

Theoretical Factors Affecting Parental Roles in Children's Mathematical Learning in American and Chinese-Born Mothers

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Abstract

This introductory qualitative study sought to explain American and Chinese-born mothers' personal beliefs and experiences with mathematics, views of U.S. mathematics curriculum, and how these factors influenced motivation regarding roles played in their children's mathematical learning through expectancy-value and attribution theories. The following eight themes were revealed from interview data with 11 mothers: (a) nature of math; (b) knowing math; (c) importance of math; (d) teaching math; (e) teacher competency; (f) parent competency; (g) parent as resource provider; and (h) parent as monitor/motivator. The authors argue that similarities and differences between American and Chinese-born mothers regarding their parental roles can be explained through the context of parental views of the importance of the subject and their involvement, through expectations for successful outcomes as a result of their involvement, and by feelings concerning the ability to control their children's successes.

Key Words: parents, perceptions, mathematics, teaching, parental support, American, Chinese, immigrant, mothers, roles, learning, expectations

Introduction

Parents' roles and involvement in their children's mathematical learning can lead to heightened performance in mathematics (Cai, 2003; Huntsinger &

Jose, 1997; Siegler & Mu, 2008). However, little evidence exists to show how mothers from different cultures support their children's elementary mathematics learning and, perhaps more importantly, *why* that support might differ. For instance, more research is needed to show the differences in (1) perceptions of the importance of mathematics learning, of the nature of mathematics, and of curriculum held by mothers from various cultural backgrounds (Gonzalez & Wolters, 2006; Jackson & Remillard, 2005; Tsui, 2005) and (2) how these perceptions are linked to ways in which different mothers support their children's elementary mathematics learning (Cai, 2003; Wang, 2004). Therefore, the purpose of this study was to examine Chinese- and American-born mothers' beliefs about mathematics learning, curriculum, and their roles in their children's mathematical learning through the lens of expectancy-value and attribution theories. The following review presents prior research on parental roles in mathematics as well as theories supporting factors that might increase involvement. First, a summary of research relating to how parents have been found to support their children's elementary mathematics learning and explanations for why that support might differ is given. Next, expectancy-value and attribution theories are reviewed as a means to elaborate on how parents' involvement with mathematical learning is likely to be influenced. Then the present study and its research questions are introduced.

How Does Parental Involvement Support Children's Mathematical Learning?

The notion of parental involvement has been described through a three-fold definition of parental roles in children's elementary learning: (1) parental behavior, (2) personal involvement, and (3) intellectual involvement (Grolnick & Slowiaczek, 1994). *Behavior* was related to the amount of time spent in the school environment. *Personal involvement* entailed the act of relating to and providing for a child's "affective environment" (Klein, 2008, p. 96) while learning takes place. Lastly, *intellectual involvement* involved making relevant learning opportunities available to children. Prior research illustrates this definition. For instance, preparation time and effort spent on academics with respect to mathematics homework and home-based support has been widely documented in the literature (Henderson & Mapp, 2002; Klein, 2008; Ma, 1999). This is both the personal and the intellectual involvement described by Grolnick and Slowiaczek (1994). Chinese American children spent four times as much effort on homework as did other American children (Huntsinger & Jose, 1997). Additionally, Chinese-born parents were found to spend more time on homework, structured their child's time more efficiently, and showed encouragement for

mathematics-related activities, much more than American-born parents (Huntsinger & Jose, 1997; Huntsinger, Jose, Liaw, & Ching, 1997). The differences proved to be important with respect to children’s successes in mathematics. Thirty-seven percent of the variance in Chinese American children’s school success was predicted by parents’ intellectual involvement and commitment to their learning. Thus, the “how” is important when considering parental roles in children’s learning of mathematics.

Cai, Moyer, and Wang (1997) expanded on the “how” when they identified the parental roles of resource provider, monitor, content advisor, and learning counselor in elementary school children’s mathematics learning (see Table 1).

Table 1. Parental Roles as Identified in the Parental Involvement Questionnaire*

Parental Role	Description
Motivator	Parents provide emotional support for students’ learning.
Resource Provider	Parents provide an appropriate place to study, relevant reference books, or access to the library.
Monitor	Parents monitor child’s learning and progress.
Mathematics Content Advisor	Parents provide advice to their children on math content.
Mathematics Learning Counselor	Parents understand their child’s current situation, learning difficulties, potential, needs/demands, and provide appropriate support.

