



Summary Report of 6 Discussion Groups developed by Zeno and Purple Group, aimed at understanding how Zeno can enable parents to leverage play to build their child's math foundation at home.

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BACKGROUND AND PURPOSE

Zeno is dedicated to increasing children's competence and confidence in math with fun and engaging activities. Our MathWays for Early Learning (MathWays) program addresses the opportunity gaps in math that persist in Washington state and throughout the nation by getting math games and activities into the homes of families with young children. While we know an early foundation in math is key to the future academic and career success of all children, Zeno's program focuses on families furthest from opportunity to ensure every family has the resources they need to support their child in math.

A grant of \$15,000 from the Bill & Melinda Gates Foundation made it possible for Zeno, in collaboration with Purple Group, to build an effective and replicable process for soliciting feedback from families participating in our MathWays program. The project included the actual application of this process by recruiting and conducting discussion groups in communities served by Zeno. The first set of discussion groups were conducted from June 22nd to June 28th (including moderator training).

These discussion groups aimed to get a better understanding of:

1. Parents' math expectations:
 - a. What math activities a child can know at what age
 - b. What children should know upon entering Kindergarten
2. What parents think children can be exposed to at home and in school
3. Parents' perceptions of what they can do at home to expose their children to math
4. How parents can use math games at home
5. Challenges parents encounter at home around engaging children with math

Specific question areas were:

Math Context. When math is mentioned, what comes to mind immediately? What do you feel about math? Why math is important for your child's future? When the term basic math is used, what comes to mind? Are there ways to make math, easy, fun for young children?

As part of the math context, we also established a group understanding of the type of math that would be discussed. The parents were given a table with Kindergarten Readiness Guidelines for Seattle Public Schools. Using the table, the following questions were asked: At what age(s), do you think children can be exposed to these math concepts? Where do you think a child can be exposed to these math concepts? What are ways that children can learn these math concepts? Parents were asked:

- 1) To think about things they may do at home that involved number, shapes, comparing things and to share what came to mind
- 2) To share what are some things that can be done at home to help children become aware of the math concepts on the table
- 3) Who would be the best person to do the things discussed?

Math Engagement. Math was discussed from the perspective of culture and upbringing. Parents were asked about how they learned math, their feeling and attitudes towards math, who helped them with math and math at home. Then, parents were asked to talk about math at home with their children:

- 1) Is it possible to teach the math concepts on the table at home? How?
- 2) Do parents use math games, math activities at home and what did they use?
- 3) What made these math games, activities and tools useful?
- 4) Did the parents play the math games with their child?

Lastly, parents were asked to share barriers to exposing children to math at home:

- 1) what are the barriers to children learning math at home
- 2) What can be done to address those barriers
- 3) how would they persuade other parents that children can learn these math concepts at home?
- 4) what would enable parents to provide math learning to children at home.

Before and during the discussion groups, parents completed the following surveys (see [Appendix](#) for survey forms and summary of survey data):

- Pre-questionnaire, demographic survey
- Math context survey, at what age and where do you think a child can be shown these math concepts? Parents complete the survey either before the discussion group or during depending on literacy assistance needed.

METHODS AND PROCEDURES

Three sets of discussion groups were conducted with three distinct ethnic groups: Chinese, African American, and Hispanic, for a total of 55 participants in Seattle on June 22-28, 2017. Each group lasted approximately two hours. Groups were led by representatives of each community and Zeno team members. These individuals received a ½ day of training on how to conduct discussion groups. Specifically, the groups were composed as follows:

- Group 1A & Group 1B: Cantonese, Chinese, age 20-45 years old, 1A-n=12 and 1B-n=12
- Group 2A & Group 2B: English, African American, age 20-45 years old, 2A-n=7 and 2B-n=7
- Group 3A & Group 3B: Spanish, Hispanic, age 20-45 years old, 3A-n=9 and 3B-n=8

All discussion groups were in-language and great efforts were made to ensure as best as possible a culturally comfortable environment. Participants were recruited by Zeno partners from each of the respective communities. All participants received a participation incentive in the form of a gift card.

Participants were recruited by Zeno partners within each community. The outline of the discussion was as follows:

- **Math Context:** understanding, thoughts and feelings about math as well as establishing a common ground for the math concepts that would be discussed.
- **Math Engagement:** who helped participants with math at home and in school, is it possible to help children at home, what are the barriers to math-at-home, math games and activities

Note: The groups were moderated by individuals with no experience moderating groups and in the Spanish and Chinese groups they actually worked with the participants. This may have impacted impartiality, e.g. for the Spanish group, it was noticed that participants repeated certain rules or guidelines, upon inquiring it was learned that they had recently participated in a training that provide those guidelines (ex. spend 30 minutes each day with your child). This group essentially repeated what they had heard, but what they shared was not necessarily practiced. While keeping this potentially biasing condition in mind, common and consistent trends were captured across the groups.

