stories about struggles with mathematics and stories without struggles in mathematics, Table 7

Table 7: Vignettes of Stories of Struggle and Without Struggle in Math Journey

<b>Interviewee</b>	<b>Vignette</b>	<b>Struggle or No Struggle</b>
Pam	“I like math it was one of my best subjects	No Struggle
Scott	“...I love math, did well in math”	No Struggle
Danielle	“Math in elementary school was not good”	Struggle
Greta	“I struggle with math but I enjoy it”	Struggle

My second step after grouping the stories into no struggle and struggle was to reexamine my research questions and determine what themes needed to emerge to answer them. Then, I reviewed the theoretical and conceptual frameworks. I used a theoretically driven inductive

approach in that I generated common stories inductively, but drew from the theoretical aspects when creating groupings (Holstein & Gubrium, 2012; Syed & Nelson, 2015). Table 8, conveys the themes from the theoretically driven inductive approach for research question one and Table 9 are the themes for research question two (Syed & Nelson, 2015).

The major themes from the stories about ABE math instructors' math journey were positive math memory, phobia, poor performance or failing, or physical punishment. Stories that were told about with positive experiences were placed into the positive math memory group. Those stories were the consistent with feeling confidence, happy, loving math, or having high achievement. The stories that were about fear, anxiety, or avoidance were placed into the phobia theme (American Psychiatric Association, 2013). Stories about failing a math class or receiving a bad grade were grouped into the poor performance or failing theme and stories about being physically touched in a negative way were placed in the physical punishment theme. Stories about experiences were placed into one group by the main theme of the story.

The major themes from the stories about ABE math instructors' teaching practices were created directly from the theoretical and conceptual framework on teachers' perception, beliefs, and knowledge. The stories about algorithms and lecture and Active Learning were grouped from stories about how teachers described their instructional practices. If a story was told about how the instructional practices have changed through professional development, colleagues influence, or personal development including stories about content knowledge they were placed in the Professional Learningal methods theme. Caring was defined by two criteria, empathy and intimacy. Stories that were about placed in this group were about understanding and valuing

what others go through, recognizing how a person’s actions affect others, and being open to different points of view.

Table 8: Theoretically Driven Inductive Themes (RS 1)

<b>Participant</b>	<b>Vignette</b>	<b>Themes</b>
Francis	“I became an architect because my mother wanted to be an architect but she quit school to raise children. I thought like spatial reasoning and I’m good at math and numbers are cool so why not.”	Positive Math Memory
Rhonda	“My anxiety began in first grade with math minute and every morning we would have a sheet of 100 problems.”	Phobia or Emotional Response
Danielle	“And I just, I’ve never been good at anything timed. So I just never did well with those.”	Negative Performance Outcome
Candy	“And she’d look, and she would march down the aisle to me, slap me across the face.”	Physical Punishment

Table 9: Theoretically Driven Inductive Themes (RS 2)

<b>Participant</b>	<b>Vignette</b>	<b>Themes</b>
Nikki	“Like this is really different. This is not like the way that I remember learning math.”	Active Learning
Wilma	“man, I can’t believe these kids don’t know their multiplication facts. And that took me back to how did I learn mine.”	Algorithms and Lecture
Xena	And that’s where I fell in love with math, like, the genuine like interest in math, and teaching maths in learning more methods of math.	Professional Learning
Betty	“I am glad that I failed out of college because it gave me perspective that not everyone sees math the same way.”	Caring



Last, I used a spreadsheet to manually code the 38 summarized narratives. I first coded each story for research question one using the theme in Table 7 . Then, in a different spreadsheet I coded each narrative for research question two. As I was coding, I cut vignettes from the summarized narratives to help support my conclusions discussed in chapter four.

After creating my two groups, I reviewed each transcript again in the group that struggled and grouped them at different levels of educational setting: elementary, middle, and high school, and college at the time of their initial struggle. These initial groupings were a timeline to describe when the interviewee's story was taking place. Then I re-read their stories in each group to uncover patterns among these categories (Holstein & Gubrium, 2012). I continued this process and the guiding themes are discussed in chapter four.

### **3.7 Conclusion**

The purpose of this chapter was to outline the methodological processes including research design, research questions, reflexive autoethnography, data collection, and data analysis of the life history interviews of ABE math instructors. This chapter described the participants and detailed my mathematical journey story. The reasons for why a life history research design was used and why the narrative analysis was conducted to answer the research questions were given. The data source for this study was life history interviews. In Chapter four, the findings of the data analysis are presented followed by the inferences from the findings presented in Chapter 4.

## CHAPTER 4 PRESENTATION OF FINDINGS

This chapter contains the results of the life history methodology, the stories of the 38 ABE math and numeracy educators from across the United States. These participants generously dedicated their time to speak with me, sharing the narratives of their mathematical journeys. Each person told me a unique story about their math educational experiences and about their adult education classroom. These self-reported stories are told from the perspective of the respondents' truths to answer the research questions:

1. What events in ABE math instructors' life histories contribute to their mathematical self-identity?
2. How do ABE math instructors' life histories contribute to and reveal their knowledge, perceptions, beliefs, and practices about mathematics instruction?

In this chapter, two major sections will be presented to answer each of the research questions. The first section includes the stories of ABE math instructors' life histories and will be described by analyzing common stories. These stories will be examined to determine ABE math instructors' mathematical self-identity based on their life history narratives. Data collected from interviews will be used to answer this question. The second section consists of an examination of interviews of ABE math instructors' reflections of their teaching practices. Teacher interviews about their math journey stories and their description of teaching will be analyzed to describe instructors' knowledge, perceptions, beliefs, and practices about math learning.

This first section provides a summary of each instructor's mathematical journey that was used in this study. The summarized narratives are retold to provide a glimpse into the lived

experiences of these ABE instructors' mathematical journey. This section will be used in answering both research questions of this study. Findings in the second section will discuss the events that contributed to the mathematical identity of this group of ABE math teachings and what they reveal about ABE teachers perceived their mathematical practices, along with their knowledge and beliefs.

#### **4.1 Summarized Stories of Lived Experiences**

The 38 ABE math and numeracy teachers were asked to reflect upon their personal math journey and some memories or key areas that they remembered in an unstructured interview. Participants were given possible interview questions as a guide but were told to share whatever they felt comfortable sharing; they could talk about any story they had about their experience with learning math. At the beginning of each interview, I would briefly visit with them in friendly banter and thank them for participating in this study. I was asking these participants to reveal personal experiences with me, an intimate endeavor, when they did not know me. I wanted them to get a sense that their stories were valuable and important to be heard.

Prior to this study, I have had people reveal their math stories to me: traveling on airplanes, sitting at the coffee shop, nurses in doctor's offices, salespeople who I encountered, etc. To prepare myself for these stories, I carefully reviewed my research questions and the interview questions. I reflected both on my mathematical journey and my years of teaching ABE math. I felt confident in my ability to put people at ease, make them feel valued, and instill trust that I would retell their stories to benefit the field of adult education.

Unlike the short stories that had been told to me in casual settings, I sought to listen with intention to events as they were told to me. I jotted down notes to ask clarifying questions about so that I could understand all the details of their lived experience (Schutz, 1967). Some of their stories were detailed, full of emotions and experiences, while others needed probing to get to the all the nuances (Siedman, 2019; Atkinson, 1998).

For this study, I utilized a narrative identity analytic approach which allowed the stories to define the mathematical self-identity of each participant. Stories help shape who we are (Adler et al., 2017). However, the stories that people tell may not be factual or exact. The goal of this study was to learn about personal experiences through story-telling and how these stories contribute to our beliefs, perceptions, knowledge, etc., not whether or not the stories are accurate or true (Alder et al., 2017). The stories in context allow us to test the theories used to explain a particular phenomenon or event (Hammrack, 2008).

Participants told stories about their mathematical journey. Their stories were about different schools, teachers, locations, times, subjects, etc. but there were common feelings or experiences that were shared. They also shared stories and thoughts about their mathematical practices that may have been influenced by the mathematical journeys. Next, I will discuss the mathematical journey stories and how they reveal the mathematical self-identity of this group of ABE math instructors.

## **4.2 Mathematical Self-Identity**

The results of the narrative identity analysis are shared in this section. I used the summarized stories that I interpreted from ABE math instructors' life history interviews about

their math journey, supported by vignettes from their interviews. The data is presented into two groups, stories of no struggle and stories of struggle. Struggle and no struggle were defined in Chapter 3 of this study. Table 10 displays the percentage of each category.

Table 10: Percentage in Each Group (n = 38)

Category	Percentage
Stories of No Struggle	42%
Stories of Struggle	58%

The stories of struggle were further broken down by when the instructor first experienced struggle and theoretically driven inductive themes were created. Appendix H contains examples from all participants, examples of the groupings, and the themes. Mathematical journey stories were placed into one category based on the overarching idea of the summarized narrative. Next, I will discuss each theme and include vignettes that illustrate the ideas presented by each participant.

#### ***4.2.1 Positive Math Memory***

Sixteen of the 38 interviewees reflected positively on their math journey. They had not experienced any sort of struggle and they looked back on their journey as a positive experience. Words like “love”, “like”, “easy” and other words that can be associated with positive feelings is echoed in many of the interviews. The data is presented by individual, unless, there was not a lot of detail told to me about their story. Then, some stories were grouped together.

#### **4.2.1.1 Rachel.**

A 62-year-old White female, recalled her story, “My earliest memories of math I’m sure are doing math in a formal setting in elementary school and being given those pages and writing answers in the pages, getting the answers right, it all sort of made sense to me.” Several other participants agreed, describing math as “making sense,” “learned math quickly,” and “it was easy.”

#### **4.2.1.2 Urias.**

Memories of doing math with their parents were recalled by this 37-year-old White female who said, “I’d be riding home with my dad, and he would make up story problems and I wouldn’t want to do them. But I would solve it because dad wouldn’t let me out of the truck until I did it successfully.” These interactions with math and their parents were told to me with smiles and chuckles as they recalled these events. Urias recalls acting like she did not want to do more math but inside she did enjoy these moments, especially when she got the answer right.

#### **4.2.1.3 Aashi, April, and Scott.**

A 62-year-old female who told a positive story, “Aashi” said, “I liked math.” She goes on to say, “And I thought I might major in math.” Her father was an applied mathematician and he told her, “One is math, it’s kind of like, it’s like a language. And sometimes you must just talk before you can understand... to me [this] was his encouragement.” April, a 44-year-old female Midwesterner, and Scott a 68-year-old male, felt that they were born mathematically gifted and had little to say about their math journey as they saw it as uneventful. April, said, “I was always blessed with awesome teachers.” April shared that she loved her math and science classes and

graduated with a biology degree. Meanwhile, Scott talked about how he has always been good at math, “It really goes back to in high school math, love math, did well in math.”

#### **4.2.1.4 Yolanda.**

“So in terms of my own mathematical journey, um, I always liked math. And I always did well in math,” said “Yolanda,” 61-year-old, White female. She continued, “And I definitely was one of those students who understood the rules of how math worked, I was comfortable with the rules. The rules made sense to me. So, it, you know, I just, I liked math for that reason you like stuff that you’re good at right, kind of thing.”

#### **4.2.1.5 Wilma and Edith.**

A 54-year-old, White female, mentioned that her math journey was also one without struggle. She attended a public school in New York City which required applicants to pass a test to be admitted. The school was in Manhattan, and she lived in Queens, so she had to travel an hour and half both ways. Wilma had memories of working with teachers but never any struggles. She learned algorithms and loved learning multiplication facts. “Edith,” a 63-year-old, White female, recalled, “I don’t remember which grade now. I was in a very, very, big school in Connecticut. And I think I was offended, they did not put me in the highest level of math, they put me in the second highest.” She later moved to Maine to a smaller school and recalled that she felt more successful in that environment.

#### **4.2.1.6 Quincy and Pam**

A 57-year-old, White male, Quincy, didn’t have any memories about elementary school but recalled that he was in upper-level math classes or the highest levels in his small school in

Southeast Alabama. He spoke about how his father was rather good at math and he felt that he was “just kind of genetically” good at math was the thoughts shared with me by Quincy. He graduated salutatorian. While, “Pam,” a 60-year-old female, said, “I like math it was one of my best subjects, just the fact of it was something I could figure out and I was right.” She went on to say this about math, “I understood it more easily, I just remember feeling bad for students working harder and getting less results, so I always felt bad about that.”

#### **4.2.1.7 Xena.**

A 41-year-old, Hispanic female, Xena, described a math story by saying it was “embarrassing.” She said, “...I was really good in math. I was really good. So sixth, seventh grade, I felt terrible because this friend was not good at math. And so we would use sign language across the room, this is so embarrassing, we would sign across the room doing logic truth tables, I think, in what sixth, seventh, eighth grade, whatever. And we would use sign language to cheat more me helping her.” Xena took AP math courses in high school but she described herself, “I wasn’t the you know, the 100% on everything, A’s on everything kind of kid, I was really good, I don’t know, middle of the ground, normal average, whatever. But I didn’t have necessarily like a passion for it. It was another course, then another course.”

#### **4.2.1.8 Tom.**

Several of the stories told to me were concise and did not have any events or stories about learning math, while a few shared a bit more than a line or two. Tom, a 48-year-old, White male, was more interested in talking about the work he does or the students. He did not recall any particular event that stood out in his math journey. Tom shared this about his math journey, “I



don't usually share this with my students, but math has been a good subject for me. I have never struggled with it. I was always placed in advanced math classes."

#### **4.2.1.9 Victor.**

Victor grew up in rural Wisconsin on a dairy farm. He recalled he was a "mediocre student" but he did struggle with reading and was in a special reading class. He recalled that experience as "humiliating" because other students would see him in a different class. Victor shared "I felt like I was dumb because I struggled with reading." He did not recall a time when he struggled with math but recalls keeping the "awesome job on your test" math certificates in a bottom drawer in his dresser. He added, "[I] kind of got a stack of them and those felt like a big deal."

#### **4.2.1.10 Nikki.**

Nikki, a 37-year-old, White female, grew up in upstate New York in a suburban area. She begins her memory, "I was identified early as someone who like, like, needed extra challenge in math. Like, I learned math quickly. In 5th grade, I won a national award in math." She recalls that her school had a math specialist who would give her additional assignments and have her work with math manipulatives. She found these activities to be fun and enjoyable. "Nikki" said, "I'm glad that I had certain resources because like those classes or those like extra enrichment activities, were the things I really enjoyed about school because I thought like a lot of the rest of school was like, very boring and I so I'm glad I had that because I think it kept my interest in learning."

#### **4.2.1.11 Tracey.**

A 32-year-old, Black female, didn't have any real struggles with learning math as she reflects on her education in Louisiana but she recalled being fascinated with math. Tracey spoke about having a lifelong learning attitude and was a mass communications major, so math was not a huge part of that career path "but I learned I always really have a love for math." When her state adopted the common core state standards, she said, "And so it really started with my interest in math really expanded because of schools, adapting, common core state standards and it that was a different way of learning, math, because the way I learned was totally different."