*Cai, Moyer, & Wang, 1997

Cai, Moyer, and Wang’s (1997) research provided clear definitions for the “how” regarding ways parents help their children learn mathematics. Perhaps most importantly, Cai’s later cross-cultural research suggested the parental roles of *motivator* and *monitor* contributed the most in both U.S. and Chinese students’ problem solving performance, a widely used criterion for establishing mathematics proficiency (Cai, 2003). However, reasoning concerning *why* parents might become involved in these ways remains unclear. Thus, factors that have been offered as affecting varying parents’ involvement in mathematics are reviewed, namely, perceptions of teachers and curriculum and culture.

Why Might Involvement in Mathematics Differ Among Parents?

Perceptions of Curriculum and Teachers

Perceptions and/or knowledge of curriculum may impact the roles parents play in their children’s learning of mathematics (Gal & Stoudt, 1995; Grolnick, Benjet, Kurowski, & Apostoleris, 1997; Jackson & Remillard, 2005; Sheldon

& Epstein, 2005). In investigating reasons why parents may *not* become involved in children's mathematics learning, changes in the school's curriculum from more traditional to reform-based instruction has been cited as an obstacle (Gal & Stoudt, 1995; Sheldon & Epstein, 2005). "The emphasis on conceptual understanding is new to most parents who are products of a school system that previously emphasized rules and procedures" (Jackson & Remillard, 2005, p. 70). However, reasons connected to mothers' perceptions of newer curricula as a disruption of support may go beyond a lack of resources. Previous research has shown parents helping students with mathematics homework rooted in reform versus traditional curriculums produced a change in the help offered (Shumow, 2003). Assistance was provided in both situations, but the task given produced different types of help (e.g., reform-based curricula resulted in less directed help; traditional curricula resulted in more step-by-step assistance).

Culture

Types of help offered to children by their parents in mathematics have also been explained through culture. Previous research showed American parents tended to attribute success in mathematics to those who possess a special talent as opposed to those who worked hard and practiced (Hess, Chih-Mei, & McDevitt, 1986; Stevenson et al., 1990). As a result, American-born parents concluded mathematics success is more about innate ability and the success of the school setting. In contrast, Chinese and Chinese American parents believed mathematics success is about effort and practice (Hess et al., 1986; Huntsinger et al., 1997; Whang & Hancock, 1994). They provided their children earlier structured exposure to mathematics concepts and practice of skills through a formal, direct mode of instruction (Chao, 1994; Huntsinger et al., 1997). Thus, Chinese parents tended to attribute their child's successes and failures in mathematics to controllable factors. Perceptions of the importance of mathematics have also been shown to vary widely across cultures. American parents did not view the study of mathematics in elementary grades as important as the study of other subjects such as reading, language, and everyday skills (Cannon & Ginsburg, 2008).

Explaining the "Why": Expectancy-Value and Attribution Theories

Culture and perceptions of curriculum begin to provide explanations why some parents may become more meaningfully involved in their child's learning of mathematics than others, yet leave many unanswered questions relating to *why* culture and perception motivate parental involvement in different ways. For instance, views of the importance of mathematics is expected to influence

the support offered to children as they learn mathematics, but underlying reasons that cause the differences that occur have not been widely discussed outside of the explanation of culture. Furthermore, while it has been stated that differences exist in how American and Chinese-born parents view aspects of ability and effort as it relates to mathematics, the knowledge of why these differences affect parent's motivation to support children in learning mathematics is not clear. Lastly, more needs to be known about why the perceptions of mathematics curriculums cause a difference in parental motivation to help their children. As underlying motivators caused by perceptions and culture become clearly defined, aid can be given to parents to change their views and thus increase their motivation to help their children in meaningful ways as they learn mathematics. Expectancy–value theory and attribution theory are based in the notion of motivation and could explain differing parents' motivation to help their children learn mathematics in ways identified as meaningful in previous research (Cai, 2003).

Expectancy–Value Theory

In expectancy–value theory, individuals' expectancies for success and the value placed on succeeding are deemed important determinants of motivation to perform different tasks (Eccles & Wigfield, 2002; Wigfield & Eccles, 2002). All parental involvement in mathematical learning is likely to be influenced by parents' perceived importance of mathematics (value) and an expectation of success that may result from their involvement (expectancy). Expectancies and values are assumed to be positively related to each other and are linked to psychological and social/cultural factors.

Expectancy

There exists a connection between the expectation to do well in a given situation and one's belief in his or her own ability and perceptions of others' abilities in expectancy–value theory (Eccles & Wigfield, 2002; Wigfield & Eccles, 2002). *Ability beliefs* are defined as broad beliefs about competence in a given domain and tend to include an individual's comparative sense of competence along with beliefs about his or her own ability. For instance, a mother who views herself as inadequate and the teacher as adequate may act differently than one who views the teacher as inadequate and herself as able to help.