KEY IMPLICATIONS

- **Math is important, but...** While all participants across all groups agreed that math was important, they had difficulties articulating how to transform that importance into actionable, realistic activities that can be consistently done at home. The concept of every-day-math (learning ways to integrate math in day-to-day activities) resonated strongly with all groups. The key to every-day-math was providing ideas on how to integrate math into their everyday lives versus the formal process of setting time aside for math.
- **Cultural reference points.** The cultural reference points varied among the three ethnic groups, therefore understanding these reference points are critical to parent engagement and the development of math activities and games for the home.
- **Understanding parents' perception of what children are capable of learning at what age is critical to parent-buy in.** The three groups had slightly different perspectives as to when it was a good time to expose/teach children the math concepts shown. This may have been due to the use of the word expose and the interpretation of the word, or it may imply different cultural norms and beliefs as to children capabilities at the various ages. It is important to address expectations and self-imposed limits with parents to reach an agreement about what children are capable of doing and at what age, as well as explaining that exposure is not about children acquiring knowledge or learning techniques. Exposure is more about introducing, showing, familiarizing with a topic so that it is not so foreign or new to the child. For example: measurements can be as simple as baking at home and reading the recipes out loud.
- **Helping children at home must be fully contextualized to obtain parent engagement.** Across all groups parents didn't seem 100% able to truly articulate what helping at home entailed and all seem to struggle with time, limited resources and multiple demands at home. Parents need more practical, real life methods and ideas which can be integrated into their day-to-day lives to expose children to math concepts at home.
- **Games are games, math is math.** While it came out more in the Chinese and Hispanic groups, all groups seem to share a sense of not knowing that their children were already playing math games at home. It seems very important to shift the language from "games" to "methods" or "educational activities." Parents were very interested in how to make it fun and interesting for the kids.

- **The source matters for each ethnic group.** For each of the diverse groups the source of the 'games or educational materials' mattered to the usage. For the Chinese group, if the source was the teacher or the school, the parents lost authority because they did not know how math was done in the U.S., so they essentially left it to the children. For the Latino group, if it came from the school or a trusted authority, then it was something to focus on, learn and help their children. For the African American group, the source was not as clear, but there was a general undertone of questioning the system, and they seem to lean more on creating connections within their own communities, relying more on trusted sources from within the community. They shared a sense of loss of the 'village' and a need to rebuild their village.
- **What does everyday math look like?** All groups mentioned common barriers to helping children with math at home, including: no time (parents' work double shifts or multiple jobs), other children, lack of resources, lack of knowledge, and not knowing how it is done or taught in the U.S. These barriers can seem insurmountable for these families. However, parents and caregivers across all of the groups were all full of ambition for their children, therefore creating opportunities or finding ways to incorporate math into their everyday lives. Most saw math as representing opportunities for their children.

DETAILED FINDINGS

Math Context

Participants across all the groups agreed that math was important and/or necessary in everyday life but there were not many positive associations with math. At best, participants had mixed-feelings about math, recognizing the importance of it but feeling some level of pause: it is for smart people, lack of confidence in their ability to do math. The Chinese and Hispanic groups shared that math was done differently in the U.S. and the African American group said it was taught differently than when they were growing up, making it very difficult for them to help their children.

For the Chinese and Hispanic groups, not knowing U.S. math seems to have a direct impact on their ability to help their children. The Chinese group mentioned losing authority with their children. Their children would challenge them by stating that they couldn't help since they didn't know how to do it, or by stating that they do it the way the teacher wants them to do it. In a way, this disarmed parents and seemed to make them powerless to help their children. While struggling with the same challenge, the Hispanic group seemed to take more of a position of 'I will learn how they do math here and then I can help my children.' Many used Google as a resource, so they learned first, then they showed their children. Others mentioned going to school to talk to the teachers.

Potential cultural reference point

Hispanic immigrants tend to see as the U.S. as simply better, the U.S. provides: better education, better opportunities, better government, in general just about everything is better than back home. This perspective grants authority to anyone in the U.S. and from the U.S., therefore, how math is taught here is not seen as bad, or the wrong way, but simply as we have to learn it and teach it to our kids.

The Chinese group seem to have a sense that math was taught better back home and questioned why the U.S. did it the way it does, it did not make sense to them. This may cause the separation effect: the kids will do it the way the schools teach them, the parents don't know the system here, so there is no common ground to work together.

The African American group did not share in this context as they are from the U.S. However, an individual who was an immigrant did reference the difference and the need to learn how to do it the way it is done in the U.S.

All three groups defined basic math similarly: basic operations (multiplication, division, addition, subtraction) and mental calculation, some even mentioned shapes, attributes, counting, logic, and times, while others talked about Arabic numerals. The African American group expressed a concern that math was being taught too quickly today in schools and children weren't getting the chance to learn the basics before moving to more complex concepts. All agreed that math can be fun and referenced the everyday need for

math, for example: following recipes, getting change at the store, construction, budgeting, access to employment and higher education, making money, critical thinking, counting.

Pre-Questionnaire

There were clear distinctions among the three ethnic groups in terms of when they felt a child can be exposed to math.

1. The **Chinese groups** felt that most of the math concepts listed on the worksheet could be learned at the age of 2-3, but measuring tools were more difficult and should be learned at age 4. One group thought that more/less/equal could be learned younger than 2 years old.
2. The **African American groups** thought that children could be exposed to math concepts from birth, although one group made the distinction that the age a child fully learns and understands the concept varies depending on each individual child. Participants said children could learn/be exposed to the concepts at daycare, home, grocery stores, school, driving, and shopping. One group suggested some ways children can learn these concepts: playing croquet (talking about colors and numbers), when getting dressed, doing puzzles, reading books, and toys. They also said parents, caregivers, and childcare providers can do these activities with the child.
3. The **Hispanic groups** mostly agreed that the math concepts could be learned around ages 3-5 and a few said possibly sooner. One group thought that appropriate age depends on the intelligence of the child. Both groups agreed that parents, siblings, daycare, and schools were good places to learn. Both groups had similar ideas about ways to practice the math concepts at home, such as play games on a tablet or phone, count steps and fruit, sort and count clothes, do puzzles, play with Legos, play with shapes, colors, car toys and blocks, sing songs, and putting money in piggy bank.