#### **4.2.1.12 Francis.**

A 45-year-old, White female shared the same experience of never struggling with math. Francis's story is fascinating because she was not educated in the United States for part of her life. Francis was born in the U.S., but she grew up in Serbia. She has always excelled at math. She spoke about being educated during a Communist Regime and how they would not allow her to be more advanced than the other students because everyone had to be at the same level. She spoke about how her clothes and house were identical to everyone else. Teachers would give her different work so she wouldn't be ahead since she excelled in learning mathematical concepts. Francis became an architect because her mother wanted her to; she seemed to like spatial reasoning and math and she thought "I'm good at math and numbers are cool so why not." Francis mentions that "math is a universal language" so she thought this would be an interesting direction. Francis talks about how she found some of the math in architecture to be very interesting and she asked the instructor about where in the world the math was used that she encountered. The teacher responded, "civil engineering" and she did consider changing her

major but it was her last year in school, so she didn't. She spoke about how the more creative aspects of architecture, such as design, materials, and color, were difficult for her but math was her favorite part. Francis has contemplated going back to school for her master's in applied math because she loves the proofs and theorems in algebra and geometry.

#### ***4.2.2 Summary***

The previous stories are paradigmatic of a positive math experience. The stories told to me were often short and did not include much detail, even when I would push for additional information; these instructors felt there was nothing more to tell. Some of the ABE math instructors had gone to school and worked as engineers and architects. These participants spoke positively and confidently about learning math. I have also experienced positive experiences with math. I recall feeling quite confident in my mathematical ability. There was something about the process that I found fascinating, perhaps it was the patterning. I learned early on how to skip count because I observed my father counting livestock every morning using skip counting. But, my journey changed after 4<sup>th</sup> grade. A few of the ABE math teachers told me that they do not share their journey with their students because they did not struggle. They believe that their story may not motivate or reassure their learners that they understand their negative feelings. Participants in this group felt confident about their mathematical journey. Their stories were about positive interactions and learning experiences.

The next sections, contain stories that were about struggling with math along their educational journey. Some of the stories are detailed recollections about their first experience with a math struggle that they felt like sharing with me and that they found to be a key memory. The memories are range on spectrum from some negative experience to complete negative

experience. The data is presented by an individual unless there was not much detail told to me about their story. Then, some stories were grouped.

The following themes, phobia or emotional response, negative performance outcomes and physical punishment, emerged from narratives where the participant first experienced struggle in their mathematical journey. The first story about a struggle or a pivotal moment was captured and summarized. These stories were not positive experiences based on the story and the tone of the interviewee's voice. These events changed their beliefs and perceptions about math. The next theme that emerged was phobia.

#### ***4.2.3 Phobia or Emotional Response***

Phobia was defined for this study from the Diagnostic and Statistical Manual (DSM), 5<sup>th</sup> edition (2013). The DSM has seven diagnostic criteria for phobia. The stories in this section have three of these criteria for phobias and were evidenced by feelings of anxiety, fear, or persistent avoidance along a spectrum (American Psychiatric Association, 2013). The use of the term phobia is not a diagnosis of a mental condition, it is merely a term used to categorize the data collected. It is important to remember to note that these stories vary from minor anxiety to more extreme experiences. These stories detail the feelings of anxiety, fear, or avoidance that this group of ABE instructors felt in their mathematical journey. The following stories share this criterion for phobia or emotional response and illustrate their experiences as they were told to me.

#### **4.2.3.1 Rhonda.**

Rhonda, a 44-year-old Black female, shared her story about math anxiety. “My anxiety began in first grade with math minute, and every morning, we would have a sheet of 100 problems. And there would be 60 seconds on the clock and then you’d hear go and you flip that sheet over and you’ve got to answer as many of those problems correctly as you can. And I was doomed from day one in the first grade, because seriously that was terrifying for me every day. I started my day, every morning in elementary school, at the height of anxiety, and no child should ever be put in that position.” Rhonda carried this anxiety with her all her through her mathematical journey. She said, “I felt like if you fail, this is the end of the line; you get one shot.” Several of the ABE math instructors had memories of “anxiety about timed assessments” or “anxiety about math facts.” One participant talked about how she coped with her fear. “Rhonda,” said, “I remember sitting in a summer school class and counting on my fingers. Because that was my method of coping at the time, and this teacher in summer school, she was like, you can't do that don't count on your fingers.” She details how she would use her toes because the teacher would not be able to see her.”

#### **4.2.3.2 Lori.**

One of the earliest grades spoken about came from Lori, a 46-year-old White female. Lori remembers struggling with learning subtraction in the 1st grade with regrouping numbers. She had an instructor who was very patient with her, and passed the class. Then, for the next class, Lori moved to a more advanced school than where she was. She struggled and had to take summer school. She was told not to use her fingers when doing math, and she said that using her fingers was a coping mechanism; it was a way for her to do the math, and when that was taken

away, she found a way to use her toes instead so she would not get in trouble. She spoke about how math was always a struggle throughout her educational career. Lori also shared that she is working on her doctorate, too.

#### **4.2.3.3 Monica**

Monica, a 39-year-old White female, talks about having math anxiety starting as early as 3rd grade. “There was a game we used to play a lot around the world, and it was with multiplication tables. You would get to put your name on a chart at the front of class and when you mastered your 2’s, 3’s, etc., by doing mad minutes, you would move around the world. I never did well, and I was never fast enough.” Monica said that her struggles began there and continued throughout her educational journey. She would have high anxiety about anything that was timed or if mastery of a concept were to happen quickly. She would freeze.

#### **4.2.3.4 Denise.**

Likewise, Denise, a 60-year-old White female, says, “I was not a good math student. I started struggling in 3rd or 4th grade.” Denise mentioned that multiplication and long division were something that she struggled with, “I didn’t know my multiplication tables.” Denise’s parents would try to help her. “My mom was great; she could teach us stuff like she taught us how to read and everything but she didn’t do the math. My dad worked on computers, and he knew the math, but when he tried to teach, the result was usually a lot of tears.” Other instructors also expressed “anxiety,” “frustration,” and “avoidance” to learn their math facts.

#### 4.2.3.5 Cathy.

Cathy, a 49-year-old White female, transferred from the school where she completed 2nd grade and started 3rd grade in a different public school. She recalls watching the teacher write on the board and not understanding the symbols. The teacher wrote, “zero x zero, one x one, all the way up to tens, and then she went back and filled in the answers.” Cathy recalls thinking, “what is the x mean?” The teacher had filled the entire board, and they were expected to memorize what she wrote. “I still didn’t know what it was, but I had to memorize these things that seemed rather unrelated to anything.” As a good student, Cathy memorized these “things.” Her mother purchased math fact cards to help with her memorizing. “I didn’t know what it was. It just had to be memorized.” Cathy recalled that the teacher had rather long fingernails and that she had “decided to make an example of me.” She appeared to be multiplying by counting, which isn’t the way that Cathy had practiced memorizing. She recalled not understanding what the teacher was doing; she felt hurt by not knowing because she was a good student, but it hurt more that everyone was staring at her. She “hated it.” “Cathy” said, “I continued to memorize all these math things, because that’s what you were supposed to do. And asking if something meant something was like irrelevant.” Jumping ahead to 5th grade, Cathy recalled being pulled out for help. She said, “there was clearly something wrong with me,” when describing the need to be pulled out of class. She said, “I just studied a lot, which involved memorizing.” Cathy said that she continued to memorize everything in math. Her grades in other classes were A’s and B’s. Her dad was an engineer, and Cathy felt comfortable asking him why they did things, but he couldn’t recall the “why.” Her high school teacher “didn’t know what my problem was.” “Cathy,” told the teacher, “None of that made sense to her.”

Nevertheless, she worked with her dad and studied hard. Her mom went to talk to the teacher about Cathy and her difficulties. Cathy reported that her mother said, “what can we do about this? You know she’s obviously really struggling, and she is doing her homework, she’s trying.” Cathy said that the teacher replied, “Well, girls just don’t develop the same way that boys do, and I think you need to lower your expectations.” Her mother felt this explanation made sense since she had not developed an understanding of math, either. Cathy ended this story by saying, “I still have that anxiety, especially about calculation.” Cathy’s experience was not unique.

#### **4.2.3.6 Danielle.**

Danielle, a 40-year-old, White female, started her story with, “Math in elementary school was not good. I remember doing those like those math facts where you’re supposed to like the five-minute frenzies or whatever. And I just, I’ve never been good at anything timed. So, I just never did well with those. I didn’t really learn my multiplication tables until I started teaching. But in fifth grade, we were doing division. And so that’s really hard. If you don’t have your multiplication tables, and there was this test. It was this horrible test that, like, eventually, it took me so long to finish, they had to put me in another room. It was like me and this other kid. And I was like honestly counting the tiles on the ceiling rather than doing this test. And but we got to what I got to the last question. It was like an extra credit question. And it was like, figuring out how many fence posts or something and because it was a closed shape. The teacher thought no one would get it right. But because I drew it, I got the answer right. So, I got 25 extra credit points, which brought my score up to 100.” Danielle spoke about other times along her math



journey, “I think sixth grade was pretty much tortured because I blocked it.” Shannon also explained how she experienced difficulties in middle school.

#### **4.2.3.7 Shannon.**

Shannon, a 52-year-old female, began her story by telling me about growing up on a dairy farm in rural Wisconsin. She came from a rather large family, and the children were expected to help with the farm chores. They would get up early for chores and return after school to do more. “Shannon” shared that growing up, her family valued grades. “A ‘C’ was a punishable offense, a ‘B minus’ was a punishment, it was rough and strict.” Shannon recounts a story of getting to skip Pre-algebra A in the 7th grade and going to Pre-algebra B in school. She recalls “that was a big deal to skip that piece and my dad was proud of me.” She describes her dad as “a very hard man.” Shannon felt much pressure to do well, knowing her family’s value of grades. However, skipping that math class made the next math class very difficult. By moving up a math level, she went into high school as a freshman taking sophomore-level math. She said that people’s perception was, “oh, you’re so smart, I hate you, said jokingly.” Shannon felt very out of place and alone. “I just had constant anxiety because there was no place to just relax.”

#### **4.2.4 Summary**

Several of the stories that were told to me were first experienced very early in the educational journey of these ABE math instructors. In my own mathematical journey, I have experienced anxiety, fear, and avoidance at different points but most of these experiences have been as an adult and not as a childhood memory. I have felt anxiety and fear while working on my Masters of Science in Mathematics. I recall crying in my professor’s office when talking about how to prove theorems of Calculus. My fear and anxiety grew so big that I left the

program before obtaining my degree. My avoidance was so strong that I fled. The stories that the ABE teachers shared about timed assessments, pressure to perform well in math, and the need to remember math facts led to feelings of “anxiety,” “fear,” and a desire to avoid engaging with math. These emotional stories were told about mathematical processes and procedures. As ABE math instructors now, these narratives are a piece of their self-identity. Early in their math journey, their experiences and beliefs about math were unfavorable. These stories were the first time they experienced struggle as math learners, but in many cases, it was not the last time. The additional shared stories are outside this study's scope, but these first experiences seemed robust for the participants. These stories illustrate how damaging this type of instruction was on these participants and inform us of the need to improve teaching practices in the early years of math education.

#### ***4.2.5 Negative Performance Outcome***

Stories about not learning leading to negative performance outcomes were second to the highest reoccurring theme. Many participants spoke about their math journey and struggles leading to poor performance or failing. These stories differ from the phobia or emotional stories as participants did not meet the definition of phobia or lacked an emotional reaction. For this study and were categorized in this group.

##### **4.2.5.1 Abby and Betty.**

Abby, a 61-year-old White female, told how she experienced math struggles after primary school. She explained how the school would place you based on the metrics set by the state. Abby said she was placed into a year-long algebra class instead of the short one-semester class. This made her feel like she could not do algebra since the metrics said she needed the extra

semester. While in algebra class, she recalls saying, “I can't do this, I don't know” to almost everything taught that semester. She felt very lost and began to believe she could not do math. Another participant had a similar story about placement. Betty, a 44-year-old White female, described herself as a band nerd who was into drama and acting. She was placed into a class that fit her schedule. Betty thought it was geometry but could not recall exactly. This class was for upper-level students and not for Betty’s grade level. She said, “I just felt left out.” She recalls them talking about concepts she had never heard before. It was the first time that Betty had a low grade in any class. Therefore, she switched classes because she was “borderline failing” in the upper-level class. Not understanding a concept would lead to poor performance or failing grades.

#### **4.2.5.2 Harry and Greta.**

Harry is a 32-year-old, Black non-binary masculine presenting person. They describe their math journey as “mathematics was something that I did but I didn’t necessarily excel at it. I struggled with learning my multiplication tables. Thankfully Schoolhouse Rock existed, so I watched the multiplication for the longest time when I was a kid.” Harry recalls flunking a math course along their journey; even in college, they felt they did not know enough about math and requested to be in a remedial math course. Greta, a 57-year-old White female, reports taking remedial algebra in college before taking College Algebra. She mentioned that she “struggled with math but she enjoyed it.” [Teacher] M said, “Now listen, ‘Greta’ you might want to consider something outside this field.”

#### **4.2.5.3 Jenny.**

Jenny starts her story by telling me she grew up in Sacramento, California. She is a 64-year-old White female and told a story about a memorable teacher. She recalled, “I did well in

math until 9th grade. My schedule didn't work with band and math. Administration decided to stick me in algebra class and skip over prealgebra. It was a disaster. I lost all math confidence. I took one more class geometry and got an A but that was because the male teacher had me sit in the front row wearing miniskirts. So that was the end of my math career." Another teacher shared the impact of their teacher on their learning in the next story.

#### **4.2.5.4 Paula.**

Paula, a 58-year-old White female, begins her story by saying, "Math was always easy for me." Nevertheless, in the 9th grade, she had a teacher who was an older gentleman near retirement. She felt that the instructor did not care if they learned the material. They were met with a harsh response if someone asked a question, so students learned quickly not to seek help. However, math was something that she did, but she was never confident in it. "And I can picture her [teacher] in my mind, you know, sitting beside his desk, and she would just be drawing all the pictures and trying to explain to himself, and I could not get any of it at all."

#### **4.2.5.5 Elizabeth.**

Elizabeth, a 39-year-old White female, told me about her struggles in the 5<sup>th</sup> grade. She recalled the teacher was older and near retirement, so she explained that the class received limited interaction with the instructor. Elizabeth said, "Um, I think one of my earliest memories is fifth grade cheating on a math test. The class did it all together, our teacher was not paying attention. And we would just take turns going up to the teacher book to find the answers and input them." Elizabeth recalls having a carefree view of education, how she would decide to do the work, memorize the tasks, and if she passed great, and if she did not well, that was okay, too.

#### **4.2.5.6 Karen.**

Karen meets with me over ZOOM while she is in her car while rushing around a big metropolitan city. She did pull over into a parking lot to speak with me. Karen is a 54-year-old Black female who went to public school. Her mother was an immigrant and found value in having an education. Karen's mom would buy workbooks for Karen to work on every summer so that she would be ready for the next grade. Karen told a story that details how she overcame her struggle, "My first time I ever failed a class was geometry. And it was because I would not study the theory, the theorems and stuff. I had tutoring at my church on Saturdays, plus I had a private tutor. So, after that, I got the highest in the geometry regions." Karen majored in communications with a business minor and then went to law school.

#### **4.2.5.7 Bianca.**

Bianca, a 48-year-old Black female, story began with her not finding math difficult. She felt that math was easy until she was a freshman in high school. Her story differs from others about struggle because she was an advanced math student in high school. However, she did experience struggle for the first time because, as a high school freshman, she was allowed to attend math at the university "Bianca" had always found math easy. She was in several honors classes in math, and she was allowed to attend university when she was a freshman in high school. "I went to University of Miami for Calculus as a freshman. That was a wakeup call. So, I took calculus, and I no longer found math easy. Not at all. And it was a lecture size class, was a couple 100 people. This is back in the day when teachers only had blackboards. Mm, like you're in like this gigantic lecture hall and I had a class before that. I just remember being awful because it was like I couldn't get to class early to get a seat to see the blackboard. So, I would

just typically end up in a back. And so, you're in class and you can't even see anything that's on the board. Homework was optional. Homework was never great. Our entire grade was based on our exam, midterm and our final. And our scores were given out by our social security number." Bianca recalls how defended she felt by this experience.