Value

Task values are determined by influences such as the features of the task, the importance of success or failure to the individual, and the believed probability of success. Generally, expectancy–value theory outlines four areas that constitute task value: attainment value, intrinsic value, utility value, and cost.

Attainment value involves the personal importance of doing well, while intrinsic value involves the enjoyment the individual gets from performing the activity (Eccles & Wigfield, 2002; Wigfield & Eccles, 2002). Utility value is determined by how much a person values a particular task with respect to future plans or goals, and cost is defined as the negative aspects of engaging in a task. Variables are influenced by individuals' perceptions of other peoples' attitudes and expectations for them, by their affective memories, and by their own interpretations of their previous achievement outcomes. Many of these variables are also evident in attribution theory.

Attribution Theory

Attribution theory suggests parental involvement in mathematics depends heavily on the controllable or uncontrollable factors involved in the task and the connected need for achievement (Weiner, 1972, 1988). The notion of controllability separates causes under a person's control from causes one cannot control. Ability, for instance, is classified as a stable, internal cause, while effort is classified as unstable and internal. Attributing an outcome to a stable cause such as ability or skill has a stronger influence on expectancies for future success than attributing an outcome to an unstable cause such as effort. This is an important point when considering parental roles and why certain parents become more involved than others, as one's beliefs about the cause of children's successes or failures have important implications for what the parent may choose to do or not to do regarding the child's achievement.

Moreover, attribution models, like expectancy-value models, include linkages between ability and effort and the need to achieve. Weiner (1988) explains:

Individuals high in achievement motivation perceive that effort is an important determinant of outcome (high effort produces success and low effort results in failure). On the other hand, persons low in achievement needs perceive that outcome is only weakly influenced by how hard they have tried. However, they do believe that personal failure is caused by a lack of ability. (p. 96)

The Current Study

The current study will expand understanding of the nature of involvement in students' mathematical learning by explaining the influences of mothers' perceptions and beliefs toward mathematics and their knowledge of the curriculum on their motivation to assume varying parental roles through expectancy-value and attribution theories. Specifically, this research answers

the following questions: (1) What are Chinese- and American-born mothers' personal experiences in learning mathematics and views of their child's mathematics curriculum? and (2) Why might their views and experiences influence parental motivation to engage or not engage in meaningful parental roles supporting their child's mathematics learning?

Methods

Setting

The study took place in a metropolitan area of central Florida. Researchers identified two sites that would serve well for participant recruitment. First, a Chinese church was selected to recruit Chinese-born parents because it serves primarily Chinese-born families and individuals who live in the Central Florida area. There are approximately 20 Chinese families and 30 individuals who attend the church on a weekly basis. Out of these 20 families, approximately 15 of them have children who are currently attending public schools in central Florida. Second, a community clinic was selected to recruit American-born parents because it regularly offered free diagnostic testing services in mathematics to school-aged children. There are about 15 families per year who use the clinic services offered 3 times per year. Every family who uses clinic services has at least one child attending public school in central Florida. Families who use the clinic services do so to obtain information on their child's mathematics aptitude. The testing could be provided for any child, from gifted to normally achieving to one who is struggling. We knew that many of the families who used the clinic services resided in areas in close proximity to the Chinese church, which was another reason the clinic was utilized for recruitment.

Participants

Mothers needed to meet certain criteria in order to participate in the study. Chinese-born mothers had to have been a parent of at least one elementary-aged child (Grades 1–6), received their primary education in China, and immigrated to the United States (acculturation). American-born mothers had to have been a parent of at least one elementary-aged child (Grades 1–6), received their primary education in the United States, and had American citizenship. The criteria were used to identify a comparative group of parents who received their education in two distinct cultural settings. Further, we wanted to ensure that teachers who served the children of the parents we interviewed had comparable backgrounds with respect to degree earned and years of teaching. The equity sought in these characteristics was important because we did not want to obtain answers based on the quality of teaching and pedagogy given

as opposed to parental preferences and beliefs regarding their child's learning of mathematics. All teachers of the sampled mothers' children were found to hold bachelor degrees in education and had teaching experience of 4–7 years.

Sampling Procedure

We used a purposive sampling procedure in recruiting participants. The sample was purposive in that we needed mothers whose children were taught by teachers of comparable backgrounds (see above) and who lived in areas serviced by the same schools, thereby assuring more control of similar curriculums and teaching experience being used in classrooms. The first author worked with a representative from the clinic to identify potential participants. She telephoned the potential participants and explained the purpose of the study. Once mothers expressed interest in participating in the study, she arranged interviews times and mailed consent forms to interested parents' homes. The second author received permission from the leader of the Chinese church to recruit study participants. She contacted all qualified participants ($n = 5$) in person and everyone volunteered to participate. Together, the researchers recruited a total of 11 mothers of elementary-aged children (M child age = 9 years) for the current study.