Potential cultural reference point

In American English and culture, terms can be used broadly and even generically to mean many different things. The discussion groups and the pre-questionnaire used the term expose (e.g. at what age can children be exposed to these math concepts). Based on Purple Group's knowledge of diverse and immigrant communities, it is deduced that this term may have caused some confusion as it is unclear what it means. It is understood that the Chinese group did a literal translation and the Spanish groups deviated between expose, teach and show. It is deduced that the Hispanic parents understood the question as at what age is a child capable of learning/knowing these math concepts. It is not clear how the Chinese group interpreted the question. The African American group got the idea behind the word 'exposure.' Culturally, Hispanics and Chinese see their role as teachers and educators of their children; exposing may not have any meaning as it has no cultural reference point.

Math Engagement

The **Chinese and African American** groups expressed that their parents, grandparents or a wide range of family members helped them as kids with math. The **Chinese groups** listed several activities they remembered doing at home to practice math (counting money and buying items, counting bamboo sticks, practicing with abacus, and reciting multiplication tables) and talked about having the sense that it was important for financial reasons. The **African American groups** talked about having more educational opportunities than their parents, which for them meant there was a strong emphasis on taking advantage of the opportunity to do better.

The **Hispanic groups** stood out as only a few participants stated that their parents or other family members helped them. The ‘help’ also came in the form of working/contributing to the family, going to the store and grandparents punishing them for not getting the right amount of change. Math was not necessarily taught, but rather used on a day-to-day basis. Many Hispanic participants stated that their parents did not have more than a basic education so they could not help. The **African American groups** mentioned having access to family members with jobs that involved math, leading to a conversation about changes in the culture around education they’ve seen in their community, namely the group felt that the community took education more seriously and teachers were more responsive of their students when they were growing up in the South than in today’s school system in Seattle.

Note: It can be expected that if there is no history of parents receiving help, recommendations should incorporate how parents can help their kids and why it is important.

All groups felt that math concepts can be taught at home by making it fun and using a variety of resources. The following were suggestions:

- **Chinese Groups:** shared what their parents and family members did with them, but many expressed frustrations with trying to reconcile how they were taught math in China with how their children or grandchildren are learning math in the U.S. In one of the groups, a participant noted a difference between teaching at home vs. in school, stating that math can be taught “spontaneously” and “flexibly” at home, but schools are very systematic. Many participants thought that some math could be taught at home, but more complex concepts are the responsibility of the school/teacher.
- **African American Groups:** cooking/baking, talking about shapes, sizes, and weights of everyday objects around the house, reading nutritional information while shopping, counting snacks (ex. how many crackers do you have?), playing with Legos, using movement based games, church tithing, counting fingers/toes at bath time, using self-talk, blocks, and puzzles.
- **Hispanic Groups:** set a schedule for math time, use One the Way, play regular cards and Pokemon card game, count dinosaurs on TV, use abacus, use educational websites and YouTube, count on hands, count toys or other items, sing songs, ABCmouse.com, sorting by color, helping with laundry and other chores, and cleaning up toys.

Math Engagement – Barriers to Math at Home

The **Chinese groups** referenced similar barriers for math at home. The resonating theme seemed to be math being taught differently in the U.S. is incapacitating parents and leading to a loss of respect from children since the parents did not know U.S. math. They also discussed a lack of affordable resources and lack of confidence in ability to help their children. Other participants focused on lack of time/energy, difficulty thinking of creative solutions and children being distracted at home with toys and video games. Lastly, parents mentioned they had a lot going on that needed their attentions.

The **African American groups** agreed that games were a good way to practice math concepts at home and also helped kids build social skills. Some of the barriers to math at home were lack of interest from kids, multiple kids to attend to (especially if there is a big age range), and learning disabilities. Some participants suggested ways to address these barriers: tutors, seeking help and ideas at the library, talk to other family or community members, and ask the teacher for extra resources. One of the groups talked about larger social issues impacting the success of children, particularly a sense of loss of the “village” mentality in the community leading to a selfish focus on “my child only” instead of the well-being of the whole community. There was also a discussion of the negative effects of drugs in the community and a general agreement that children are not taught to be respectful of parents and other adults as much as in the past. The group also mentioned biases in the school system and methods of teaching geared specifically towards white culture that made it harder for black students to succeed in public schools. Both groups felt that these barriers could be addressed by “becoming the village” or “defining our new village,” requiring building trust and stronger relationships with other parents, friends, and community members. There were also suggestions for how parents could better engage their children with math: find fun ways to teach kids, define their own educational goals for their child, be engaged with teachers, and share resources with other parents

The **Hispanic groups** did not feel there were any disadvantages to teaching math-at-home, but discussed the following challenges: difficulty connecting with the child or the child does not want to do it, hard to concentrate on one child when there are many in the house, lots of other things to take care of that are prioritized over education, and confusion over how math is taught in the U.S. The ideas for addressing these barriers were focused primarily trying their best as parents to not repeat the pattern of their parents/families, and dedicating time each day to working on math. Participants in one group had advice for other parents about how to practice math concepts at home: study English, send kids to after school programs, practice time management, ask older children to help teach younger ones, and do activities that make kids feel like they are playing not studying. Overall, there was a strong desire to do better than previous generations and change their way of learning to fit into U.S. ways for learning.

RECOMMENDATIONS

Everyday Math:

There is an opportunity to increase parent participation at home by emphasizing that Zeno's MathWays program introduces children to math in a fun and creative way that has nothing to do with the formal 'how the U.S. does math.' Zeno math games are more about the fluidity, fun and practical everyday situations that familiarize children with early math concepts and make math less foreign.