#### **4.2.5.8 Ophelia**

Ophelia, a 27-year-old female, begins her story, "I did struggle a little with math in middle school. And then, I don't somewhere around high school it got easier. I think algebra made a little bit more sense to me in high school. But something about the teacher or maybe it was because I was helping my peers more. Or maybe it was because we had calculators at that point. Yeah, I remember in like junior high the struggle with decimals, too." Ophelia's story was short and did not share many details, but she ended her math journey narrative by saying, "I did struggle a little with math... And then I went to college, thinking about not really a math career. I wanted to do art."

#### **4.2.5.9 Zoey.**

Zoey recalls that she was always a good student. She attributes this to both of her parents being teachers. Zoey is a 43-year-old Black female who was educated outside of the United States and recalls when she was sent to university that math was a struggle for her. At this institution, Zoey was told she had one more opportunity to pass a test, or she would be sent home, lose her scholarship, and end her educational journey. She asked her brother for help, saying, "Hey, I have something to tell you. I am losing this scholarship, so I have only one opportunity if I pass this test. For this test, I need to study a lot, and I don't understand, I don't know what happened. I know all my life are I was good at math and now I don't understand, and

you say okay, don't worry, he told her with one friend that was really good at math." "Zoey" said that she studied with this friend of her brother and passed the exam, so she was allowed to stay in school. Another participant who experienced poor performance or failing for the first time in their post-secondary education journey was

#### **4.2.5.10 Sarah.**

Sarah works in the upper Midwestern United States a 57-year-old White female. She said, "Calculus kicked my butt. And knowing that, you get your confidence shaken. Because as we learn now about growth mindset, I was probably one of those kids, I was great at memorizing steps and rules. And yeah, that part of math came easy for me. And then when I'm in a big lecture hall, where everyone already had that background, and the way to really do well was to think more deeply, I struggled with that." Sarah's lack of conceptual understanding made her feel like she did not know math as well as others.

#### **4.2.6 Summary**

Stories told in this subset first experienced struggle at high school and above, with only three stories about primary school. These stories model math journeys where poor performance or failing occurred. They told about perceptions and beliefs about teachers, the participants' ability, and primarily during the middle and high school years of education. The stories that were told were not as emotionally charged as the stories in the phobia or emotional response group; however, these lived experiences were during times of struggle. I recall a time in the 7<sup>th</sup> or 8<sup>th</sup> grade when I was placed into advance math because of my mathematical ability but I was not doing well. I didn't relate to the instructor or understand the information they were teaching. My grades in that class began to decline quickly. Hearing the stories about the experiences of

these ABE teachers, I could relate and empathized with how they felt. These memories were told at various levels of negative experiences with geometry and algebra classes. The stories in the next section were challenging to hear. These stories were about being physically punished for not knowing math.

#### ***4.2.7 Physical Punishment***

Two students recalled stories in which they were physically hit either by a family member or a teacher. Both of these stories were about learning multiplication facts, and both instructors admit that they struggle with these math facts today. These stories were incredibly shocking.

##### **4.2.7.1 Ida.**

Ida, a 45-year-old female, recounts this story, “I am foreign graduated. I remember a time in my math experience with math teachers very tough and hard. I remember my sister, she’s the eldest, teaching me and helping me to memorize my multiplication tables. And I still remember that she was very tough. She had the chart in one hand and a ruler in the other so every time I’d say it wrong, like [makes a slapping motion to indicate the ruler hitting her]. So that was the elementary, I feared the math classes because I wasn’t good in multiplication table in memorizing it that that was the fear that if I don’t memorize it, I can’t move forward.” Ida’s sister’s punishment was to motivate her to learn these math facts, but they had the opposite effect.

##### **4.2.7.2 Candy.**

Candy’s stories are shocking because she was physically hit on several occasions by her teacher. Candy starts, “It’s a funny story, but it’s not a funny story. So I was, I needed glasses at



a very early age, I had very poor vision. And of course, you don't know when you're a little one, you know, by third grade, I guess it was. It really came to light. I didn't know whether my parents took me, you know, to the doctors, or it was just I was bumping into things, I don't know. But I needed glasses. And now you got to remember, I'm very old. So back then there weren't a lot of choices for little kid's glasses. And so, mom bought me this, you know, really cute pair of cat's eyes that were just you know, so for a second grade, I just didn't wear them. I you know, we had desks back then. And I shoved them. You know, mom sent me to school, and I shoved them in the back of my desk. So, third grade comes and there are my glasses in my desk, but I happen to sit in the back row. And it was a very, very small school, it was only 4 classes for classrooms. Three grades. And the So alright, so anyway, so I'm in the back row. And we're starting multiplication tables. And so, the teacher is at the front of the row, and she's holding up the cards for each child in each row. So, she you know, Johnny, you know, two times two, okay, four, next, next, next comes to me, I can't see the cards. So, it's like I had I think the attitude of and I really care anyway, so it was like, I'd make up the problem, and then make up an answer. And she'd look, and she would march down the aisle to me, slap me across the face. Wow. And then walk back up. And of course, I had to sit down because I didn't get to play anymore, you know, with this wonderful game that she had. And so it was like, oh, math is bad. It really hurts. Yes. And you know, and of course, it was back in the day where you didn't go home and tell your parents because you had that fear in the back of your head that your parents would then give you a beat? Yeah, which they wouldn't have, you know. But it finally came to a head. You know, it lasted the whole school year, every day. I guess I wasn't very bright. I didn't stop it. And anyways, right? She'd marched down every day when we played the Multiplication

game and slap me across the face. So it finally ended when a friend in my class told her parents and her parents told my parents and then, you know, ended and I guess I wore my glasses after that. I don't have a lot of memory after that of what happened. But I just know from that day forward, one I hated math. And two, I never learned my multiplication facts because of that." Candy's beliefs about her math ability were changed because of this experience. After she shared this experience, I told her I was sorry that this experience happened to her. She dismissed any feelings of sadness with a smile on her face and remarked that teachers could not do that now.

### **4.3 Summary**

These stories about physical punishment may be shocking. The impact of these experiences could have been placed in the phobia or emotional response sections, but because of the physical experience, they were placed in their group. These stories stood out primarily because of the physical pain that was experienced. As I heard these stories told to me, I have a very visceral response to it. Although, I had never experienced physical punishment while learning math, I have experienced physical punishment in the ways they had described. The participants in this group both experienced punishment while learning math. Their experience changed their mathematical self-identity to disbelief in their ability to know math, which occurred when a student learned their multiplication tables. Both interviewees said they still do not know their math facts but are both ABE math instructors in their programs.

Overall themes emerged from all the stories, and they were grouped. The stories of ABE math instructors' mathematical journey their feelings or experiences were identified. These common themes were chosen from the analysis. This analysis was done to align the stories into a shared narrative of feelings and experiences. I present these stories because of a systemic and

qualitative review of the data. The next section of this chapter will discuss how their stories reveal their mathematical instruction beliefs, perceptions, experiences, and practices.

#### **4.4 Mathematical Instructional Practices**

ABE math instructors enjoyed speaking about their teaching and their students. They were eager to share stories about how ABE math instructors' mathematical journeys contribute to and reveal their knowledge, perceptions, beliefs, and practices about mathematics instruction. The empathy, happiness, and overall sense that their work made a difference could be felt in every interview. As I listened and read their stories multiple times to create a cohesive summarized story, I inductively created themes from the theoretical framework for this study. These themes were active learning, algorithms or lecture professional learning, and caring. In Appendix I, you will find each participant, key vignettes, and the category their story was placed into based on my analysis. I will discuss each theme and use examples from the summarized interviews. Each story was placed into only one thematic section based on the overall narrative.

##### ***4.4.1 Active learning***

Instructors told stories about their teaching practices and how they like to create a fun math environment. The words “fun,” “engaging,” and “creative” were used by several of the participants. A few participants told stories about incorporating manipulatives, buzzers, hands-on activities, and group work. These examples are instructional methods that are active. They engage the learner beyond a straight lecturer at the front of the classroom.

#### **4.4.1.1 Ophelia.**

Ophelia was born and raised in the South-Central region of the United States. She resides and teaches in the same small town. She earned her bachelor's degree in education and teaches math, science, social studies, reading, and writing for her program. She works full-time and focuses on math four days weekly for about 10 hours of instruction. Ophelia remembers her math struggles and strives to ensure that her students are intimidated. "Ophelia" said, "Like, definitely my favorite part of teaching is teaching math. It seems like a lot of students think that math might have been the thing that made them leave school. The first go around and so I try to make it as fun as I can but also less intimidating because a lot of people come in and they're so nervous about fractions. They remember it from school, and they didn't quite get it the first go around."

#### **4.4.1.2 Karen.**

Karen came to adult education after passing the Bar Exam and practicing law. She said, "Law school wasn't the easiest for me." So, she began looking for another career path. She said, "My mom always wanted me to be a teacher." Karen speaks about her math classroom, "I tell my students about my stories of struggle with math. So, I try to make it easier for them and not let them feel ashamed because a lot of them have baggage that they brought with them. They tell me things 'like teachers back in the day, you know, corporal punishment, the teacher would punch me,' so I try to make math as fun as possible. And I play games. I have buzzers so you know, they want to hear."

#### **4.4.1.3 Monica.**

Monica began teaching Kindergarten and enjoyed all the hands-on math games and learning activities. "It was a very challenging experience, but I loved teaching the math; it was

like so fun. I love manipulatives, and hands-on patterns and things like that.” However, the school closed. When Monica began teaching adults, she worked in the study lab. She said that “I absolutely loved jumping from topic to topic and need to need and doing baby short bursts of math.” Monica later transitioned to teaching inside the jail and found that those students struggled with math, too. She said the students would tell her they were dumb and could not learn math. “I would tell them that they aren’t dumb because most of them were in there for a drug charge. I told them that they were good at math because they if they sold drugs, they used math a lot.” Monica would tell them that they are doing math when they weigh, measure, label, sell, markup, etc.. She tried to show them where they use math in their lives so they would make connections and build up their self-esteem. Monica teaches in Wisconsin, working with college math faculty in their teaching practices. Her team teaches courses so adult learners can succeed in their math classes. Monica is working on gaining content knowledge by finishing her master’s degree in mathematics.

#### **4.4.1.4 Nikki.**

Nikki tells a math memory about her learning and its influence on her in the classroom. “I was fortunate that my school had a math specialist. And she would give me like other assignments to do. I remember building shapes with tangrams and doing things like that and now as a teacher I’m like yeah those were good activities to do but I wonder why didn’t everybody in my class get to use them? Like those weren’t necessarily things that like, only somebody who, you know, was further ahead should be doing, but like, probably could have benefitted everybody. But I still think the way that it was taught affected me in that at, like, it convinced me that like, I was good at doing it, but that I wasn’t the type of person who could like to create new

ideas. And, you know, and I think that's kind of a shave, because I probably could have gone further, like, I probably could have done more and enjoyed it. And that just wasn't the way it was taught there was even in college, there other people like that did not exist ever. Like I don't think I ever did any kind of project with other people in a math class, it was very individual." When she began teaching math to adults, she found that her program had a hands-on, conceptual-based curriculum. "I'm looking though these materials and I'm like, oh this is really neat. Like this is really different. This is not like the way that I remember learning math. But it sounds really interesting. Like, I kind was like, oh I would have loved this, like, I would have just eaten this up when I was a kid. And learning all this stuff, so you know, I started using that. I started teaching and eventually they gave me my own class because they were like, oh okay, like, you got this, this is your thing. And I was like, helping the other teachers try to use the curriculum because I really liked it and they struggled to use it because they weren't, they didn't feel confident sometimes with like, how to, you know, I don't know, they didn't feel confident in their own math. So, they felt they didn't like having something that was more open-ended. They wanted it like more scripted." Nikki has a master's degree in math, theology, and philosophy. She works full-time, teaching math, science, and history.

#### **4.4.1.5 Rachel.**

Rachel is a 62-year-old White female who mentioned that she "had worked at Time Magazine writing weekly teacher's guide for teachers who used "the physical magazine in their classroom." "Rachel," said, "I was easily motivated by the charts on the wall, or do you remember those SRA boxes? I would take out the little math box and I remember, you know, like, the colors changed the farther you got in more advanced topics, the deeper the colors were.

She went on to describe how she uses technology in her online classes and the material in her face-to-face classes, too. “I love teaching online because of all the technology; I am a huge fan of Polypad and Desmos. I have written several activities using both. Now, when I teach in the classroom, we go to the computer lab so students can get on the computers.”

#### **4.4.1.6 Urias.**

Urias teaches for an adult education program in a small, rural Midwestern community. She tells her class, “I am a math nerd, my goal is for you to not hate math by the time you’re done with my class. Like, you don’t have to like it, you don’t have to love it. But I just want you to not hate it and not fear it.” Urias speaks confidently about teaching math. She talks about the importance of having fun in a math class, “So I mean, I don’t do a whole lot of intentional math is fun, yay, stuff. I just try to make math approachable. So I talk to students explicitly about what we’re going to learn.” Some instructors have found that creating problems that most students have experienced helps their students.

#### **4.4.1.7 Quincy.**

Quincy spoke about his students and mentioned how they were not fond of mathematics and often told him they struggled with algebra. “So I asked typically to sit down and say, you know, you use algebra everyday. And they look at you like, okay, and I’ll just say let’s go bowling. You know, let’s act like we’re going bowling and then you know, kind of, shoes that cost stays the same, and then you do the number of games and your cost, I would figure those things out or you go to the grocery store. So, you’re doing algebra.” Quincy holds a doctorate in math and English and works full-time teaching reading, writing, social studies, science, and math for his program. He tries to focus on math for one hour four days a week.

#### ***4.4.2 Summary***

Stories about creating lessons that incorporate real-life manipulatives, buzzers, and other creative means were discussed in this chapter. These stories reveal how these instructors teach math in fun and creative ways to engage and retain their learners. They strive to make the math relevant to everyday life, and there is no sole focus on procedures. I find that as a math instructor, I tend to be in this group. Students actively speak out in class and engage in group work. The learners appear to be engaged in the content and I try to reinforce the idea that creating their own understanding of the topic being lectured on is important in learning. Similar to the stories I heard, I was not taught using active learning strategies and some instructors shared that the way they teach is not the way they were taught math, which is why they teach math this way. Instructors strive to create engaging and fun learning activities to help support and aid in the learning process. A few instructors shared that their beliefs in their ability to do math have changed because of the creation and enrichment of the activities they have created. It felt like the teachers in this group had energetic math classrooms from their interviews and that they enjoyed creating new ways to learn.

#### ***4.4.3 Algorithms and Lecture***

The stories in this section contain teaching math as a process that must be followed. Learners are exposed to lectures, either video or in-person, and practice. These teachers talked about how they teach like they were taught and have found it to be quite effective.

##### ***4.4.3.1 Tracey.***

Tracey works part-time for her center, teaching reading, writing, science, social studies, and math. She described her love for learning and said It was her love that brought her to adult



education. “Tracey” holds a master’s degree in special education. She said about teaching math, “You can show people how to write. Yeah, you know, I mean, it doesn’t mean they will be good writers, but with math, you can teach them the rules, you can teach them the steps. And mean, you know, you work with them enough and you know, give them enough problems. Then they know they will either get it right or they get it wrong. You know.” Tracey teaches math four days a week for 20 hours. Instructors found math to be “rules” or “memorized”. Two instructors shared that they skip over concepts they believe students do not need to know to pass the GED exam.