Demographics

For the American participants, we attempted to obtain a relatively diverse sample of mothers. American-born demographics are made up of exactly one-third Caucasian ($n = 2$), one-third African American ($n = 2$), and one-third Latina ($n = 2$) parents. English was the primary language spoken in all but one participant household, where Spanish was the primary means of communication. Each participant was her child's primary caregiver. The mothers noted their occupations as (1) accountant, (2) special education teacher, (3) housewife, (4) administrative assistant, (5) general education teacher, and (6) research assistant/associate, with all reporting middle socioeconomic status.

Demographic variables for Chinese mothers reflected similarities and differences with American participants. All Chinese participants reported being middle socioeconomic status except one parent who self-identified as low socioeconomic status. All participants reported Chinese as the primary spoken language in their homes. Each participant was her child's primary caregiver. Mothers listed their occupations as (1) software engineer, (2) manager, (3) bookkeeper, (4) housewife, and (5) professor. Table 2 further summarizes participants' demographics for both participant groups.

Table 2. Participant Demographics.

Characteristic	Immigrant Chinese-born parents ($n = 5$)	American-born parents ($n = 6$)
Mean Acculturation	14.1 years	32.4 years (natives)
Mean Educational Level	Master's degree	4-year college degree
Mean age of children	11-0 (years-months)	7-0 (years-months)

Author-Researcher Perspectives

The identification of a researcher's positionality in a qualitative research project is important because the researcher becomes the instrument by which data is collected and analyzed (Glesne, 2006). The first author spent a good amount of time reflecting on her own subjectivity regarding this research project and what that meant to her position as a researcher. As a former mathematics teacher, she was confident in her knowledge of mathematics. Her experiences with her own parents and what they assigned as mathematics homework included a wide variety of applications, drills, and concepts that were often embedded into situations in daily life. In regards to data collection and analysis, she expected her inquisitive nature to result in the reporting of themes and voices of participants, even though they may have differed from her own.

The second author speaks Chinese as her native language, and she also attended the Chinese church regularly that was selected as one of the study sites. She was born and raised in China and came to the U.S. to study exceptional education at the age of 21. The second author also loves learning and teaching aspects of mathematics. She remembers how by first grade she had mastered the multiplication facts table and won the first prize in a math competition. She loved playing math games and solving math problems. She found such tasks interesting and engaging. Her math teachers were good at explaining problems and made them understandable to her even though her elementary school was poor and math manipulatives were not available for teachers or students. She later found out that most of her peers grasped conceptual understanding of math concepts naturally through a combination of didactic discussion, drawing pictorial illustrations, and making references to daily materials. Currently, the second author is the mother of an early elementary student. She is actively involved in her son's mathematics learning through (1) teaching math concepts by connecting to daily life applications and using concrete materials as well as drawing pictorial illustrations, (2) reinforcing declarative knowledge by playing instructional board games and online computerized games, (3) challenging him to solve mathematical problems in order

to foster a love for learning mathematics, and (4) building his self-confidence by doing all the above consistently and habitually.

Throughout the course of this study, the researchers have attempted to acknowledge their own feelings about mathematics and the teaching of mathematics and have tried not to inflect their position into research data. Efforts were taken to interpret all research data in full awareness of the researchers' "lens" by using various verification strategies (Creswell & Miller, 2000).

Verification of data analysis, resulting codes and themes, and guards against external threats to validity were achieved through a variety of means. First, three independent coders reviewed transcripts at stages two and three of data analysis (Grbich, 2007). Codes were deemed to be reliable if the three coders achieved 80% agreement or greater. Coders reached consensus on their disagreements. Second, reliability of source information was obtained through the use of verbatim translation (Grbich, 2007). Finally, participants were shown results of the analysis as a means of member checking to ensure consistency in data reporting (Creswell & Miller, 2000; Glesne, 2006; Grbich 2007).

Data Collection Procedures

Interviews were the primary data collection method employed in the study to gain an in-depth understanding of the research questions. We wanted mothers to experience comfort and freedom to express their opinions freely and thus generate a range of issues and thoughts expressed in response to interview questions. Each mother participated in one interview session focusing on parents' perceptions of mathematics teaching and learning and questions relating to each mother's perceived roles in her child's mathematical learning. After agreeing to take part in the study, a time to complete the interview session was arranged. Each interview session took from 20 to 50 minutes to complete.

The first author held all individual interviews with American-born mothers. The second author held all individual interviews with Chinese-born mothers in the church. Chinese participants all elected to be interviewed face-to-face in Chinese at the Chinese church on a Sunday after lunch. Interviews with Chinese-born mothers took two Sunday afternoons. All American participants chose to utilize telephone interviews to adhere to individual schedules except one mother, with whom the first author conducted a face-to-face interview at the clinic. The Spanish-speaking mother was interviewed in Spanish by the first author with the aid of a translator.