- *Consider creating a list of everyday math situations with corresponding activities that parents can do at home with their young children.* This list can be categorized by starting age and should contain a short description of parent expectations and what the children will gain from it. As part of this list, each cultural group should have specific ideas or items from their own culture to increase familiarity with the items. A few examples from the discussion groups:
 - Chinese Community – parents discussed using bamboos to count
 - Hispanic Community – parents mentioned using beans to count
 - African American Community – parents referenced things like baking, park items, etc.
- *Zeno should consider real-life, day-in-the life of parents' video series that shows how parents can integrate math into their day-to-day routines.* Short videos, 30 to 60 seconds, with lots of real-life tips showing exactly how to integrate math into everyday life. These should be in-culture and in-language.
- *If possible, Zeno can explore a type of opt-in text program providing parents daily texts with tips on everyday activities.* The content created and mentioned in this section can be leveraged. Activities for on the way home, activities at the grocery store, activities while walking, while cooking, while making tortillas, etc. These can have links to the website for more information.

Game Development and Engagement (usage):

There is a certain level of 'foreign' that is naturally inherent in math games developed in the U.S. This essentially means that the parent has to take time to figure out the game, assess it, learn it and then teach it to their children. This process does not sound like fun. It is suggested that Zeno consider making the games less foreign:

- *Consider creating a game development committee from parents of each targeted community.* These committees would be structured specifically for game development. Essentially, the parents from each community would be directed to bring games, activities or items they would use at home to 'play math'. The parents can even be given a budget to go and buy

games from their communities to bring to the game development sessions (or this can be part of the first session, group goes together). A maximum of 3-4 structured, 1 ½ hour sessions are recommended with each targeted community.

- *Consider adding video instruction to current written instruction.* Create short, how-to-videos to explain how to use the games instead of the current written format. This is intended to cut the time it takes parents to figure out the games, increase familiarity and decrease the feeling of 'foreign'.

Game Distribution:

- *As part of its plan, Zeno should consider how it gets the games into the homes.* Each community seemed to attribute home participation based on where the games come from.
 - **Chinese Community:** Parents from this community mentioned that they are not familiar with the way math is done in the U.S. and even questioned the way it was done. This presented a barrier to the parents as they did not know how to help their children, so it seemed like they distanced themselves and are letting the school system take care of it. This may offer an opportunity for math at home by leveraging the Zeno MathWays program. However, it seems that engagement may increase by delivering the games directly to the parents versus being sent home with the children. Zeno may also explore having different games for parents to play with their children versus children bringing home math games to play with their parents. It seems that if the games are provided by the children, the parents feel at a loss since it is U.S. math. There may be a need for the children to not be familiar with the games or the parents may lose authority since the children are the 'experts' in how things are done in the U.S.
 - **Hispanic Community:** The Hispanic community also mentioned experiencing the challenge of math being done differently in the U.S. However, in their case they mentioned they would take the steps to learn how to do math the U.S. way or they would seek help in the school. Overall, this community may also benefit by having games provided to parents directly and not through the children. However, this group did not refer to any feelings of their authority being diminished.
 - **African American Community:** Common core also came up in the discussions, but it didn't seem like a barrier for these parents. Distribution through the schools should be fine.

Communications:

- *In communications Zeno should consider using copy that emphasizes how the games help with everyday math and to introduce, familiarize children with concepts early in life.* It's not about learning math early, but rather recognizing concepts to make it easier to learn later. It is important to communicate to the parents the following:
 - Age when a child can start doing the referenced activity
 - What a parent can expect from the child
 - The results the parent should expect
- *It may be important to introduce parent orientations through the community partners.* These orientations can be used to establish the math context, explain the purpose of familiarizing versus expecting children to learn, and provide resources and links for additional resources, e.g. show the some of the short videos.
- *Consider more directly defining 'helping at home', this comes into play heavily for everyday math.* Parents are very strained at home with multiple jobs, multiple children and limited resources. Please see everyday math section.
- *Zeno should explore developing everyday math methods, activities and games.* Remember that given the various cultural reference points, games, activities, tools and methods are not self-explanatory therefore, introductions and direct explanations are necessary.
- *Zeno should be more intentional about the language it uses to describe its games and tools as well as explore other names, you can have internal names and external names if necessary.* For parents, it would be important to hear that Zeno provides educational activities, methods to familiarize children in the early ages to math concepts. These set the expectation that it is not expected that children will acquire the knowledge but rather see it so that it is not foreign. Additionally, it is recommended that Zeno stay away from using the term engagement on materials intended for the parents. Engaging parents implies that they are not engaged.

APPENDIX

PRE-SURVEY RESULTS

As part of the discussion groups parents were asked to fill out a basic demographic survey. The following are the high-level results.

Summary of Questionnaire:

- A total of 55 parents participated in the discussion groups from three distinct diverse communities, Cantonese (n=24), Hispanic (n=17) and African American (n=14).
- 91% of participants were female (n=50)
- Of the participants, 38% (n=21) stated that their children attend an early childcare center and 55% (n=30) said no, four left the question blank.
- Educational attainment/Marital Status:
 - African American participants:
 - Majority had at least some college
 - Majority were single, never married (n=8) and married (n=5)
 - Language spoken at home with Children, English
 - Average number of children at home, 2.43
 - Hispanic participants:
 - Mainly had grammar and high school
 - Majority were married (n=12)
 - Language spoken at home with children, Spanish
 - Average number of children at home, 2.5
 - Chinese participants:
 - Mainly had grammar school
 - Majority were married (n=20)
 - Language spoken at home with children, Cantonese
 - Average number of children at home, 2

DISCUSSION GROUP SYNTHESIS

Individual Group Syntheses

Chinese A

Section #1

Most people in the group agreed that math is important, but did not have positive associations with the subject and did not think of many ways it could be fun.

In general, basic math was defined as shapes, attributes (big, small, short, long, etc.), logic, counting, time, multiplication formula table, addition, subtraction, and general calculation. Overall seemed to have a very broad view of what math is, and an impression that one needs to be very smart to be good at math.