#### **4.4.3.2 Meg and Wilma.**

One was “Meg” shared, “When I teach math, I’ll talk about rules. I’ll talk about inverting the back number when you’re multiplying. But I do it in a much simpler way and things that I don’t think they really need to know to pass the test. I really don’t put time there.” Meg has her master’s degree in business education and works part-time teaching only math. She usually teaches two days a week for 10 hours. Wilma, a part-time instructor who teaches math only for her program, believes all adults should know their math facts since she loved learning the mathematics procedures. She was often shocked at how many adult learners do not know their math facts. Therefore, she spends time with adult learners to memorize them. She teaches three days a week for a total of 12 hours. One thing that Wilma said is that there is little difference between teaching children math and adults’ math, with one exception about adults. “They are more vocal, why do we have to learn this? How am I ever going to use this? And so I’m light hearted when teachers are sorry, to students say that, I’d say, you’ve may not ever use this again. But we need it so we can get through and finish this test. And so you can accomplish your

goals.” Wilma disclosed that the amount of professional development she attends varies, “sometimes monthly, sometimes less.” She holds a master’s degree in education and Christian ministries.

#### **4.4.3.3 Aashi.**

Aashi shares what she loves about teaching in ABE and how she is trying to help students to move past the idea of being quick to achieve a grade. She talked about how she likes to teach social justice and access. She teaches at a small class English and math. When reflecting on her teaching, “Aashi” shared this, “What I’m constantly telling students, well, a couple things. One, that’s the beauty of adult as there’s no failing. It just, I guess I love that. And then I try to model a math I said, even though I have all this mess still sometimes with the GED problem. I read the problem. I’m like, I don’t know. I don’t know what to do. So I say what do I know? And as I start with what I do know I can build it. And model that because it’s so much kind of magical thinking like you either know it or you don’t. It’s a process, once people understand it’s a process then they know it.” “Aashi” says, “Yeah, I think that the misconception is that if you’re good at math, you do it quickly.” However, not all instructors lecture or show algorithms for learning math.

#### **4.4.3.4 Scott and Edith.**

Scott has his master’s degree in Christian education and teaches in the Southwest area of the United States. Before becoming an adult educator, he worked for the state, reviewing and approving records for Title 1 schools. Scott says that when he presents a new math concept, he “use[s] a lot of them video, you can YouTube, Khan Academy become a great favorite of mine. Another one is called math antics. And another one I’ve just recently started to use a little bit

more. It's called Mr. J. And so use those, and then I used to teach a concept, followed up with that, and then practice, then we usually have a worksheet, or we use Kaplan book by Kaplan. But anyway, we use it to sort of be our final foundation in terms of getting them prepared for the GED, we have had three or four students who've gone through it and have completely all the pieces and have completely passed the GED." Edith shared this same instructional practice. She described the impact of her math journey on her instruction. "I remember my freshman year, they did this weird new thing where instead of the lecture, they gave us a packet. And there was no talking. I was able to finish Algebra 1 by April. I love Sal Khan, so sometimes I put students on Khan Academy. Some people that works for some people it doesn't I know when I had to go back, I have a Masters in Math, so I went back to Khan Academy." Edith works full-time for her program, teaching reading, writing, social studies, science, and math. She holds a master's degree in engineering with a minor in math. She tries to focus on math for at least 20 hours each week.

#### ***4.4.4 Summary***

Stories about teaching math through lectures and procedures were discussed in this section. ABE math teachers in this section told stories about teaching through lectures, worksheets, memorization, and repetition. As a new teacher, I also taught this way. It was the way I had been taught and I learned math but as I taught adults I found that was not the case. The instructors seemed comfortable teaching the rules or steps, and telling learners that they are learning material they may never use. Several instructors believe that following the steps is the best way to achieve math learning. They talked about innovation using online lectures found on Khan Academy or YouTube or finding a trick in helping adults learn an algorithm.

#### ***4.4.5 Professional Learning***

Several teachers told me stories about how they changed their instructional practices. Some attended professional development, while others taught themselves or contacted other instructors. Their stories illustrate the impact of professional development and interactions with other instructors on their mathematics instruction.

##### **4.4.4.1 Lori.**

Lori speaks about being an independent learner who does not always ask for help. She was new to teaching GED and to the idea of helping people because she was always an independent learner. Lori said she was not educated as an educator but accepted the challenge of learning to become an ABE teacher. She would push herself to learn the material and often tell students that she didn't know the answer and would have to "look into it." She said this about teaching GED, "it's a learning process between both the instructor and the student and I really enjoy that." Over time, Lori's skills in math have improved, and she felt more confident. She said, "I've started doing math boot camps to help students progress in their GED readiness to take the GED exam. I model the process and work together with the students."

##### **4.4.4.2 Paula.**

The story of self-teaching is continued with Paula. She works full-time teaching reading, writing, science, social studies, and math and tries to teach math for at least six hours each week. She talks about teaching ABE in a prison facility in a rural Midwestern state. Paula holds a bachelor's degree in elementary education and literature. She said, "I wasn't real comfortable with math, still, I knew I understood some of the concepts of math. So, I taught that over and over again because many of the residents had short-term memory issues so they needed it

repeated a lot. I learned the math I needed as I taught it.” Professional development was another way that many instructors improved their instruction. Paula currently works in the New England region of the United States.

#### **4.4.4.4 Candy.**

Candy attended professional development on math and described it as “I’ll tell you when I found this PD. I thought I’d found heaven. Isn’t it crazy? It’s just like, I’ll never forget sitting in that first workshop with the trainer, and all my peers and everything and all these normal adults, if you will, who maybe didn’t struggle, like it didn’t seem to struggle like it I did with math, but she’s doing this stuff and I’m going Oh, my God. Oh my god. You know, this is fantastic. This is I felt like a little kid, I felt like a little kid learning, you know, geometry for the first time when she when she was talking about the circles and how to do the perimeter and the diameter. Yeah, I can’t even you know, yeah, it was amazing.” Another way some of the teachers spoke about improving their instruction was by finding a mentor.

#### **4.4.4.4 Danielle.**

Danielle said this about her math journey into teaching after she was hired as an ABE teacher, “I would have to be teaching some math, but you know, it wasn’t going to be anything advanced and my manager would help me and, I did not feel like confident that I could do that level of math. And it was interesting, because just seeing the way that she [the manager] taught really helped me and that’s, that is when I finally was confident in you know, like, what, six times seven is first? Or like how to subtract fractions when you must borrow, you know, the sort of like, my anxious stuff got ironed out at that point.” Danielle spoke about how her manager mentored her, saying, “One thing that impacted me was not professional development but my

manager.” Danielle holds a master’s degree in art and religion and works full-time at her program, teaching reading, writing, science, social studies, and mathematics. She usually spends one hour each week teaching math. Danielle is a professional development leader and leads training multiple times a year.

#### **4.4.4.5 Ida.**

Ida works full-time, teaching reading, writing, and mathematics for her program. She holds a master’s degree in sociology. She retells a math memory that impacted her as a teacher now. “I still remember [being hit] but I do appreciate it like back then it’s hard when you force someone to memorize without understanding, but at the same time, I appreciate it because that was fundamental. I dig deep in the like; I am always asking the question how I’m going to be a better teacher. And how I’m going to let them love math because the first statement I hear is I hate math. I tried to do some connection between the I mean, I try to avoid what my sister used to tell me ‘You have to, you have to, you have to’ but is going to help you and you’re going to need it later on.” Ida focuses on math for four hours a week and tries to teach it three times.

#### **4.4.4.6 Jenny.**

Jenny speaks about her math journey and its influence on her. “At 21, I decided I would try math again. They placed me in beginning algebra and that went well. I ended up changing my major to business and had to take different math classes it, all the way through business calculus. They all went fine. Then I got my MBA and was in human resources for several years. But I quit doing that and decided to start substituting, because I thought gee, I might want to be a middle school math teacher. So, I taught myself all the math that I had forgotten. I passed the certification by the skin of my teeth and became a middle school math teacher for one year, that

was right before all the schools closed. And for health reasons, I decided to not go back. But I started to work with adult literacy students. I was hired first as a tutor, but I found myself doing instruction. I was told that ‘tutors don’t do directed lessons.’ But the students were struggling with the work in the math lab, so I continued to try to help them connect what they were doing even though I got in trouble.” Another instructor talked about learning about conceptually teaching math.

#### **4.4.4.7 Shannon.**

“Shannon,” said, “I was good at memorizing, but I wasn’t good at thinking on my feet fast. I still have anxiety about doing math fast. Like, I can do air math, I was taught the algorithms, so I am amazed at how people use different strategies and how faster they are.” Shannon had attended professional development training on the different levels of knowing. This idea resonated with her because it did not focus on the algorithms. It was about conceptual understanding. So, Shannon began to learn all she could about this idea to relate to her students better. Shannon holds a bachelor's degree in math and secondary education. She works part-time, teaching only math. She teaches math one hour a day, Monday through Friday.

#### **4.4.4.8 Xena.**

Xena’s professional development experience led to her finding a friend and life-long mentor. Xena holds a doctoral degree in English. She teaches reading, writing, and mathematics. Math instruction for her programs is five days a week for two hours. She talked about teaching adult education. “I didn’t know about all the tests; I knew there was a GED test and that’s it.” Xena said that she attended a professional development and connected with the trainer. The trainer began to mentor her, they had connected over their different life experiences. “Xena” said

this, “We bonded over experiences. And that’s where I fell in love with math, like, the genuine like interest in math, and teaching math in learning more methods of math. I knew I didn’t need as much content, because I you know, obviously I did well enough up through that algebra course, that I didn’t feel like I was behind, but some on the methodologies right on adult numeracy. And I think she brought a lot of that and that mentor relationship that I was able to build with her.” “Yolanda” tells the story of when she first started teaching. She described her class, “...the students were very used to us. We do math for an hour a day at the end of the day, and we just work. So that’s how I set it up, that they did math on their own an hour a day, like with a workbook and you start here, and you start here and this person is ready to take the GED, she’s doing algebra, this person’s over here. And I just, again, I’m new to the field, and I’m new to sort of an understanding of so many different things. But I’m just like, oh, math, whatever.”

#### **4.4.4.9 Yolanda.**

Yolanda started teaching right out of college. She taught high school social studies and recalls she “loved it.” She started teaching in the Northeastern part of the United States. Her introduction to teaching math was through a course within the social studies curriculum called “financial literacy.” She moved to the New England region and began teaching for a non-profit. She talked about how she used to teach math to students for an hour a day with a workbook, and everyone was working on their own level. Over time, Yolanda had an a-ha moment about her teaching practices, “And so I’m meeting the other teachers, and I’m just hearing and what people are doing, and then my own professional development that I just sign up for randomly. And I sort of come to this, understanding that that I might not be doing that great a job in the math department. And I have I have this amazing, amazing executive director who is like, just she just



didn't she just let you she was a really good teacher, she let you discover it. With that like guiding you just but let you discover it without telling you. You know what, Thank You really suck at that." Yolanda goes on about her journey to be an ABE math teacher, "So like, all that PD, right? They tell you all the time about the holes in people, I don't think I understood that as an adult education instructor until I had that student with so many holes. That's when I then that's when my teaching math changed, that I came to understand the how, how adult students come to with these giant holes in their education and that that's informed by teacher teaching. So now I'm I seek out and I use materials that are much more concrete in nature, that idea of go slow to go fast, like fill in that foundation, backed by low level math core, it's called foundations in math." One instructor did not mention any specific professional development but expressed an interest in being better as an instructor.

#### **4.4.4.10 Bianca.**

Bianca said this about her math education journey, "... my instruction has changed just based on what I feel, I think that they need and what I've seen that they need, and I've taken a lot of, I attend conferences, pretty much every year, every year I do at least one. And I've taken a lot of classes as well. At the University of Chicago, they have a program for teachers who teach math, or science currently, okay? And it's about how to teach math. Okay, so I've done pretty much all their math, their math sequences, so maybe about another two or three years of those courses, and those are all graduate courses. And then I also did a post master's after my doctorate through Drexel, and again, it was on the focusing of teaching of math." Bianca holds a doctoral degree in adult education. She teaches reading, writing, science, social studies, and math full-time. She tries to teach math three days a week for 12 hours.

#### **4.4.4.11 Sarah.**

Sarah said this about her math instruction, “I was probably awful though, that I think about my time in the classrooms I really teach like that. I tried to make up for it with enthusiasm, and genuinely caring about my students like whatever you need on here. I taught in a classroom chalkboard. Okay. Different colored chalk. No Smart Boards yet no Whiteboards yet. Nasty chalk hands.” She said, “And that's when I went to a workshop on problem-based learning. And I learned about really like hands on teaching. And you're not the sage on the stage. You're the guide on the side. And that that whole workshop that three- or four-day workshop that also changed my thinking and my approach to teaching.”

#### **4.4.4.12 Pam.**

Pam went to school to be a dietitian. She worked as a dietitian for 11 years until the hospital she worked for got bought out. She said, " My college major was nutrition and then I got a master's in education. I started teaching middle school math, and I enjoyed it a lot. She talked about how she would educate adult when she was working as a dietitian so when a job came open to teach math for adult education she thought, “I could do that.” She explains, “I took lots of professional development but I have been able to read people to and understand people, and like I told you I felt bad for people who struggle. I can picture this girl who had this trouble, which made it real for me. Not everyone gets it as quickly as me.”

#### **4.4.4.13 April.**

“April” said, “When I was new, I would spend a lot of time, making my own material. I mean, books are great but you know, some of it's hard to find things.” April talks about the teacher support network she is affiliated with and how they reinforce ideas of working in groups

and talking through math. Although April's mathematical journey was a positive experience, she knows that her students struggle. "I want my students to not be intimidated [by math]." April talks about how she has learned to give students little erase boards to help them learn and be engaged.

#### **4.4.4.16 Cathy.**

Cathy has a bachelor's degree in psychology with a concentration in special education. She teaches math, science, history, reading, and writing for her program, focusing on math twice a week for 4 hours each day. She attends professional development weekly, and she is a professional development trainer. Cathy says, "Well, how I taught before [she attended professional development] was going through the pages of my students' book, and helping support them through it. And it was just like, oh, this is how you do this one, like this problem. And I don't teach like that at all anymore. I don't even use a traditional GED textbook... "I dig deep in the like, I am always asking the question how I'm going to be a better teachers. And how I'm going to let them love math because the first statement I hear it is I hate math." Cathy explains that her 'ah-ha' moment came when she attended a professional development of understanding math conceptually and allowing context to support learning. She always seeks ways to teach math more meaningfully and engagingly and then share her knowledge with others.

#### **4.4.4.17 Elizabeth.**

Education has always been a struggle for Elizabeth. She told me that she has always taken the bare minimum of whatever was required and is surprised when she passes a class. She goes on to tell me that all her memories about how teachers teach is "somebody is lecturing in

the front, I am taking notes, I'm writing down everything that they wrote, and I'm memorizing it, to try to pass the class so that I can move on." She goes on to say, "I was sort of qualified for my job because I have a master's degree." Elizabeth shared that she has a bachelor's degree in multidisciplinary studies and a master's degree in gender and cultural studies. She adds, "so, nothing math related." She says that she didn't feel confident in her job and doesn't consider herself a math person.