An interview protocol was utilized during the interview process (see Appendix). Questions used were largely open-ended, allowing participants to supply researchers with as little or as much information as they felt necessary to express their thoughts on questions posed (Glesne, 2006). The interviews

began with questions designed to elicit participants' perceptions of mathematics as a learning entity; the mothers were asked to reflect on their own learning of mathematics and their current perceptions of its importance in life. Next, questions were posed inviting participants to reflect on their views of their children's learning of mathematics pertaining to the school and curriculum. Lastly, participants were asked about the roles that they played in their children's mathematical learning.

Data Analysis

The analysis of interview data involved several stages of identifying, sorting, and analyzing. First, all interviews were audiotaped and transcribed verbatim; the tapes were then destroyed (Grbich, 2007). Interviews not conducted in English were translated into English before being coded. Transcripts were entered into Microsoft Word in an effort to organize the data. The research team then reviewed the first two interviews of both immigrant Chinese-born and American-born participants concurrently to discuss possible codes and early emerging themes (Grbich, 2007). Identified codes were given definitions, and a list of codes and definitions formed the first version of the study's codebook.

Second, the research team independently analyzed the next two sets of interviews and met to discuss and agree on findings. Certain themes and codes were added or deleted during this stage until researchers reached a consensus on the information, which produced a revision of the original codebook formulated in the first round of analysis (Glesne, 2006; Grbich, 1997).

Finally, each researcher analyzed the last three sets of transcripts, first independently and then again as a group, to reach consensus and make any necessary changes. Thus, a total of three versions of the codebook were developed from these processes. Final checks among the research team were performed on all codes to ensure accuracy and consensus (Grbich, 2007). Related codes (e.g., importance of math and perceptions of math) were condensed. Final numbers from the analysis process produced a total of eight interrelated themes.

Results

Table 3 provides an overview of the eight themes uncovered in the study: (a) nature of math; (b) knowing math; (c) importance of math; (d) teaching math; (e) teacher competency; (f) parent competency; (g) parent as resource provider; and (h) parent as monitor/motivator. Indicator categories include codes uncovered in both immigrant Chinese and American parents' responses.

Table 3. Eight Themes of Mother’s Perceptions of Mathematics, Curriculum, and Parental Roles

Interview Themes	Indicators	
	<u>Chinese-Born Mothers</u>	<u>American-Born Mothers</u>
Nature of Mathematics	Regimented Verbal Strategy Practice Memory	Regimented Verbal Steps
Importance of Mathematics	Responsibility Good at It Accomplishment Interesting/Useful	Better Things to Do Can’t; Don’t Fun The “Challenge”
Knowing Mathematics	Motivation Hard Work Application Interest Gift	Talent Right Background Practice Basics
Teaching Mathematics (Mother’s Beliefs)	Memory Practice Application and Integration	Memory Practice Steps/Basics
Teaching Mathematics (Actual)	Lack of Depth Lack of Application No Practice Too Simple No Mastery	Effective/ Blind Belief No Focus Exposed to More
Teacher Competency	Not Competent Not as Good as Mine	Competent
Mother Competency	Good	Poor
Mother as Resource Provider	Provide Additional Supplies Make Up Problems	Games Tapes
Mother as Monitor/ Motivator	Enforce Additional Practice Meaning/Extension	Make It Fun The Child’s Responsibility

Parent Perceptions of Mathematics

Nature of Math

The first theme uncovered relayed parents' perceptions of the nature of mathematics. This theme revolved around ideas and memories of parents' own learning of mathematics and parent's perceptions of the learning process. Mothers born in China emphasized that they related mathematics to terms such as practice and a "mental knowing." They reported the learning of mathematics being filled with practice and memorization. However, their recollection of mathematics tended to include a richer and more involved mathematics along with a restating of facts—parents often spoke of math as strategy and a way of flexible thinking that extended from one subject to many others.

American-born parents emphasized mathematics as regimented and somewhat teacher led. Many reported their learning of mathematics as a series of steps. Indications of mathematics being more streamlined and less flexible were apparent throughout American parents' responses, suggesting that the learning experiences of American and immigrant Chinese-born parents possessed similarities yet also important differences, as few American-born parents spoke of mathematics as an application of reasoning.

American-born Mother: I remember learning math primarily as the teacher was writing on a chalkboard. And they would show you, um, the different steps...the different steps to get to the answer.