There was some concern about math being difficult.

Section #2

When assessing age children show know the listed math concepts, most said 2-3 years old, but using measuring tools stands out as one where many in the group thought 4 years old was appropriate.

When talking about how to learn and discuss math at home, the group brought up a number of ideas, including: counting and sorting toy cars, watching TV and online shows, drawing/coloring shapes, sing songs, counting stairs while walking or various household objects, and talking about how much/how many of something a child ate during dinner.

When asked who is the best person in the household to do the activities listed, many said the person who takes care of the child (mostly mothers) as well as siblings. There was also a mention by multiple participants that children do not listen to the grandparents in the house when trying to work on these concepts (or in general).

Section #3

About half of the participants said their parents helped them with math when they were children. Activities they remembered doing at home included: counting money and buying items, counting bamboo sticks, practicing with abacus, and reciting multiplication tables. Most remembered math as challenging and difficult, and associated it with tests and competition with other students.

No mention of teachers being helpful in this group.

All participants agreed that it is important to teach math at home, and listed similar set of activities as those mentioned in Section #2, and a few mentioned using Zeno games at home.

The discussion did keep coming back to the idea that math is taught differently in China and the US, so many participants who did not grow up in the US have felt frustrated when trying to reconcile their understanding of how to do basic operations (like addition or multiplication) with what their children are taught to do in

US schools. Some in the group also expressed similar concerns about grandparents not being listened to, or children not believing their grandparents could help them.

Section #4

All participants agreed it is possible to teach children math at home, but identified the following barriers they have encountered: children do not respect parents the same way they respect teachers, math taught differently in US and China (ex. the latter is more based on rote memorization than explaining why something works), lack of affordable resources, and lack of confidence in ability to help child with math.

Suggested ways to address these barriers included: getting math games and resources from Zeno and CISC (Airplane Chess, books from home visitors); finding free games and video online (YouTube) using smartphones and tablets; playing games that show a concept in English and Chinese to both help parent understand and connect concepts across languages; and use toys like Legos to help child explore using critical thinking skills.

Chinese B

Section #1

The group's initial thoughts about math included: math is needed for everyday life, struggling to memorize multiplication table, difficulty teaching math to children, and difference between Chinese and US ways of learning/teaching math. When asked about basic math, participants mentioned basic operations (multiplication, division, addition, subtraction), mental calculation, and Arabic numbers.

All believed math is important because it is part of everyday routines (going to grocery store, counting money), leads to making money, and helps develop critical thinking/logical skills. Many said that to make math fun for kids, adults can provide visual aids and play games. One participant mentioned that when learning is fun, children learn better and build self-confidence.

Section #2

Most participants indicated on worksheets and by raise of hands that 3 years is the appropriate age to learn the listed math concepts. The knowledge of more/less/equal was seen by some as a skill children could learn from a younger age, and some thought that measurement is a harder skill (appropriate for age 4). A few thought that math learning did not start until preschool, and one participant said that they believe we underestimate the ability of children to learn these concepts, and that they could be learned before age 3.

Participants mentioned ways to practice these math concepts at home, including: YouTube videos, playing games, reading books, asking child to clean up using size and color words, singing songs, playing outdoors, and playing with building blocks and other toys.

A few participants said that everyone in the house could do these activities with the child, most said mothers and siblings were the best person. Participant quote: "Mothers are more patient. Fathers are more sensitive to numbers but they are bread winner, too busy with work."

Section #3

Most participants said their parents and/or grandparents helped them with math when they were children, and that they had the sense that math was important but did not see it as fun. One participant mentioned that their mother did not know math so could not help. Most of the examples they gave of why math was important revolved around money or economics (used to buy groceries, need to know math so you don't get cheated by merchants).

Most talked about their experience with math at school as very competitive and students who did better had higher standing/status. Teachers were mostly associated with memorization, tests, and lack of interaction. Dad and old siblings helped with homework.

Participants had a few ideas about how to practice math concepts at home, but most of the discussion focused on difficulties of teaching kids at home when they learn math in a different way than their parents did in China. One participant noted a difference between teaching at home vs. in school, stating that math can be taught "spontaneously" and "flexibly" at home, but schools are very systematic. Many participants thought that some math could be taught at home, but more complex concepts are the responsibility of the school/teacher.

Section #4

Participants reported using a variety of games and toys at home to practice math: bingo, airplane chess, poker cards, CISC games, bowling, building blocks, and toy cars. Some participants mentioned advantages to doing these activities at home, including children become familiar with numbers and build confidence, and build linguistic abilities.

Many participants said they have experienced the following barriers when practicing math with their child at home: not enough time/energy after work, hard to think of creative solutions, children are distracted at home with toys and video games, and parents have a lot going on that needs their attention. Participants also offered some potential solutions to these challenges: get help from other relatives, set a schedule and expectations for the child to assign time to focus on math/educational activities, and have older children play with and teach younger children while parents focus on our priorities.

This group also discussed ways to encourage other parents to engage their kids with math at home, including talk to your child about what they are doing and push them to explain and letting children play together to learn from each other. One participant expressed concern that it is disrespectful to try to teach other parents to teach the way you do because everyone has their own approach that is best for their child.

African American A

Section #1

The group generally had negative feelings about math, talked about anxiety and not being good at it themselves. Did mention that their children were good at math. All said math is important for many reasons, including budgeting, employment, access to high education, and cooking. Some thought don't need high level math for everyday life, but important to know basic math so you don't have to depend on others for information.

A few participants said their children enjoy and are good at math, and they make it fun by playing cards, talking about shapes, and counting candies, beads, and money. One participant noted that "I struggle with that cause my kids don't seem really into numbers now."