Nevertheless, she teaches math. She said, "I am relearning math skills, but also relearning math skills in a way that's specific for adult learners, okay, has completely changed my relationship, it's, you know, just being alive, as long as I've been alive. adulting, as long as I've been adulting, I'm forced to do math all the time." She talks about how she has been working alongside another instructor, and her mentorship has been valuable. She goes on to add that she tries to attend as much professional development as she can.

#### ***4.4.6 Summary.***

This section shared stories about moments of elation, whether in a formal training or while working alongside another instructor. ABE math teachers explained that, before learning effective instructional methods, they used to teach math primarily through algorithms and lectures. They modeled the process of solving problems. Then, they attended a professional development with a mentor or peer teacher guiding them to improve their instruction. There were several "ah-ha" moments for instructors looking to improve their teaching strategies. My experience as an ABE math teacher was similar to this group of teachers. I recall my first professional development. It was called "Teachers Investigating Adult Numeracy." We were assigned cohort groups and given manipulatives. Since I knew math fairly well, I was confident

that this professional development would be easy. Little did I know, that I would be challenged to visually represent multiplication or division of fractions. I remember being stumped, not knowing how or what to do. I knew the answer but how do I draw it. Through this professional development, I began to conceptually understand why algorithms work and I was able to visual demonstrate multiple ways to illustrate different mathematical ideas. This section also shared stories about teachers whose motivation to learn math they once failed, avoided, feared, or had anxiety about had changed. They were now the math instructor and wanted to appear confident and knowledgeable. These teachers' activities sought ways to conceptualize math beyond processes they had long forgotten.

#### ***4.4.7 Caring***

The stories that focused on understanding the learner's life, their emotional needs, valuing the learner, or being open to a different perspective about how learners felt about math were categorized in this theme. Stories in this section focus on the learner as the important factor in a teacher's instructional practice. As teachers told these stories, I could feel their empathy for their students.

##### **4.4.7.1 Abby.**

Abby holds a bachelor's degree in elementary education and works full-time for her program, teaching all subjects. She tries to focus on math for 6 hours each week. Usually, she teaches math twice a week. She shared that she laughs at the thought that she believed she was not good at math or believes she was not. She gained confidence from teaching 5th grade because her responsibility was to know the material. Her journey allowed her to change her

mindset. She went on to tell me that because of her struggle, she is compassionate and patient when working with others, especially the ones with math anxiety.

#### **4.4.7.2 Tom.**

Tom began teaching about 15 years ago, working for Princeton Review in New York. He describes himself as an English person because it is what he studied in college. However, Tom had never struggled with learning math, but he did understand having difficulties in learning. He told a story about how he was “traumatized by physics.” He understands his learners need more than just a lecture, saying, “I definitely don’t do things the way I learned them, because that’s the way almost all my students had been taught and that obviously didn’t work for them.” Tom does not want to create trauma for his learners. He said this about his students, “Oh, Lord, I mean, at some point, students either don’t understand whatever thing was happening in their math class, or feel that they don’t understand a thing that was happening in their math class.” His compassion for his students shines through in his statement about their learning, “I know that I can’t do that [teach the way he was taught] with my students, because their presence in my classroom is proof that it did not work for them.” The interview with Tom was primarily focused on his students.

#### **4.4.7.3 Victor.**

Almost all the stories were about helping learners with “anxiety,” “trauma,” and “mindset,” but there was one story shared with me by Victor, a 54-year-old who stands out. Victor tells students,

What I tell students is, I first say, you know, the first day really, my big message is always that my first job is to make sure you don't quit. So, I say, you know, my goal is to

make you comfortable, because people have a lot of bad experiences with math. [He begins to recite his speech to the class] Some of you will say, I really liked math but you never had a chance to finish high school. But many of you will point out some really terrible math experiences. And I just want to say right now that I think that for the most part, the system has failed a lot of people in math education, and that you may have spent a lot of years beating yourself up believing the idea that if you'd only paid attention more when you were 14, if you had learned your multiplication facts or when your 12 you should have done better. And you believe it's your fault. I really, really tried to emphasize that there's a lot of institutional responsibility for people's lack of success in mathematics. And it's probably to my advantage that I never set out in life to become a math teacher.

Victor says that what he loves about teaching math is when a student realizes, "It's not this list of crazy rules that you just memorize and chug through." He goes on to speak passionately about his students,

These folks are people who didn't complete high school, often lots of really traumatic experiences in life, homelessness, you know, family disruption, lots of moving, you know, becoming a parent at early age, immigrant status, you know, all of those things that contribute to not having completed high school. And math is almost always that sort of big fear, like this is going to be the thing that trips them up and they think 'I'm never going to be able to have my high school credential because I can't do the math' So that's the part I love is really building people up and showing them that they're a lot more skilled than they probably thought they were.

This story shows the interpersonal connection that Victor has with his students. As he shared, you could feel the emotions as he talked.

#### **4.4.7.4 Betty.**

Similarly, Betty, a 44-year-old female who works full-time teaching math and holds a master's degree in adult education, shared her story of struggle and how it influences her as a teacher. Betty said, "I am glad that I failed out of college because it gave me perspective that not everyone sees math the same way." She realized she experienced shame in her math journey because she did not have the foundation and became defensive in her college math course. She allowed her emotions to block her ability to go further because she felt like if she could not get "this one tiny thing" nothing else mattered. Betty's experience helps her relate to the learners in her program.

#### **4.4.7.5 Denise.**

Denise holds a master's degree in special education and math education. She works 15 hours each week teaching only math. "Denise" said, "Math in adult education is much more about the relationship, much more about the relationship." Denise speaks about her career working with special education learners in high school. She noticed that they also struggled with math and realized it was not just her. She realized that students need to know you care.

#### **4.4.7.6 Francis and Greta.**

Francis said that she tries to get to know the students. "I try to think how this presents to the students and how this information falls. And whether there's too much." Greta mentions that she likes to model that struggle is part of the process in math. She said, "I get it when they say,



‘this is driving me nuts,’ I tell them let’s stop, let’s try again, and I even went back and figured out why we need to know that.” Relating to students and working alongside them were common stories, along with having compassion, empathy, and viewing the world from their perspective.

#### **44.7.7 Harry and Zoey.**

Harry works full-time, teaching adults reading, writing, science, social studies, and mathematics. He usually teaches math five days a week for 20 hours. Harry begins by saying, "I think that teaching math is easier for me because I never officially learned math in the traditional sense." He also stated, "my dad got his bachelor’s in math and did not inherit any of those genes." He spoke about his math journey, saying that he learned math out of necessity and noticed that people who love math teach it differently than him. He gives the example of a student who may ask him, “What is the Pythagorean theorem? I say to them that I do not even know what the Pythagorean theorem is but this is how it works and this is what I have learned about it.” “Harry” says, “When I am teaching math, I am not really teaching just math. I am usually using my psychology degree, where we speak about anxiety, phobia, or other traumas. We talk about emotional regulation skills and mindfulness and then teaching math.” Harry has a master’s degree in special education. Zoey explained that many of her students struggle with math and have a negative point of view about math. She tries to help them believe a different mindset about math, telling them “no, you can do it and I will help you.”

#### **4.4.7.8. Rhonda.**

Rhonda holds a master’s degree in mathematics and French and works full-time, teaching math for about 10 hours weekly. Rhonda is working on her doctorate in adult education. She is always encouraging her students to learn. She tries to reassure her students that they do not have

to perfect, and she reminds them that adult education has no grades. It is made to learn. She says, “I give my students so many changes to try again because that’s the point of learning from mistakes.”

#### **4.5 Summary**

Stories in this section focused on a change in perspective about math, understanding the life of their learners, and their emotional needs. During the interview, the warmth and caring that could be felt from these stories about teaching and individual students was wonderful. Stories about meeting the emotional needs of their students over strictly learning about math were told by some of the teachers. These teachers talked about giving space for learners to express their emotions and striving to create a safe, inclusive classroom that indicates a human connection between these teachers and their learners. As an instructor, I find that I gravitate to this type of instructional practice. I find that I love helping learners to learn and it doesn’t have to be about math. Part of knowing how to teach is the connection that an instructor builds with their learners. I find that when I connect, care, and become invested in the person, the learning happens naturally. As one of the participants said, “I love algebra, I am good at it, but I love students more.” I care about their success and what to see them out in the world succeeding.

#### **4.6 Conclusion**

This chapter described the summarized stories of lived experiences and how they contributed to the mathematical self-identity and the instructional practices of ABE math instructors. The shared life stories emerged from the interviews conducted over ZOOM, transcribed, summarized, and read numerous times. This collection of stories that were shared was quite emotional and compelling. The ABE math instructors provided their math journeys.

Some stories were about happiness, excitement, and joy, while others were about fear, anxiety, failing, and physical punishment. Their stories continued into their current ABE math classrooms, where they shared stories about creative ways to teach and have fun, the importance of understanding and valuing the lived experiences of their learners, recognizing how a person's actions affect others, and being open to different perspectives. There were stories about teachers overcoming their negative experiences to develop a stronger, positive math identity as a result of improving themselves for their learners. Furthermore, there were some instructional stories about lecturing, memorizing, and following math rules.

My reflexive ethnography about my mathematical journey was similar to the participants of this study. Using the same criteria for classifying the participants in this study, my mathematical self-identity would have been categorized in the poor performance or failing group and my instructional practices would have been placed in the caring category. Although, my entire mathematical journey has been shared for this study. It is important to include my experiences with the findings of this study because it is the lens through which I interpret the world.

These 38 stories are interesting individually but powerful when viewed as a collective. The transcribed narratives may read as suspenseful, traumatic, or joyful. There may be endings where teachers overcame negative experiences. In contrast, others became open to viewing the difficulties of learning math through the eyes of their students, or they may read flat without adventure. Nevertheless, the audio of these narratives is full of positive and negative emotions. Honoring the intent of life history narratives and narrative identity analysis involves numerous readings of transcripts and replaying of audio files to summarize and retell a complete story.

Each participant's story of their first experience of mathematics struggle or no struggle, along with their mathematical knowledge, perceptions, beliefs, and practices, were captured to address the two research questions of this study. All the stories told revealed a group of people who may or may not be trained in teaching and who give wholeheartedly to their students with a desire to impact them positively. They are compassionate and empathetic and want to see all their learners succeed in education and life. Chapter 5 includes a summary of the narrative analysis, a discussion of the three groups and three subgroups, and the interpretation of the findings.

## **CHAPTER 5 – INTERPRETATIONS, DISCUSSION AND RECOMMENDATIONS**

This study analyzed stories of ABE math and numeracy instructors, who were from all across the United States, as narrative identities to understand key events that contributed to the mathematical self-identity and revealed the mathematical knowledge, perceptions beliefs, and practices about mathematics instruction. This study provides a framework to navigate the intersection between the individual's lived math journey experience and the development of an ABE math instructor mathematical self-identity. It fosters insight into how ABE math teachers comprehend and apply their knowledge, beliefs, perception and instructional practices in the field of mathematics education within their classroom.

A few of the participants asked me what my end goal was. I told them that I wanted to spotlight ABE math instructors and highlight how one's story gives us a lens to experience this hidden world of adult education. This study offers an opportunity to view the influence of one's mathematical journey. After all, telling people you are a math instructor evokes stereotypical thoughts of intelligence or being an expert in problem-solving, a person who is quick with the answer and never experiences struggle. In this chapter, I will discuss the summary, interpretation, and discussion of the findings and tell the stories where those stereotypes are not always seen.

### **5.1 Summary of the Findings**

This study addressed a research gap by telling the stories of ABE math and numeracy teachers. Thirty-eight ABE math teachers shared their math journey and stories about their math instruction. These stories answer the research questions about the events that contribute to the

math self-identity of this group and how their knowledge, perceptions, and beliefs contribute to their mathematics instruction.

The findings and shared stories were grouped through theoretically driven inductive themes. For research question number one, there were four overarching themes. Positive stories without struggle or key turns were grouped under the positive math memory. Stories that were about fear, anxiety, or avoidance were placed in the phobia or emotional response group, and stories about failing or poor math performance were grouped together and placed into the negative performance outcome category and experiences about physical punishment were grouped. For research question number two, each narrative fits into four categories. The groups were Active Learning, algorithms and lectures, professional learning and caring. The stories about creative and fun ways of teaching math, that the interviewees described, were not lectures, worksheets, or memorization, were grouped under this heading. For the instructors who did talk about, for example, teaching as lectures, worksheets, or memorization; they were categorized as algorithms or lectures. Teachers also told stories about ways they have and continue to improve their instruction, either by mentoring, professional development, or self-directed learning. The last category for research question two was caring. The category for caring was given to stories about understanding and valuing what others go through, recognizing how a person's actions affect others, and being open to different points of view. .

The findings of this study gave insight into the experiences of ABE math instructors' mathematical journey. The shared stories inform individuals about the existence of ABE math and numeracy teachers and allow a unique perspective on how their lived experiences may influence one's math self-identity. The findings also allow us to view the ABE classroom and

how teachers instruct adults in their classrooms. The narrative interviews of ABE math instructors about their math journey and its influence on their instructional practices gave a view behind the curtain of this mysterious educational world of ABE.

In this chapter, I will discuss my interpretation of findings and link these findings directly to theory, studies, and my literature review. Two sections will be presented to answer each of the two research questions. First, the stories contributing to the mathematical self-identity of ABE math instructors will be described by analyzing the narratives told. Second, the examination of these stories to determine how they contribute and reveal the knowledge, perceptions, beliefs, and practices that ABE math instructors utilize in their classrooms.

## **5.2 Interpretation of the Findings**

While the mathematical journey stories I was told were unique experiences by the narrators, some of the tales shared overarching commonalities. My interpretation of these summarized stories found that they were positive and negative. Some were about struggles and not experiencing struggles during their math journey. The analysis represents the stories of the lived experiences of ABE math instructors. The following interpretations result from one-on-one communication between the participants and myself and the theoretical framework of this study, the literature reviewed, and other research.

### ***5.2.1 Math Self-Identity***

Humans with a strong math identity tend to view math positively (Bong & Skaalvik, 2003). They view their ability to work with math confidently and competently (Bong & Skaalvik, 2003). The stories told to me were about loving math and feeling confident about

their ability. Ma and Kishor (1997) found that a strong math identity was tied to a strong engagement, motivation, and achievement in mathematics. The shared stories illustrated these sentiments of confidence and ability. They were placed in the positive math memory group. The instructors indicated that they never experienced struggle in their mathematical journey. It has been theorized that students acquire more than just knowledge but transform into another person that has developed into an identity that is either inclusive or exclusive in the community of math learners (Hannula et al., 2016).

As teachers, their math self-identity has changed because their mathematical community has changed. This idea aligns with the theoretical approaches to the socio-cultural idea of community belonging (Wenger, 1998; Lave and Wenger, 1991). The stories of no struggle fit neatly into many theories about mathematical identity. The tales that mentioned a parental figure who viewed mathematics positively may have influenced their children's experiences in math because that was their community of learning (Wenger, 1998).

Not all the stories were positive, and there were stories about anxiety, fear, avoidance, diminishing performance, failing, and physical punishment. The psychological and physical experiences of anxiety, fear, avoidance, and physical punishment relate to math anxiety or math trauma (Ufuktepe & Ozel, 2002; Richardson & Suinn, 1972). Math anxiety and math trauma from past experiences have been shown to correlate with lower math knowledge, understanding, and motivation (Ashcraft & Krause, 2007). The math story about being frozen when doing a timed math assessment is a physiological reaction that manifests from feeling math anxiety (Faust, 1992). The physical punishment that some teachers experienced has led to them not knowing some mathematical concepts as adults (Barroso et al., 2010).