Importance of Math

Further differences in perceptions concerning mathematics began to emerge as parents discussed the importance of mathematics, which revolved around parents' appreciation of mathematics as a learning phenomenon as well as the relevance of mathematics to life events. Chinese-born parents emphasized feeling responsible towards the learning of mathematics and an interest in succeeding in its understanding.

Chinese-born Mother: I feel it is kind of my responsibility to learn math well since the teacher was teaching you. I like math a lot. I think it is very interesting. Especially I would feel glad when I solved difficult problems.

Similarities and differences were apparent in American-born parent responses. Most American-born parents indicated an overall uneasiness about mathematics, ranging from a general discomfort to an inability to understanding or comprehend mathematics. Along with expressing their dislike regarding the subject, other parent responses indicated that mathematics did not hold importance in their life.

American-born Mother: ...ugh, no. Can't grasp it...don't grasp it....

American-born Mother: I have better things to do than think about numbers...

Knowing Mathematics

Knowing mathematics refers to parents' views on what it takes for someone to come to know and excel at mathematics. Chinese-born parents believed that to be good at math, one must show interest.

Chinese-born Mother: I think you need to increase your interest in learning mathematics....Regardless of learning styles, practice is critical if you want to be good at mathematics.

Chinese-born Mother: First, one should practice a lot. Practice will make one become gradually more and more interested in math.

In contrast, most American-born parents believed that one had to possess talent to obtain mathematics achievement.

American-born Mother: I think that you have to be somewhat number oriented...and not get a mental block about it. I think that happens a lot, where kids don't understand, so they push it out.

Parent Perceptions of School, Teachers, and Curriculum

Teaching Mathematics

The fourth theme revealed thoughts concerning how mathematics should be taught as well as on the effectiveness of the teacher and the school mathematics curriculum. At odds with their own beliefs about how mathematics should be taught, Chinese-born parents viewed the U.S. school curriculum in math as weak and lacking depth, practice, and mastery learning.

Chinese-born Mother: I think math education in the U.S. is inadequate. It seems that it is covered very broadly, and the child is learning about a variety of everything. Yet the child did not learn to master any of them.

Chinese-born Mother: I feel that the schools here do not provide enough time or items for the child to practice. If you want your child to be good at mathematics you have to teach him yourself at home.

Chinese-born Mother: I feel there is a significant lack of practice. They rarely ask students to practice. Very little homework. That's why I have to check the amount of homework and come up with more for my child to practice.

In disagreement with their counterparts born in China, some American-born parents saw the curriculum for math as generally effective, but listed vague or few specifics as to why they felt that way.

American-born Mother: They always prepare the kids well for mathematics because they...they have to...the school right now must do well on the FCAT testing.

Alternatively, specific reasons mentioned by some American-born parents for seeing the U.S. curriculum as low included a lack of focus and an emphasis on other content areas like reading.

American-born Mother: Right now I really don't see that much of a focus on math; I still see more of a focus on reading intervention or pull out for reading more than math.

Teacher Competency in Math

The fifth theme addressed each mother's feeling about her child's teacher and the teacher's ability to teach mathematics to the child. The responses show differences between varying parents' perceptions of teacher effectiveness. Overall, Chinese-born parents did not report being confident in the level of math knowledge exhibited by the teacher. Often times, mothers felt more prepared in understanding mathematics and gave measurable attributes that were seen as lacking, such as knowledge of problem solving and concepts.

Chinese-born Mother: Sometimes, my son brings home math problems, and the teachers do not even know how to solve them. I solved them, but the teachers did not even know how I reached the conclusion.

In contrast, it appeared that American parents trust teachers' competencies.

American-born Mother: I know that she [the teacher]...I have heard of people talking about her strengths and what she's done. How it's her passion (math), and I think that's a good influence...a good way to open someone's mind up to a positive way of thinking about math.

Parent Roles in Child's Mathematical Learning

Parent's Competency in Math

The last three themes dealt with parental roles in children's mathematical learning and factors that might have influenced these roles. The sixth theme uncovered related to parents' feelings of competency regarding their own knowledge of mathematics and their ability to act as a resource for their children's learning. Chinese-born parents reflected a basic comfort with mathematics.

Chinese-born Parents: My math training is more than enough to teach her.

Unlike Chinese parents, most American-born parents seemed less sure as to how much they could help with mathematics.

American-born Mother: I don't feel prepared at all. It's a very scary road for me, actually. Math isn't my favorite subject. I will...take the necessary steps for her to grasp what she needs.

Parent as Resource Provider

The seventh theme involved parents as resource providers for their children. Many Chinese-born parents reported that they did not feel that American schools provided enough homework for their children and seemed to be aware of more strategies and ways to help their children by supplementing the teaching and often re-teaching or extending the topics taught. Parental support came across as systematic and connected to the child's learning process with the *parent* as the main resource to their child.