Section #2

Group generally thought that children can be exposed to the listed math concepts as early as 0-1 years old, said kids can be exposed to these concepts at daycare, home, grocery stores, and other everyday locations.

Section #3

Participants said a variety of family members helped them with math at home when they were children. Some had parents with strong math background (worked at Boeing, as accountants), other did not and got help from aunts/cousins or teachers. Group emphasized the role of the teacher in making math fun and understandable.

Some participants thought that boys are better at math than girls, and that higher education is not as important for girls.

All believed that parents can teach math at home by connecting it to everyday activities, including church tithing, counting fingers/toes at bath time and cooking, using self talk, tally marks, household objects, blocks, and puzzles. Participants saw math as valuable for building confidence and preparing children for school.

The group listed variety of family members who can do math at home with kids: mom, dad, grandma, grandpa, older siblings. Some discussion about confusion around how math is taught today, many participants learned a different way than how kids are taught today.

Section #4

Group agreed board games were a good way to do math at home in a fun, less stressful way. Many remembered playing games as kids and though it was a good alternative to TV, allowing kids to build social skills as well. Games mentioned include: Uno, Go Fish, Monopoly, Sorry, Chutes and Ladders, Candyland, Dominoes, and puzzles. Also talked about outside games like hopscotch and double dutch.

The group identified some challenges to doing math at home: parents don't know how or learned a different way than what is taught in school, lack of interest from kids, multiple kids to attend to (especially if there is a big age range), and learning disabilities. Some suggested ways to address these problems were find a tutor for the child, go to the library to get help and ideas, talk to other family or community members, and ask the teacher for extra resources.

There was an interest in and ideas around engaging other parents to get them excited about doing math at home with their child. Solutions revolved around creating a sense of community (referred to as "become the village") by forming a group of parents and reaching out to old friends or neighbors with kids of similar age to share resources and ideas. There was also some discussion of math being harder for parents to work on with kids than reading because the methods of teaching have changed over time for math, but reading hasn't changed.

African American B

Section #1

Initial feelings about math in the group were mixed, some thought it was fun up to a certain level (algebra and geometry were difficult), and some had only negative feelings.

All felt that math is important for their child or grandchild (many in this group were primary caregivers for grandchildren) because it is used for many parts of everyday life such as budgeting, measuring, counting, and critical thinking. The group saw basic math as addition, subtraction, algebra, and geometry. One participant runs a daycare in her home and talked about using play money. There were concerns that math is being taught too quickly today in schools and children aren't getting the chance to learn the basics before moving on to more complex concepts.

All agreed that math can be fun but there is often too much pressure and it is taught in boring ways.

Section #2

The group made the distinction that children can be exposed to the concepts on the worksheet from birth, but the age they learn and understand the concept varies depending on the individual child. Thought kids could be exposed to the concepts at home, school, driving, and shopping. Some ways children can learn these concepts are playing croquet (talk about colors and numbers), when getting dressed, doing puzzles, reading books, and toys. The parent, caregiver, and childcare provider were all thought of as people who can practice the concepts with the child.

Section #3

When thinking about who taught them math as a child, participants mostly talked about siblings (especially in a big family), grandparents, and extended family (aunts/uncles). Many felt that they had more opportunity to learn than their parents and the expectation was to take advantage of this opportunity.

There was also discussion of the differences in expectations around education in general when growing up in the South vs. the culture around education in Seattle today. Generally, participants felt the community took education more seriously and teachers were more responsive to the needs of their students when they were growing up than in today's school system. There was a lot of concern that teachers today do not cultivate a culture of learning in their classrooms today because they don't care about students, are teaching in fields they are not comfortable with (common with math), or aren't there to help kids.

The group also came up with more ways to help kids learn math concepts at home: cooking/baking, talking about shapes, sizes, and weights of everyday objects around the house, reading nutritional information while shopping, counting snacks (ex. how many crackers do you have?), playing with Legos, and using movement based games.

Section #4

Participants gave long list of board games that help explore math concepts at home, including cards, dominoes, Uno, Skip Bo, Farkle, Zeno games, made up games, Monopoly, flash cards, and Sorry.

During the discussion about barriers to learning math at home, there was a strong emphasis on larger social and economic issues that impact a family's ability to support and engage with their child. Participants expressed concern and frustration about the loss of the "village" mentality in the community leading to a selfish focus on my child only instead of the well-being of the whole community. There was also discussion of the negative effects of drugs in the community and a general agreement that children are not taught to be respectful of parents and other adults as much as they were in the past. Participants also agreed that there are biases in the school system and methods of teaching towards white culture that make it harder for black students to succeed in public schools.

Participants also strongly believed that it is possible to overcome these barriers by building trust in the community and asking other parents and family members for help (generally referred to as needing to "define our new village"). The group suggested some ways parents can better engage their kids with math: find fun

ways to teach kids, define their own educational goals for their child and be engaged with teachers, and share resources with other parents. There was an interest in finding or creating more events in the community for parents and children to attend together.

Spanish A

Section #1

Participants saw math as numbers, adding, subtraction, money/business, algebra, multiplication, division, shapes, know the date/days of the week, and knowing ages. All thought math is very important for everyday life, including following recipes, getting change at the store, and construction. One participant said math “is the base of all other studies.”

Section #2

Participants said that the appropriate age for the math concepts listed depends on the intelligence of the child. Some mentioned that children can learn from older siblings at home, at daycare, and in kindergarten, and that both mom and dad can work on math at home. The group had some ideas about ways to help children learn the math concepts at home: play games on tablet or phone, count steps and fruit, sort and count clothes, do puzzles, and play with Legos.

Section #3

A few participants said their parents helped them with math growing up, many said their parents did not have more than basic education or were not literate so could not help with math or other subjects. Some were taught it was important and some said it was not a focus when they were children, but no one thought there were disadvantages to teaching math at home.