The stories about failing or declining performance in their math classroom and negative feelings about math are consistent with the findings of the systemic review done by both Barroso et al. (2010) and Hembree (1990). The stories these teachers experienced as students were about emotional distress, which may have impacted their ability to focus, logically reason, and problem-solve (Luttenberger et al., 2018). These experiences may have caused their lower math self-identity because their interactions with teachers were not positive (Boaler, 2012; Dweck, 2006).

Additionally, several of the stories from this group experienced declining performance or failing after primary school. Considering Erik Erikson's theory of psychosocial development, it is during ages 12 – 18. Humans are at stage five of development (Orenstein & Lewis, 2020). This state is when people want to conform to societal norms, reflect on experiences, and establish their sense of self (Orenstein & Lewis, 2020). These experiences may have influenced the establishment of their math self-identity or may have weakened it. Participants who once had a strong math self-identity spoke about being misplaced into higher-level math courses, and skipping to the next class in the sequence was a shameful experience (Monroe, 2012). The study that Monroe (2012) conducted reminded me of the stories where students hid their feelings of weakness and felt like they had let either a parent or an administrator down. "Shame is felt when a weakness or personal flaw is exposed" (Monroe, 2012, p. 73)

Learning math facts and/or experiencing timed math facts assessments were a shared memory told by ABE math instructors. These stories were tales about feeling embarrassed, confused, and anxious. Their stories were about how they remember being told to memorize, follow a procedure, or produce the correct response sometimes for multiple problems in a short

time. Current research indicates that procedural and conceptual understanding must be taught as connected ideas (Powell et al., 2022). Although Powell et al. (2022, p. 8) said, "...there is no causal evidence that timed assessments will produce mathematics anxiety," a few of my interviewees would disagree. Powell et al. (2022) say that using and implementing timed assessments are beneficial teaching techniques. These claims are controversial in the field of mathematics education. In an article by Barshay (2023), experts still debate the benefits or damage caused by timed assessments. The National Council of Teachers of Mathematics does not support the practice, while the U.S. Department of Education recommends timed activities to support fluency (Barshay, 2023). Researchers Boaler and Greeno (2000) found that students who saw math as merely a procedure without meaning did not develop a mathematical identity or refused to develop an identity.

Reflecting upon all the stories about either no struggle or struggle in each of the ABE math instructors' math journey and the theoretical framework for math self-identity align with two puzzle pieces. Humans who felt no struggle had strong math identities and were confident in their abilities (Bong & Skaalvik, 2003; Ma & Kishor, 1997). Conversely, the majority of the interviewee experienced struggle along their math journey and remembered feeling deficient, embarrassed, or anxious. Their mathematical self-identity was negative or weak, and they avoided math courses after taking the required courses (Barraso et al., 2021; Boaler, 2013; Boaler & Green, 2002; Ma & Kishor, 1997; Hembree, 1990). Some of the experiences were quite traumatic. The research on trauma and trauma treatment is beyond this study's scope. I acknowledge the importance of some knowledge of these areas when speaking to a person about their lived experiences with math.

There are many factors to consider when understanding the impact of trauma. Trauma can shift a person's mental processes in three ways. First, how people think about themselves; second, how they see others and the world around them; and lastly, how they view their future (Beck et al., 1979). Humans who experience trauma may begin to see themselves as incompetent compared to others (Levin & Hanson, 2019). This perception about themselves may change their self-identity (Holland et al., 2001). Wenger (1998) illustrated this belief about a person's learning and indicated that a person's identity is developed in relationship to shared communities. However, if a person's experience with mathematics is negative, seeing it as a bunch of rituals, processes, or procedures, they may reject the development of their math identity (Boaler and Greeno, 2000). A weak or negative math identity has led to math avoidance, poor performance in mathematics, and math anxiety (Barrasso et al., 2021; Ma & Kishor, 1997; Hembree, 1990).

The stories of the math journeys that were told to me by this group of ABE math instructors suggests that their experiences did shape their mathematical self-identity. The findings of this study are supported by other studies on teacher identity that suggest that teachers' previous experiences and stories are associated with identity (Hossain et al., 2013; Lutovac and Kaasila, 2011, 2014). Although identity is a dynamic construct that is changing over time, the findings of this study align and add to the current body of literature on math self-identity. In the next section, I will interpret the stories about ABE math instructors' journeys, their mathematical practices, and what they revealed about the knowledge, perceptions, beliefs, and practices of mathematics instruction.

### ***5.2.2 Mathematical Instructional Practices***

Teachers' experiences as students have been shown to influence and contribute to their teaching practices and beliefs in a few studies (e.g., Hossain et al., 2013; Lutovac and Kassila, 2011, 2014; Philipp et al., 2007)). Theory and studies support the notion that student identities differ from a 'teacher's identity (Goldin et al., 2013; Hannula et al., 2016). In this study, teachers described how their math journeys contributed to their knowledge, perceptions, beliefs, and practices about mathematics instructions.

The stories about how ABE math instructors' math journey influenced their instructional practices align well with the current research. The beliefs teachers described in their narratives for this study came from personal experiences, formal or informal training, and caring about their learners. Richardson and Denton (1996) found the same findings in his study on K-12 teachers, except there was no mention of empathy for learners. The beliefs about how math should be taught were discussed during the interview. Cross (2009) and Ernest (1989) found that teacher beliefs about mathematics ranged from procedure-driven facts to pattern-seeking. The same is true for this study. Some ABE math teachers believed math instruction should be hands-on, fun, engaging, and represent real-world activities. While other instructors thought math should be taught through processes, lectures, and repeated practice. The stories about teaching using lectures, practice, and algorithms were told by instructors who did not experience struggle in their mathematical journey and found math to be a set of "rules" or "facts" that a person must memorize. Math, viewed as a set of procedures or steps, can be less engaging to learners (Cross, 2009).

While other ABE math instructors told stories about how they teach hands-on problem-solving that involves group work, and perhaps real-world contexts, this type of instruction aligns with the research from the *Components of Numeracy* (Ginsburg et al., 2006). Adults need these three factors, context, content, and cognitive and affective, to develop their numeracy skills. Research has shown that students who engage in problem-solving and group work see themselves as competent and develop identities that associate math as a part of their future. However, the lecture-based settings did not (Boaler and Greeno, 2000). Some teachers talked about being creative and fun with their teaching practices based on their enjoyable experiences of learning math. Although some teachers had experienced struggles in their mathematical journey, they did not want their students to view math as they did. This shift in their practice from their own mathematical experience is addressed in the change from student identity to teacher identity (Hannula et al., 2016).

ABE math instructors who were uncomfortable teaching math told stories about how they taught themselves the math they had once failed or felt they would never know. Their motivation to learn has changed, and the reason for learning is now seen as worthwhile (Hannula et al., 2016). The goal is to learn the material so they could feel more confident when teaching it to their learners (Johnson et al., 2019). Some teachers told stories about 'ah-'ha' moments during professional development or peer learning. These 'ah-'ha' moments happened when teachers were allowed to understand conceptually and procedurally the math they planned to teach (Ball, 1988). Teachers who talked about specific training were allowed to arrive at their own way of knowing and were able to justify their answers (Ball, 1988). Knowing why math works is just as important as doing the calculations correctly. These teachers were learning to explore, and this

changed their beliefs and identity about math (Ball, 1988; Hannula et al., 2016; Hossain et al., 2013; Lutovac & Kaasila, 2011, 2014; Poletini, 2000). It was important for these teachers to experience this type of change because their lack of knowledge and confidence impacts their students' ability to achieve mathematical understanding (Horne, 2022).

Additionally, it is important to consider the affective factors, which consist of how learners like math, value learning math, confidence in learning math, and math achievement (Khine, 2015). For this study, affective factors, along with understanding and valuing the life of the learner and their emotional needs and being open to a different perspective about how learners felt about math, were categorized as caring (Yallom & Leszcz, 2005). These stories about mathematics instruction were not always related to an ABE math 'instructor's personal math journey. Many teachers who did not struggle with learning math understood that their learners did, and stories about how they always thought it was easy or loved it would not support their learners in achieving their academic goals. The teachers' focus was not on themselves but on helping students succeed by being relatable, encouraging, supportive, honest, and communal. These stories align well with the *16 Habits of Mind* (Costa et al., 2022) research based on constructivist theory. It is a learner-centered approach to teaching and focuses on helping students adjust their thoughts and behaviors when confronted with life and academic challenges (Costa et al., 2022).

The stories about mathematical practices did not always align with the stories of the mathematical journeys. Many of the ABE math instructors who had experienced struggle in their math journey worked at changing their beliefs, perceptions, knowledge, and practices to benefit their learners. These adjustments align with studies that have been published on K-12 teachers.

The instructors who did not change their mathematical beliefs, perceptions, knowledge, and practice were a small population. A literature review shows that this instructional practice may not develop learners who see math as part of this identity or belief.

### **5.2.3 Summary**

The findings of this study suggest that the narrative stories about ABE math instructors' math journey had some impact on their mathematical self-identity. The instructors who told stories about never experiencing struggle were confident in their mathematical ability. A few had previous jobs as architects and engineers. The instructors who struggled told tales about a negative or weak math self-identity before becoming an ABE math teacher.

The role of ABE math teacher has inspired the strugglers to learn the math they once feared or disliked. Some even experienced clarity on a math topic for the first time after many years away from a formal class. Those positive moments have helped to repair some of the trauma that existed.

The strugglers share their journey with their learners. But the non-strugglers do not. Instead, some teachers seek to understand the gaps of their learners while one or two others use methods that work for them in learning math. Nevertheless, many instructors interviewed have a mission to help their learners succeed in math. Some instructors create life-long friendships and have former students visit them.

### 5.3 Discussion

This study is similar to another study recently conducted by Wilder and West (2023). Our participants for the study are different. I selected ABE math teachers and they utilized college and university faculty members. Additionally, they investigated math journeys to identify barriers that may alter a person's belief in their success in mathematics and find ways to promote effective pedagogy in mathematics. While I explored how a person's math journey informs their mathematical self-identity, perceptions, beliefs, experiences and practices as they are now teachers of math.

Wilder and West (2023) found stories that were positive, negative, or a mixture of both. For this study, I captured the first story that participants told. These stories were positive or negative exclusive but other stories that were told were a mixture. Those additional stories were outside the intent of this study and were not included. We both found stories about mathematical trauma and negative performance whereas, they were investigated fixed mindsets and discrimination in ethnicity and gender.

Both studies spoke about caring. Caring in this study referenced instructional practices from stories that ABE math teachers told me about how they are invested in helping their learners beyond the scope of learning math. They wish to help them as a mentor or confidante who will guide them with sound advice beyond just education. Wilder and West (2023) speak about the importance of creating a nurturing environment within the mathematical classroom as a way to promote a positive learning experience.



Wilder and West (2023) found that stories that shared stories about two instructors who had a positive experience with math because once they found success they continue to be successful in mathematical learning. I did not hear any stories that were similar in nature to this experience but I did have teachers share about the importance of making math relevant to their learners so they could find success. Wilder and West (2023) also spoke about the importance of making math relevant.

Another way that our studies differed is I interviewed my participants, recorded, transcribed, listened and reviewed their transcripts. Wilder and West (2023) had participants write their math autobiography. The participants in my study were mathematics teachers. Their stories about classroom instruction were recent. The stories that Wilder and West (2023) collected were about a person's previous math journey because these instructors were from different fields and not just math teach

### ***5.3.1 Limitations of the study***

This study was limited by the number of participants and the diversity of the population interviewed. The study was limited to participants who agreed to participate voluntarily. Although this study utilized a set of interview questions, participants were allowed to share stories they felt comfortable sharing with me. The stories that people shared were viewed to be accurate. However, there was no way for me to confirm their story. I did seek clarification about their stories. Nevertheless, details that might have been omitted might have been relevant to this study.

The obtained stories were viewed as accurate and the participants as trustworthy. Although stories could not be verified as true or false, no inconsistencies were noted in the stories they told. But, there could have been outside factors that impeded their memory at the time of the interview, such as the mindset of the participants who were currently teaching in the classes, which may be different than that of participants who were off during the Summer. The lack of ability to verify the stories told challenges the validity of the data.

Additionally, generalizability and bias are limitations of this study. The interviews collected did not represent the entire population of teachers in ABE programs. The data collected was from ABE math teachers who voluntarily met with me. My bias and closeness to the field of ABE may be considered a limitation. Although, I did write my own personal story in this study to be transparent. The stories of the instructors did become intertwined with my own personal narrative (Scott-Pollock, 2022).

### ***5.3.2 Contributions of study***

My contributions to the body of knowledge are that it strengthens and confirms the work that has been done on math identity, motivation, and beliefs. Stories about the math journeys of ABE math instructors and their transition to teachers strengthen the studies that have been done on student and teacher identity (Boaler & Greeno, 2000; Hannula, 2016; Holland et al., 1998; Lutovac & Kaasila, 2014; 2011; Richardson, 1996) The stories about formal and informal learning support the findings of Ball (2014) on the importance of developing teachers to have a deeper conceptual knowledge and not simply a procedural understanding. This study contributes to the discourse on math facts or timed assessments and the phobias or emotional reactions

experienced and remembered as adults. Last is the importance of caring and its role in adult learning.

This research revealed the impact of individuals' mathematical journeys on their perceptions, beliefs, identity, experiences, and mathematical practices, encompassing positive experiences, phobias or emotional response, negative performance outcome, and memories of physical punishment. My unique contribution lies in uncovering how the mathematical experiences of ABE math teachers continue to be influenced by their experiences for decades after the initial event. My work is unique because of this finding but also because there is limited research on ABE math teachers in the United States. ABE math and numeracy is an area that there is limited research on in the United States. It is hidden, as this research has stated.

This study is novel because it introduces the educational research field and others of this area of education. The findings of this study indicate that a person's mathematical journey may guide a person's educational journey. The methods used in this study are innovated because traditionally they have been utilized in primarily sociology, psychology, and anthropology. This study implies that mathematical autobiographies inform educational researchers about beliefs, perceptions, and experiences. By utilizing McAdam's Narrative Identity Analysis, primarily used in psychology, a person's perception or beliefs about their ability in mathematics may be better understood and interventions created to improve inequities in math education.

This study is pioneering because it reveals the uniqueness of the ABE math classroom and the qualifications that educators have to teach adults math. It illuminates areas where research on adult learning strategies or cross-disciplinary collaborations between educators,

researchers, and professionals from math could lead to insights that might improve the work being done. This study offers a starting point for additional research in this area.

My contribution to Southern Methodist University Simmons School of Teaching and Learning mission can be illustrated in the collaboration across the academic community and interdisciplinary collaboration. This research showcases a methodology primarily utilized in Sociology, Anthropology, Psychology, and other Social Sciences. Additionally, this study integrates theory and research from different disciplines and aligns them within the context of a human's journey in learning mathematics.

My contribution to ABE math and numeracy educators is in retelling their stories to reveal the hidden world. In Chapter 4, I retold the stories told to me through vignettes and my interpretation. These stories help connect practitioners by sharing experiences that may be similar. Stories are what connect us as humans.

### ***5.3.3 Recommendations***

I conducted this study to learn how ABE math instructors' math journey influences their math self-identity and how this journey contributes to knowledge, perception, beliefs, and practices about mathematics instruction. There has been work similar to this in secondary education. The following recommendations are given to support and continue the work done in this study, see Table 11. The eight themes that emerge in these recommendations are from Chapter 4:

1. Positive Math Memory,
2. Phobia or Emotional Response,

3. Negative Performance Outcome
4. Physical Punishment,
5. Active Learning,
6. Algorithms and Lecture,
7. Professional Learning, and
8. Caring.