Chinese-born Mother: I, then, show her the relationship through drawing...number line...basically, using pictures to illustrate the concept. Once I draw the picture and explain it to her, she can understand it... you have to illustrate it in a way that she can understand.

In contrast, American-born parents saw *teachers and others* as resources for their children over themselves. While basic resources were cited, most American-born parents relied on resources that were detached or external to their own support structures.

American-born Mother: They all do homework in the afternoons. They all pretty much, like there's all these...at least on my son's school website...they have a lot they can go on and play the math games.

American-born Mother: Getting help from their dad or seeking the help of their teacher.

Parent as Monitor/Motivator

The final theme dealt with a mother being a monitor and motivator of her child's learning process. As viewed in other themes, differences between parents were uncovered. In general, immigrant Chinese-born mothers responded in rich and various ways related to monitoring and motivating their children's learning of mathematics.

Chinese-born Mother: I reward them with money, like one dollar. But, I don't give them cash. Instead, I write them a check. They also have a

check book to keep track of how much money they have earned. So they know how much money they have in their bank account. Of course, I am the bank.

American-born parents seemed to defer motivating and monitoring to others, trusting more in the aptitude of the child's teacher or another source.

American-born Mother: I would not have a problem going to the teacher or emailing the teacher for extra help for them, or, like I said, driving them in the morning early or in the afternoon.

American-born Mother: You know what I mean, if they didn't get it with their teacher that day, what makes me think they are going to get it with me at home?

Discussion

Although caution should be used when interpreting the results of the findings due to the small number of parents interviewed and a limited means of data collection, the results of this study suggest that similarities and differences between American and Chinese-born mothers regarding their parental roles in mathematics can be explained through the context of perceptions of importance of the subject, expectations for successful outcomes as a result of their involvement, and feelings concerning the ability to control a child's successes.

Apparent in the results was the difference in the importance of mathematics between mothers. According to expectancy-value theory, perceptions of task utility (important or unimportant) could be influenced by a person's interpretations of their own past performance in mathematics and their affective memories (e.g., a person who remembers performing poorly in mathematics may not value it, while parents who remember doing well may value it more; Eccles & Wigfield, 2002). Indeed, many mothers that we interviewed who remembered doing well in math seemed to value the subject more than those who remembered doing poorly or who attached a negative connotation to the subject. This valuing or devaluing could prove to affect the support given to children or the type of support given (e.g., monitors and motivators), as task value's ultimate significance is the impact on a person's choice to engage in the task through attainment value, intrinsic value, or utility value (Wigfield & Eccles, 2002).

A belief particular to Chinese-born mothers was the importance of practice, not only in learning mathematics, but also in increasing one's interest in the subject (e.g., intrinsic value). This alludes to the possibility that, while Chinese-born mothers believe that talent is a precursor to success in advanced

mathematics, they believe they can push or train their children to become interested in and good at math through practice, a belief not made apparent by American-born mothers' comments (Hess et al., 1986; Huntsinger et al., 1997; Whang & Hancock, 1994). This explains and expands notions of earlier research reporting that Chinese-born mothers tend to attribute their child's successes and failures in mathematics to controllable factors (Hess et al., 1986; Whang & Hancock, 1994).

Tied to interpretations of past performance and the effect on valuing roles are the beliefs that mothers' hold in their own ability to help their children. According to attribution theory, captivating beliefs about a person's own mathematics ability or efforts may lead to feelings of controllability or uncontrollability on the part of the parent, thus leading them to become more or less involved in their child's learning or to become involved in qualitatively differing ways (Weiner, 1972). Many mothers who expressed a comfort with mathematics described assigning extra work for their children or brought mathematics into daily life routines, while mothers who seemed uneasy with mathematics seemed to forgo the responsibility to other people. Thus, the convergence that occurred in many parents who did not remember doing well in math and who did not feel they could adequately assist their child led to a difference in assistance received by their children (Cannon & Ginsburg, 2008; Hess et al., 1986; Stevenson, Lee, & Stigler, 1986). Interestingly, Chinese-born mothers seemed to appreciate homework that was more practice driven because they felt apt enough in the content to provide the applications and connections necessary in math through their own teachings. In contrast, American-born mothers seemed to appreciate homework that was "fun" or more "self-guided" applications or extensions of instruction done in the classroom, perhaps because they were more unsure of how to help.