The group came up with more suggestions for ways to make math fun at home: count on hands, count toys or other items, sing songs, ABCmouse.com, sorting by color, helping with laundry and other chores, and cleaning up toys.

Section #4

Participants talked about a few barriers to teaching math at home, including having a lot of children to take care of, lots of other things to take care of that are prioritized over education, and differences in learning math concepts in Mexico. When talking about how to address these barriers participants focused on trying their best as parents, not repeating the pattern of their parents/families, and dedicating time each day to working on math. There was a strong desire to do better than previous generations and change their way of learning to fit into US ways for learning.

Spanish B

Section #1

Participants associated math with money, problem solving, work, memorization, and reasoning. They thought of basic math as adding, subtracting, division, multiplication facts, and counting. Participants all agreed that math was important for their child’s future because they could earn more money (“have thing I didn’t have”) and change their future. Some said it is complicated to work on math with their children because it is a different math than what they learned.

Section #2

Many said the listed math concepts can be learned around age 3-5, and a few said children could start learning at birth. The group gave some ways to expose children to math concepts at home: playing with shapes, counting, colors, playing with car toys and blocks, counting eggs and cheerios, sing songs, and putting money in piggy bank. Generally thought parents and teachers were best to teach these concepts, some also mentioned siblings.

Section #3

Most said parents didn't help with math when they were kids, some said siblings helped, and one talked about a teacher being most helpful with math as a child. Some said it was not taken seriously or was not fun until high school.

No one in the group thought there were disadvantages to learning math at home, all thought it was important for their child's future and thought doing math at home made it easier for kids when they get to school. Some barriers or challenges with teaching/learning math at home are: it can be hard to connect with the child or the child does not want to do it, hard to concentrate on one child when there are many in the house, and parents feel they might confuse the child by teaching the way they learned instead of how it is taught in school.

Most of the group agreed it is possible to work on math concepts at home. Some suggestion on best ways to do this: set a schedule for math time, use One the Way, play cards, Pokemon cards, count dinosaurs on TV, abacus, and use educational websites and YouTube.

Section #4

Participants had suggestions for other parents about how to practice math concepts at home: study English, send kids to after school programs, practice time management, ask older children to help teach younger ones, and do activities that make kids feel like they are playing not studying.

Combined Syntheses

Chinese groups

Section #1

In both groups, most participants thought math is important or necessary for everyday life and routines (ex. going to grocery store, counting money), but did not have positive associations with math. Many in both groups talked about the difficulty of teaching math kids because it is taught differently in US schools than in China.

The groups had a similar idea of what basic math is, which included: basic operations (multiplication, division, addition, subtraction) and mental calculation. One group also mentioned shapes, attributes, counting, logic, and times, while the other talked about Arabic numerals.

Section #2

Both groups thought the math concepts listed on the worksheet mostly could be learned at age 2-3. Both groups said using measuring tools was more difficult and should be learned at age 4, and one group also thought more/less/equal could be learned younger than 2 years old.

The groups came up with very similar lists of ways to address these concepts in the home, including counting and sorting toy cars, watching TV and YouTube/online shows, drawing/coloring shapes, singing songs, counting stairs while walking or various household objects, and talking about how much/how many of something a child ate during dinner, reading books, asking child to clean up using size and color words, and playing outside.

Both groups said that mothers and siblings were the best people in the house to help children with these concepts, and multiple participants in one of the groups mentioned that children did not want to listen to their grandparents living in the home.

Section #3

About half of the participants in each group said their parents or grandparents helped them with math at home. They listed a few activities they remembered doing at home to practice math (counting money and buying items, counting bamboo sticks, practicing with abacus, and reciting multiplication tables) and talked about having the sense it was important for financial reasons. Participants mostly had negative associations with math as children, only remembering tests and competition. The negative association seemed to extend to school and teachers in general as one group didn't say anything about teachers helping, and the other talked about their teachers giving tests and being distant from students.

Again, participants in both groups generally agreed it was important to teach math at home, but many expressed frustrations with trying to reconcile how they were taught math in China with how their children or grandchildren are learning math in the US. In one of the groups, a participant noted a difference between teaching at home vs. in school, stating that math can be taught "spontaneously" and "flexibly" at home, but schools are very systematic. Many participants thought that some math could be taught at home, but more complex concepts are the responsibility of the school/teacher.

Section #4

When discussing barriers, the groups covered similar themes to other sections. One group focused on their experience with children not respecting parents the same way they respect teachers, math being taught differently in US and China (ex. the latter is more based on rote memorization than explaining why

something works), lack of affordable resources, and lack of confidence in ability to help child with math. The other group focused on a lack of time/energy after work, difficulty thinking of creative solutions, children being distracted at home with toys and video games, and parents having a lot going on that needs their attention.

Suggested ways to address these barriers were similar, and included getting help from other relatives, setting a schedule and expectations for the child to assign time to focus on math/educational activities, having older children play with and teach younger children while parents focus on our priorities, getting math games and resources from Zeno and CISC, finding free games and video online using smartphones and tablets, playing games that show a concept in English and Chinese to both help parent understand and connect concepts across languages, and using toys like Legos to help child explore using critical thinking skills.

One group did not address the question of suggestions for encouraging other parents to engage their kids with math, but the other came up with some ideas: talk to your child about what they are doing and push them to explain and letting children play together to learn from each other. One participant in this group expressed concern that it is disrespectful to try to teach other parents to teach the way you do because everyone has their own approach that is best for their child.

African American Groups

Section #1

Generally mixed feelings about math, one group talked about anxiety and lack of confidence in their own ability to do math. However, in this same group many mentioned their children are good at math.