Table 11: Recommendations

Recommendation	Source of Recommendation
1. Educators need to understand different math identities and math beliefs.	RS1 themes 1, 2, 3, and 4 (Bong & Skaalvik, 2003) (Ma & Kishor, 1997) (Orienstein & Lewis, 2020)
2. All educators need to have skills to support learners as they work through their math phobias.	RS 1 themes 2, 3, and 4 (Beck et al.,1979) (Monroe, 2012) (Wenger, 1998) (Ufuktepe & Ozel, 2002)
3. Timed assessments and mad-minute math facts should be used with caution because of the damage they can do if not implemented correctly.	RS 1 & 2 (Barshay, 2023) (Boaler & Greeno, 2000)
4. Project-based learning and group learning model supports a positive math identity when teaching mathematics, relating math tasks to adult learners.	RS 2- theme 1, 5, & 7 (Barshay, 2023) (Boaler and Greeno, 2000) (Ginsburg et al., 2006) (Johnson et al., 2019) (Wenger, 1998)
5. Let adult learners share their math stories with their ABE math teachers for interpersonal relationships.	RS 2 theme 8 (Costa et al., 2022) (Khine, 2015) (Yollam & Leszcz, 2005)

### 5.3.3.1 Math Memories.

Educators need to understand how math identities and beliefs begin. Beliefs and identities constantly change (American Psychiatric Association, 2013; Hossain et al., 2013; Lutovoc & Kaasila, 2011, 2014). Educators need to understand how to support learners to feel confident and competent when doing math so that they view math positively (Bong & Skaalvik, 2003).

Educators need ways to increase engagement, motivation, and achievement to build strong math identities (Ma & Kishor, 1997). Adults may find it cathartic to reflect on their math journey. There are many benefits to reflecting on one's learning (Costa et al., 2022). Reflection supports metacognition and a reimagined future experience (Ryan, 2013). Educators need support in helping learners reflect through different activities to allow time to process positive and negative thoughts and emotions.

### **5.3.3.2 Math Phobia and Physical Punishment.**

This theme was captured in the math memories. However, additional recommendations are needed for math phobia and physical punishment. Math phobia includes anxiety, fear, and avoidance as defined in the DSM-5 (American Psychological Association, 2013). Lived experiences that are phobias, or involve physical punishment, may be deeply ingrained in an adult learner or ABE math educator (American Psychological Association, 2013). ABE math educators need support and training to care for their learner's needs along with training and education on how to guide learners to resources or techniques that can assist with lessening their phobias (Monroe, 2018). ABE math instructors need to know how to utilize teaching practices that support reflection as a pathway to assist learners or themselves in overcoming their math fear, anxiety, and avoidance (Ufuktepe & Ozel, 2002; Richardson & Suinn, 1972).

Furthermore, timed assessments and mad-minute math facts should be used with caution because of the damage they can do if not implemented correctly. These activities are a controversial instructional technique (Powell et al., 2022). There is research to support this methodology as an important teaching strategy (Barshay, 2023). However, the stories from this study inform us that they may potentially cause math trauma or an adverse change in math self-

identity and beliefs. Learners who see math as a set of procedures without meaning do not develop a mathematical identity or refuse to develop an identity (Boaler and Greeno, 2000).

### **5.3.3.3 Improving Instruction Beyond Algorithms and Lectures.**

The stories about improving instruction were the most common theme shared in this study. ABE math instructors told stories about their own learning through conceptual, project-based group activities. There is research that supports this learning in the secondary education setting (Boaler & Greeno, 2000). Students allowed to engage in this type of learning appear to have a strong math identity, feel more confident, and envision themselves using math. ABE instructors may need training on successfully implementing this in their classrooms. Instructors might find it beneficial to revisit the research on integrating conceptual and procedural knowledge in math education (Powell et al., 2022). This can help them align their beliefs, perceptions, and experiences with mathematical practices that endorse the NCTM recommendations for teaching (Barshay, 2023).

Additionally, the *Components of Numeracy* (Ginsburg et al., 2006) indicate that context is a component of mathematical proficiency. Adults utilize mathematical thinking as they go about their lives. Utilizing familiar experiences in lessons supports mathematical proficiency and keeps learners engaged (Ginsburg et al., 2006).

### **5.3.3.4 Interpersonal Relationships.**

Adult learners are often the most challenging students to provide educational services to because of numerous factors discussed in Chapter 2. The *16 Habits of Mind* (Costa et al., 2022) support the need for students to feel understood and valued (Yallom & Leszcz, 2005). Educators



may need additional training on incorporating these ideas into their classroom and understanding why they are important. Additionally, ABE math instructors may benefit from the research that has been done on social-emotional learning in K-12 settings.

#### ***5.3.4 Future Direction of Body of Knowledge and Related Research***

The future direction of the body of knowledge and the related research based on the information presented data is slowly widening. Internationally, adult numeracy and mathematics are being researched, and studies are being published frequently, but in the United States, they are stagnant. Research may be conducted in dissertation research but is scarcely published.

Future research should explore the influence of age, gender, race, and social class on students' and teachers' narratives of math journeys. This research may confirm the findings of Lim(2008) (2008), Martin (2007), and Nasir and Cobb (2002). However, without conducting these studies, we may never know. Other areas of need are beliefs about math teaching and learning, investigating specific mathematical topics in adult education, and their importance to adults in everyday life.

Future research is needed on adult basic education teachers to understand the path to this little-known education arena. Understanding how future teachers come to adult education will aid in the recruitment and perhaps the development of educational courses similar to teachers who wish to be teachers in K-12 settings.

This study did not include the research on how ABE math learners' math journey contributes to their mathematical self-identity. A pilot study was conducted on learners, but the life history methodology might be an opportunity for future research. Future research may also

consider analyzing the data from life history interviews using Bourdieu's habitus to understand how social factors and beliefs influence stories (Wedge, 1999) or analyzing stories for the emotional responses given.

There is a limited amount of funding for adult education research. The Institute for Educational Sciences (IES) finances and focuses on large-scale research projects that develop and test much-needed interventions. These quantitative or longitudinal endeavors are not conducive to adult education. However, there has been renewed interest in funding small research studies. Currently, the Adult Literacy and Learning Impact Network (ALL IN) requests research proposals for short-term projects that align with the National Action Plan for Adult Literacy. These small grants will allow researchers to investigate areas of adult education. I focus on adult mathematics and numeracy, which is subtended under the heading of literacy.

This study informs policymakers of the uniqueness of this population and the need to fund innovative research methods to understand this hidden population further. Adult education is essential to the United States economy and provides an avenue to create informed citizens. These findings confirm most of the research already done in K-12 arenas, but some of this research is small. By allocating funds for quantitative and qualitative research on adult learners, adult education research will have a voice. Thus, this provides for a deeper understanding of education at all levels.

### ***5.3.5 Conclusion***

Thirty-eight ABE math and numeracy instructors were interviewed about their math journey. The stories told were about not struggling with learning math, struggling at learning

math, and about their beliefs, perceptions, knowledge, and practice about mathematical instruction. Their stories were summarized and retold, allowing me to answer this study's research questions. By tying their narratives to research, we can better understand how a person's math journey impacts their mathematical self and feelings towards math.

In my reflective autoethnography, I shared my personal journey. It was an important piece of this study because it is the lens through which I view the world. The stories the participants told helped remind me why I wanted to be a teacher and reaffirmed my desire to be a researcher. I want to be of benefit to this world. I want to help people achieve their educational goals by helping them navigate a subject that many find difficult. I want to inform the world that learning mathematics is more than finding a solution. It is a creative, reflective, visual process that is not always quick, reminding humans that mistakes are an opportunity to learn and not a punishment. This study will not be the end of my journey.

## **APPENDIX A Mathematics Autobiography Survey Used in Pilot Study**

What is your gender?

What is your race/ethnicity?

What is your age?

Have you completed an adult education/GED program?

Are you currently enrolled in an adult education/GED program?

What is your native language?

What kinds of jobs have you had in the past?

What job(s) do you currently have?

What are your career goals?

What is the highest grade level you attended in school?

Why did you stop attending school?

How confident do you feel in math classes?

What are some early memories you have about learning mathematics?

What is your proudest math moment?

What is your worst math moment?

What is your favorite or least favorite aspects of math?

What are two examples of when you have used math outside of school?

What area of math do you find the most challenging?

Why are you seeking to obtain your high school diploma now?

After you obtain your high school diploma, do you plan to enroll in additional math courses? If so why or why not?

Do you experience mathematics anxiety? Describe any experiences you have had with mathematics anxiety.

Do you like math? Why or why not?

Do you value learning math? Why or why not?

Do you consider yourself knowledgeable about math? Why or why not?

Is it hard or easy for you to study for math classes, do math homework, and actively monitor whether you understand or do not understand math ideas? Why?

When you are taking a course that includes math, what is your primary goal? (e.g., to pass and finish; to do as little work as possible; to not look dumb; to look smart; to learn the most)

Do you find it easy or hard to persist when you face difficulty in mathematics?

What are some examples of times this has occurred, and what did you do?

Are you willing to be contacted for a follow-up interview about your responses? The interview will take place before, during, or after your GED classes, either in person (with a researcher coming to your class area) or by video-conferencing. If you are willing, give your phone number and/or email below:

### APPENDIX B Pseudonyms and Characteristics

Name	Gender	Age	Ethnicity	Race
Karen	Female	18-24	Non-Hispanic	White
Danny	Male	18-24	Non-Hispanic	White
Fred	Male	35-44	Non-Hispanic	White
Tara	Female	18-24	Non-Hispanic	White
Holly	Female	45-54	Non-Hispanic	White
Jennifer	Female	35-44	Non-Hispanic	White
Bob	Male		Non-Hispanic	White
Sarah	Female	25-34	Hispanic	White
Pat	Other	18-24	Non-Hispanic	White
Scott	Male	18-24	Non-Hispanic	White
Tasha	Female	25-34	Non-Hispanic	Black
Christi	Female	18-24	Non-Hispanic	White

Tom	Male	25-34	Non-Hispanic	White
Greg	Male	25-34	Hispanic	White
Michelle	Female	25-34	Non-Hispanic	White
Kim	Female	45-54	Non-Hispanic	White
Tiffany	Female	45-54	Non-Hispanic	Native American/Pakistani
Mark	Male	18-24	Non-Hispanic	White
Terri	Female	18-24	Non-Hispanic	White
Cara	Female	18-24	Non-Hispanic	Native American

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## APPENDIX C – Initial Survey

Informed consent will be first.

1. Do you agree to be video-recorded and keep your camera on as part of your participation in this research study?

Yes, I also consent for my video recordings to be played for scientific or educational audiences. Participants can contact the Principle Investigator if they change their minds about their video recordings being played for scientific or educational audiences.

No, I do not consent.

2. Sign below, if you agree to participate

3. Select one: I am at least 18 years old or I am under 18 years of age.

4. Are you currently an adult basic education mathematics and numeracy teacher? (Within the last 18 months.) No or Yes

5. First Name:

6. Last Name or Surname:

7. Age:

8. Gender:

9. Race:

10. Ethnicity:

11. What time during the day is best for you to meet (Select all that apply):

Mornings, Afternoons, Evenings



12. What days of the week are best for you to meet (Select all that apply):

Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

## **APPENDIX D- Invitation to Participate in a Narrative Research Project**

Hello, my name is Brooke Istas. I am a Ph.D. candidate at the Simmons School of Education and Human Development. I am conducting a research study of Adult Basic Education Mathematics and Numeracy Teachers' personal narratives for my doctoral dissertation research.

My research will focus on storytelling and how those who hold math teaching positions in adult basic education narrate their professional and personal journeys. A list of questions will be available to you, but you are encouraged to choose what experiences you feel are the most meaningful, where your story begins and ends, and what information to include and exclude. The average interview takes 90 minutes each, with 1 to 3 meetings. You will choose how long and how detailed your story is and how many sessions you would like to have.. I am interested in whatever you have to share. I understand that recalling some memories may be painful, and you may choose to end the interview at any time.

The interviews will be recorded, and portions of the transcribed interviews will be included in the final research project, but your identity will remain confidential; your name and any identifiable features will never be disclosed. The video and audio files will be kept in a secure online repository indefinitely. Only my advisor and I will have access to them.

Participating in this dissertation project will assist researchers and policymakers in understanding the mathematical journey of adult basic math educators and provide meaning to their experiences and perceptions of mathematics.

If you would like to participate in this research project, then please fill out this short survey <https://bit.ly/hidden-teachers> that will take you approximately 5 minutes. Thank you for your consideration. If you have any further questions regarding this project, please contact me at 620-441-5596, [bistas@smu.edu](mailto:bistas@smu.edu).

## APPENDIX E- Suggested Questions

*Note - These questions are made available before the interview for your convenience. This project is about your personal experiences. You are not expected to answer these questions in any particular order or at all. You are free to include whatever information you choose to include. I am interested in your understanding of mathematics as an ABE/GED teacher and your experiences as a mathematics learner.*

Let's start with your experiences...

Tell me the story of how you began as an adult education mathematics teacher. By answering the question: how did you end up becoming an adult basic education mathematics teacher? (Be very detailed with your story, start at the beginning until you reach where you are currently)

Using a timeline from when you were born to where we are today, I want you to consider your math learning experience and journey. If this journey was a book with important moments where chapters along this timeline, how might your book begin?

What were some of your math learning experiences in elementary, middle, high school, college and now?

Are there any particular moments that stand out to you?

How did you feel during these experiences? Were there any strong emotions involved?

Did you face any challenges or obstacles in your math journey? How did you overcome them?

How does your math learning experience and journey influence you as a teacher?

How is learning math and teaching it to others different?

What experiences or stories have you heard other learners tell you their math journey? Has this changed your teaching practices?

If I were to visit your program and observe you preparing and teaching that day, what would I observe? What is a day in the life of an adult basic education mathematics and numeracy educator like?

How do you describe your role as an ABE Math and Numeracy teacher?

How do you decide what to teach, the materials you will use, or do not use?

## APPENDIX F - Post-Survey

1. The highest degree you hold
2. Major Area of Study in College (If College Degree is marked)
3. Does your state require you to be licensed to teach in adult education? If yes, what are the requirements for obtaining licensure?
4. Do you work Part-time, Full-time, or Volunteer?
5. How many hours do you work each week?
6. What topics do you teach for your program? Math, Reading, Writing, Science, History,  
All the above
7. Are you given paid preparation time for class?
8. How many days each week do you teach math?
9. How many hours do you teach math each week?
10. How often do you attend professional development on teaching mathematics to adults?  
Weekly, Monthly, Yearly, Other
11. Tell me the story of how you began as an adult education mathematics teacher.

## APPENDIX G - IRB

### SOUTHERN METHODIST UNIVERSITY

#### Research Participant Information and Consent Form

Title of the Study: Hidden Teachers: Stories of Adult Basic Education Mathematics Educators in the United States

Principal Investigator: Brooke Ista (phone (620) 441-7429, email: [bistas@smu.edu](mailto:bistas@smu.edu))

#### DESCRIPTION OF THE RESEARCH

You are invited to participate in a study on storytelling and how those who hold math teaching positions in adult basic education narrate their professional and personal mathematics journeys.