All participants in both groups agreed that math is important for their children or grandchildren because it is used in key parts of everyday life including budgeting, access to employment and high education, cooking, measuring, counting, and critical thinking. One group described basic math as addition, subtraction, algebra, geometry, and money, and the other said it was important to know basic math so you don't have to depend on others for information. One group also expressed concern that math is being taught too quickly today in schools and children aren't getting the chance to learn the basics before moving on to more complex concepts.

All agreed that math can be fun but there is often too much pressure and it is taught in boring ways. A few participants said their children enjoy and are good at math, and they make it fun by playing cards, talking about shapes, and counting candies, beads, and money.

Section #2

Both groups thought children could be exposed to math concepts from birth, although one group made the distinction that the age a child fully learns and understands the concept varies depending on each individual child. Participants said children could learn/be exposed to the concepts at daycare, home, grocery stores, school, driving, and shopping.

One group suggested some ways children can learn these concepts: playing croquet (talk about colors and numbers), when getting dressed, doing puzzles, reading books, and toys. They also said parents, caregivers, and childcare providers can do these activities with the child.

Section #3

Participants mentioned a wide range of family members who helped them with math as kids. Some had parents or other family members with jobs that involved math, and many talked about having more educational opportunities than their parents, which meant there was a strong emphasis on taking advantage of the opportunity to do better.

One group discussed some changes in the culture around education they've seen in their community. The group felt the community took education more seriously and teachers were more responsive to the needs of their students when they were growing up in the South than in today's school system in Seattle. There was a lot of concern that teachers today do not cultivate a culture of learning in their classrooms today because they don't care about students, are teaching in fields they are not comfortable with (common with math), or aren't there to help kids.

Both groups strongly agreed that children can learn math concepts at home, and suggested a number of ways to do so: cooking/baking, talking about shapes, sizes, and weights of everyday objects around the house, reading nutritional information while shopping, counting snacks (ex. how many crackers do you have?), playing with Legos, using movement based games, church tithing, counting fingers/toes at bath time, using self talk, blocks, and puzzles.

Section #4

Both groups agreed that games were a good way to practice math concepts at home, and also helped kids build social skill. Some suggested games: Skip Bo, Farkle, Zeno games, Uno, Go Fish, Monopoly, Sorry, Chutes and Ladders, Candyland, Dominoes, and puzzles.

When discussing barriers to teaching math at home, one group focused on barriers effecting individual families, including: parents don't know how or learned a different way than what is taught in school, lack of interest from kids, multiple kids to attend to (especially if there is a big age range), and learning disabilities. Some suggested ways to address these problems were find a tutor for the child, go to the library to get help and ideas, talk to other family or community members, and ask the teacher for extra resources.

The other group talked about larger social issues impacting the success of children, centered on the loss of the "village" mentality in the community leading to a selfish focus on my child only instead of the well-being of the whole community. There was also discussion of the negative effects of drugs in the community and a general agreement that children are not taught to be respectful of parents and other adults as much as they were in the past. The group also agreed that there are biases in the school system and methods of teaching geared specifically towards white culture that make it harder for black students to succeed in public schools.

Both groups felt that the barriers they discussed could be address by "becoming the village" or "defining our new village", requiring building trust and stronger relationships with other parents, friends, and community members. There were also suggestion for how parents could better engage their children with math: find fun ways to teach kids, define their own educational goals for their child and be engaged with teachers, and share resources with other parents.

Spanish Groups

Section #1

Participants in both groups associated math with money, business, and work, and named numbers, counting, adding, subtraction, algebra, multiplication, division, shapes, know the date/days of the week, and knowing ages as parts of math.

All thought math is important for their child's future and for everyday activities like following recipes, getting change at the store, and construction. Focus in both groups on the importance of math for making money and for children to "have things I didn't have."

Some said math was complicated to work in with their kids because it is a different math than what they learned.

Section #2

In one group, the group mostly agreed that the math concepts could be learned around age 3-5, and a few said they could be learned earlier. The other group thought the appropriate age depends on the intelligence of the child. Both groups thought parents and older siblings could work in these math concepts at home with children, but both also said daycare and school were good places to learn them.

Both groups had similar ideas about ways to practice the math concepts at home, such as play games on tablet or phone, count steps and fruit, sort and count clothes, do puzzles, play with Legos, play with shapes, colors, play with car toys and blocks, sing songs, and putting money in piggy bank

Section #3

Across both groups, only a few participants said their parents helped them with math when they were kids. Many said their parents did not have more than a basic education so could not help. Some had siblings that helped, and one participant talked about a teacher being helpful.

Both groups thought it was possible to teach math at home by making it fun and using a variety of resources. Some suggestions included: set a schedule for math time, use One the Way, play regular cards and Pokemon card game, count dinosaurs on TV, use abacus, use educational websites and YouTube, count on hands, count toys or other items, sing songs, ABCmouse.com, sorting by color, helping with laundry and other chores, and cleaning up toys.

Section #4

Neither group thought there are any disadvantages to teaching math at home, but both talked about challenges such as: it can be hard to connect with the child or the child does not want to do it, hard to concentrate on one child when there are many in the house, lots of other things to take care of that are prioritized over education, and parents feel they might confuse the child by teaching the way they learned in Mexico instead of how it is taught in school in the US.

When talking about how to address these barriers participants focused on trying their best as parents, not repeating the pattern of their parents/families, and dedicating time each day to working on math. Participants in one group had advice for other parents about how to practice math concepts at home: study English, send kids to after school programs, practice time management, ask older children to help teach younger ones, and do activities that make kids feel like they are playing not studying.

Overall, there was a strong desire to do better than previous generations and change their way of learning to fit into US ways for learning.