#### WHAT WILL MY PARTICIPATION INVOLVE?

You will complete the online pre-survey about your demographic information and availability for 1 to 3 interview sessions that last 90 minutes. You will then be contacted to schedule your interview sessions and a list of interview questions will be sent to you. You will then take a short post-survey on information about your education and adult basic education mathematics teaching position. You will be video recorded during these interview sessions. Participants may choose not to participate and can withdraw at any time without penalty. Your consent is optional and voluntary. Your decision whether or not to participate will not prejudice your present or future relations with Southern Methodist University. The pre-survey should take approximately 5 minutes, the interviews will be 1 – 5 hours depending on your preference, and the post-survey should take approximately 10 minutes.

Your total participation time will be approximately 5.25 hours.

#### ARE THERE ANY RISKS TO ME?

There is a slight risk that you may tire from answering the questions or recall some memories that are painful, however, you may stop your participation in the research at any time. Should you need additional mental health resources a list has been compiled:

National Empowerment Center <http://www.power2u.org/>

Phone: 800-POWER2U (800-769-3728) TTY/TTD: 800-TTY-POWER (800-889-7693)

Hours: Monday-Friday, regular business hours (EST)

Languages: English and Spanish

Description: This line offers mental health information and referrals. They do not offer crisis counseling but they can help the caller find a crisis line or other services in their area.

Information is available on topics such as advance directives, electroconvulsive therapy, schizophrenia, self-help groups in your area, legal services in your area, and meditation and self-help techniques.

Additional information: For a listing of peer-run facilities that serve as alternatives to hospitalization, go to <http://www.power2u.org/peer-runcrisis-services.html> (these only exist in

the following states: NH, ME, WV, OH, GA, AK, NY, NE, AZ, NC).

Warmlines <http://www.warmline.org/>

Description: This website lists peer support warm lines by state. Information about each line, such as hours of operation and scope of services provided, is included. Lines that accept national calls appear in red text.

You may also call 211 to speak to a mental health professional. If you are in crisis, you should immediately call 911. Since you are being video-recorded and filling out a consent form, there is a possibility that confidentiality could be breached (e.g., in case of theft of consent forms or videos). To minimize this risk, all video files and data will be stored in a secure location accessible only to the researchers. No other risks are anticipated.

#### ARE THERE ANY BENEFITS TO ME?

There are no direct benefits from participation.

#### HOW WILL MY CONFIDENTIALITY BE PROTECTED?

There may be publications or presentations about this study, but your name will not be used. In all analyses and reports about this study, we will use fake names instead of real names. The data will be stored in a secure, password-protected space, and only people who work on the project will have access to it. Only people who work on this project will watch the video files. If you give permission, we would like to play parts of the videotapes to other scientists at a scientific conference or to other teachers in a teacher education trainings. You may or may not be included in these selected videotapes.

#### WHOM SHOULD I CONTACT IF I HAVE QUESTIONS?

You may ask any questions about the research at any time. If you have questions about the research, you should contact the Principal Investigator, Brooke Istas, at (620) 441-5596 or [bistas@smu.edu](mailto:bistas@smu.edu). If you are unhappy with the research team's response, have more questions, or want to talk with someone about your rights as a participant, you should contact the Chair of the Institutional Review Board at Southern Methodist University at [researchcompliance@smu.edu](mailto:researchcompliance@smu.edu).

Your signature indicates that you have read this form, have had a chance to ask any questions, are at least 18 years old and voluntarily consent to participate.

We will give you a copy of this form.

Your signature also indicates that you agree to be video-recorded if you choose to keep your camera on as part of your participation in this research study.

I agree to participate in this study

I do not agree to participate in this study.

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I am 18 years of age or over

I am under 18 years of age

Sign your name here: \_\_\_\_\_

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Your signature indicated that you agree to allow us to play parts of the videotapes to other scientists at a scientific conference or to other teachers in a teacher education trainings. You may or may not be included in these selected videotapes and you may change your mind at any time by contacting the Principle Investigator, Brooke Istas, at [bistas@smu.edu](mailto:bistas@smu.edu) or call 620-441-5596

I agree to allow use of my video recording to other scientists at a scientific conference or to other teachers in a teacher education training.

I do not agree to allow use of my video recording to other scientists at a scientific conference or to other teachers in a teacher education training.



## Appendix H – (RS1)

Participant	Vignette	Category
“Victor”	“So I really began to be a very good math student, and I really loved Miss C class, and I was a good very successful algebra student.”	Positive Math Memory
“Quincy”	“I remember, you know, mostly finding math, like, in the regular class, like kind of, fine, easy, you know, kind of boring.”	Positive Math Memory
“Nikki”	“I mean, I am a math nerd. I love math”	Positive Math Memory
“Tracey”	“I always really have a love for math.”	Positive Math Memory
“April”	“I was always blessed with awesome math teachers”	Positive Math Memory
“Pam”	“I like math it was one of my best subjects”	Positive Math Memory
“Rachel”	“My earliest memories of math I’m sure are doing math in a formal setting in elementary school and being given those pages and writing answers in the pages, getting the answers right, it all sort of made sense to me.”	Positive Math Memory
“Scott”	“It really goes it really goes back to in high school math, love math did well in math.”	Positive Math Memory
“Tom”	“I don’t usually share this with my students, but math has been a good subject for me. I have never struggled with it. I was always place in advanced math classes.”	Positive Math Memory
“Urias”	“I’d be riding home with my dad and he would make up story problems and I wouldn’t want to do them. But I would solve it because dad wouldn’t let me out of the truck until I did it successfully.”	Positive Math Memory
“Wilma”	“Math was not a big deal, it was easy.”	Positive Math Memory
“Xena”	“I was really good in math. I was really good.”	Positive Math Memory
“Yolanda”	“So in terms of my own mathematical journey, um, I always, I always liked math. And I always did well in math.”	Positive Math Memory

Participant	Vignette	Category
“Aashi”	“I thought I might major in math.”	Positive Math Memory
“Edith”	“I was captain of the cross-country team and the top student in math and science.”	Positive Math Memory
“Francis”	“I’m good at math and numbers are cool so why not, become an architect.”	Positive Math Memory
“Lori”	“I just didn't, you know, because I was embarrassed, you know, I didn't want to say, Okay, I can't do this math, and I need extra help.”	Phobia
“Cathy”	“I still have that anxiety, especially about calculation.”	Phobia
“Shannon”	“I still have anxiety about doing math fast. Like, I can only do air math. You know, I couldn't I mean, I was only taught algorithms only we were never taught like estimation strategies, any of that made it all the way through with a degree with only doing so I didn't know people weren't doing algorithms in their head.”	Phobia
“Monica”	“I always had a lot of nervousness and anxiety around math in particular.”	Phobia
“Rhonda”	“Well, I had a very negative beginning to my mathematics education. I'm like, seven years old thinking, I don't know anything. I'm stupid.”	Phobia
“Danielle”	“I think sixth grade was pretty much tortured because I blocked it.”	Phobia
“Denise”	“I was not a good math student. I started struggling 3rd or 4th grade. I didn't know my multiplication table. “My mom was great; she could teach us stuff like she taught us how to read and everything, but she didn't do the math. My dad worked on computers, and he knew the math but when he tried to teach the result was usually a lot of tears.”	Phobia
“Greta”	[Teacher] M said, “Now listen, ‘Greta’ you might want to consider something outside this field.”	Negative Performance Outcome

Participant	Vignette	Category
“Harry”	“Mathematics was something that I did but I didn’t necessarily excel at it. I struggled with learning my multiplication tables.”	Negative Performance Outcome
“Jenny”	“Prealgebra was a disaster. I lost all math confidence.”	Negative Performance Outcome
“Meg”	“I hated math. Math was the only subject I ever failed in my life. I failed high school geometry.”	Negative Performance Outcome
“Betty”	“So I ended up failing by one point I think that was won't allow me to move forward.”	Negative Performance Outcome
“Abby”	“When I got middle school, high school math was very difficult for me. And I know like I only took algebra in high school. I never took geometry in high school.”	Negative Performance Outcome
“Karen”	“My first time I ever failed a class was geometry. And it was because I would not study the theory”	Negative Performance Outcome
“Ophelia”	“I did struggle a little with math... And then I went to college, thinking about not really a math career. I wanted to do art.”	Negative Performance Outcome
“Paula”	“And I can picture her [teacher] in my mind, you know, sitting beside her desk, and she would just be drawing all the pictures and trying to explain to her, and I could not cannot get any of it at all.”	Negative Performance Outcome
“Zoey”	[Speaking to her sibling] “hey, I have something to tell you. I am losing this scholarship and I have only one opportunity [to keep it] if I pass this test”	Negative Performance Outcome
“Bianca”	“I no longer was finding math easy. Not at all.... I just remember being awful. Homework was optional. [My] homework was never great.”	Negative Performance Outcome
“Elizabeth”	“Um, I think one of my earliest memories is fifth grade cheating on a math test. The class did it all together, our teacher was not paying attention. And we would just take turns going up to the teacher book to find the answers and input them.”	Negative Performance Outcome

Participant	Vignette	Category
“Sarah”	“[A college math course] kicked my butt. And that was knowing, you know, you get your confidence shaken.”	Negative Performance Outcome
“Candy”	“She [the teacher] would march down the aisle to me, slap me across the face. Wow.”	Physical Punishment
“Ida”	“She [her sister] had the chart in one hand and a ruler in the other so every time I’d say it wrong, like [makes a slapping motion to indicate the ruler hitting her]”	Physical Punishment

## Appendix I – (RS2)

Participants	Vignette	Category
“Karen”	“I try to make math as fun as possible. And I play games. I have buzzers so you know, they want to hear.”	Active Learning
“Monica”	“It was a very challenging experience, but I loved teaching the math, it was like so fun. I love manipulatives, and hands-on patterns and things like that.”	Active Learning
“Nikki”	“I’m looking through these materials and I’m like, oh this is really neat. Like this is really different. This is not like the way that I remember learning math. But it sounds really interesting. Like, I kind was like, oh I would have loved this, like, I would have just eaten this up when I was a kid”	Active Learning
“Ophelia”	“The first go around, and so I try to make it as fun as I can but also less intimidating because a lot of people come in and they're so nervous about fractions.”	Active Learning
“Quincy”	““So I asked typically to sit down and say, you know, you use algebra every day. And they look at you like, okay, and I’ll just say let’s go bowling. You know, let’s act like we’re going bowling and then you know, kind of, shoes that cost stays the same, and then you do the number of games and your cost, I would figure those things out or you go to the grocery store. So you’re doing algebra.”	Active Learning
“Urias”	“So I mean, I don't do a whole lot of intentional math is fun, yay, stuff. I just I try to make math approachable. So I talk to students explicitly about what we’re going to learn.”	Active Learning
“Rachel”	“I am a huge fan of the Polypad and Desmos. I have written several activities using both.”	Active Learning
“Edith”	“ I love Sal Khan, so sometimes I put students on Khan Academy. Some people that works for some people it doesn’t.”	Algorithms/ Lecture
“Wilma”	“I can't believe these kids don't know their multiplication facts. And that took me back to how did I learn mine. And I remember	Algorithms/

Participants	Vignette	Category
	the teacher drilling it, yes, I spend time teaching multiplication facts.”	Lecture
“Aashi”	“And then I try to model a math I said, even though I have all this mess still sometimes with the GED problem.”	Algorithms/ Lecture
“Tracey”	“You can show people how to write. Yeah, you know, I mean, it doesn’t mean they will be good writers, but with math, you can teach them the rules, you can teach them the steps. And mean, you know, you work with them enough and you know, give them enough problems. Then they know they will either get it right or they get it wrong.”	Algorithms/ Lecture
“Meg”	“I’ll talk about rules. I’ll talk about inverting the back number when you’re multiplying.”	Algorithms/ Lecture
“Scott”	“Use a lot of them video, you can YouTube, Khan Academy become a great favorite of mine.”	Algorithms/ Lecture
“Cathy”	“I dig deep in the like, I am always asking the question how I’m going to be a better teachers. And how I’m going to let them love math because the first statement I hear it is I hate math.”	Professional Learning
“Candy”	“I’ll tell you when I found this PD. I thought I’d found heaven. Isn’t it crazy?”	Professional Learning
“Danielle”	“One that was not professional development that that had a really big impact was at some point, my manager, when I was a new teacher had a whole set of the Empower books.”	Professional Learning
“Sarah”	“And that’s when I went to a workshop on problem-based learning. And I learned about really like hands on teaching. And you’re not the sage on the stage. You’re the guide on the side. And that that whole workshop that three or four day workshop that also changed my thinking and my approach to teaching.”	Professional Learning

Participants	Vignette	Category
“Ida”	“As I said, I dig deep in the like, I always asking question how I'm going to be a better teacher.”	Professional Learning
“Jenny”	“So I taught myself all the math that I had forgotten.”	Professional Learning
“Lori”	“It’s a learning process between both the instructor and the student and I really enjoy that.”	Professional Learning
“Paula”	“I learned the math I needed as I taught it.”	Professional Learning
“Shannon”	“And so I did all the PD ever if it was free, you know, I would do it at World Ed or on LINCS.”	Professional Learning
“Xena”	“I knew I didn't need as much content, because I you know, obviously I did well enough up through that algebra course, that I didn't feel like I was behind, but some on the methodologies right on adult numeracy. And I think she brought a lot of that and that mentor relationship that I was able to build with her.”	Professional Learning
“Yolanda”	“And so I'm meeting the other teachers, and I'm just hearing and what people are doing, and then my own professional development that I just sign up for randomly. And I sort of come to this, understanding that that I might not be doing that great a job in the math department. And I have I have this amazing, amazing executive director who is like, just she just didn't she just let you she was a really really good teacher, she let you discover it. With that like guiding you just but let you discover it without telling you.”	Professional Learning
“Bianca”	“I attend conferences, pretty much every year, every year I do at least one. And I've taken a lot of classes as well.”	Professional Learning
“Elizabeth”	“ I am relearning math skills, but also relearning math skills in a way that's specific for adult learners, okay, has completely changed my relationship, it's, you know, just being alive, as long	Professional Learning

Participants	Vignette	Category
	as I've been alive. adulting, as long as I've been adulting, I'm forced to do math all the time.”	
“April”	“We have a great professional development network.”	Professional Learning
“Pam”	“I took lots of professional development but I thinking being able to read people to and understand people.”	Professional Learning
“Abby”	“I laugh at the idea that I struggled so much. But because I did struggle I am more compassionate and patient when working with others, especially the ones with math anxiety.”	Caring
“Betty”	“I am glad that I failed out of college because it gave me perspective that not everyone sees math the same way.”	Caring
“Denise”	“Math in adult education is much more about the relationship, much more about the relationship.”	Caringl
“Francis”	“And I can spot when there's a student that just thinks about it in the wrong way that makes sense to them. And I applaud that.”	Caring
“Greta”	“I went back and figured out why we need to know that.”	Caring
“Harry”	“When I am teaching math, I am not really teaching just math. I am usually using my psychology degree where we speak about anxiety, phobia, or other traumas. We talk about emotional regulation skills and mindfulness and then teaching math.”	Caring
“Rhonda”	“I give my students so many changes to try again.”	Caring



Participants	Vignette	Category
“Tom”	“Teenagers stop coming for teenager reasons. And those same teenager reasons are probably contributing factors as to why they're not in regular school anymore. If I were 17 in a program that was voluntary to me, I would struggle with that, too.”	Caring
“Victor”	“My goal is to make you comfortable, because people have a lot of bad experiences with math that some of you will say, I really liked math that I just You never had a chance to finish high school, but many of you will point out some really terrible experiences in your in your math experience.”	Caring
“Zoey”	“No, you can do it and I will help you.”	Caring

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