The interaction of expectancy and ability beliefs (both about one's own ability as well as the ability of another) may have also affected the reported roles mothers played in their children's learning of mathematics. A parent deciding how to help a child may establish their expectancy for success in doing so based on their observations of other's ability (e.g., the teacher's ability) along with knowledge or beliefs concerning their own ability (Eccles & Wigfield, 2002). Observing the teacher as good at teaching and understanding mathematics and oneself as better may produce one type of expectancy and corresponding role, while observing a teacher as bad at teaching and understanding math and oneself as worse by comparison may produce another type of expectancy that one will do well as a helper, producing a different type of role. The comparison could also work to influence parental roles in mathematics if beliefs about their ability to do math are poor and they place more value in the teachers' ability as

opposed to their own (or the opposite). Most American-born mothers viewed the curriculum and the teaching of mathematics as fairly adequate, despite the absence of concrete factors supportive of their opinions. It seemed from our limited information that American-born mothers are more apt to believe in the competence of the teacher and of the curriculum than Chinese-born mothers. Although cultural differences may also explain the findings (Eccles & Wigfield, 2002; Hess et al., 1986; Huntsinger et al., 1997; Whang & Hancock, 1994), perhaps the view of the U.S. mathematics curriculum is a contributing factor to the propensity of some mothers to monitor and motivate their child more than others (Cai, 2003).

Our study also suggests the possibility that three distinct conclusions are reached by parents who hold certain views of teachers and their competence in comparison to their own. First, some parents believe that even if the teacher is inadequate that they cannot do anything to assist their child because their ability is worse or that they simply do not understand the curriculum (Gal & Stoudt, 1995; Grolnick et al., 1997; Jackson & Remillard, 2005; Sheldon & Epstein, 2005). Supporting evidence for this conclusion is found throughout responses indicating some of the mothers' reliance on computers, tutoring programs, or other outside sources for assistance. Second, parents may see an inadequate teacher and respond with increased assistance because they perceive their own ability as better than that of the teachers, as evidenced by many of the Chinese-born mothers' responses. Finally, some parents view the teachers' knowledge as "good," leading to either an unquestioned support of the dominance of the teacher and a lack of their own support (as evidenced by one parent's feeling unable to help if her child did not learn from the teacher) or to lending support in other, non-academic ways (Henderson & Mapp, 2002).

As mentioned previously, little is known concerning why the perceptions of mathematics curriculums cause a difference in parental roles taken or in the type of support given outside of views of varying mathematical tasks (Shumow, 2003). The link between ability/effort and the need for achievement also holds implications for parental roles (Weiner, 1972, 1988). The results of this study suggest the possibility that Chinese- and American-born mothers view the mathematics curriculum in the United States in very different ways. If one has a high need for achievement, then their attribution of success will correlate more with effort than ability. In other words, a mother needs to succeed in her support of her child's learning (perhaps because the school or teachers are failing them), so they believe they *will* succeed. On the other hand, individuals who are low in achievement needs are more likely to perceive that failure is due to their ability deficiencies. Or, mothers who view teachers and curriculums as adequate may have a subsequently low need to help their children and may not even believe they can do so (Eccles & Wigfield, 2002; Weiner, 1988).

As evidenced by the responses, some mothers saw the curriculum as not meeting their expectations for their child's learning and, to compensate for this gap, they compiled extra assignments and practice opportunities for their children to complete. The perception of an inadequacy in instruction influenced the roles that mothers played in their child's learning of mathematics, perhaps because it heightened the mother's need for achievement and her subsequent belief that her effort will matter in her child's learning. This finding also may better explain past research findings that Chinese American children spend four times as much effort on homework as did European American children (Huntsinger & Jose, 1997). It may also explain the propensity for some parents to become motivators and monitors of their child's learning in mathematics, more so than others who may see the curriculum as adequate (Cai, 2003).

Limitations of the Research

The results of this analysis depict important differences in how parents view mathematics, teachers, curriculum, and their own abilities, as well as the subsequent impact on parenting roles. However, there are several important limitations that should be noted. First, due to the length of the interview sessions, limited information was obtained, which makes it difficult to say differences observed between mothers apply to all Chinese-born and American-born mothers. A second issue is the small group of participants interviewed. This affects the ability to make broad statements about the themes uncovered. Next, the sample size in the current study is not big enough to examine whether gender, SES, or other parent characteristics predicted parents' beliefs or responses. This is an important issue, as "it has been pointed out that inconsistencies in linking parent involvement to academic achievement are related to the failure of studies to fully assess differential effects by socioeconomic status" (Tam & Chan, 2009, p. 85). Many inconsistent findings appear in the literature relating to how parent's income, job status, and related factors affect support given to their children, and this is a definitive limitation to the present study. Lastly, the information was all self-reported by the mothers; the nature of the study (i.e., pilot study) and available resources (i.e., time and money) made a more encompassing amount of data collection difficult.

Future research should address these issues. First, a larger sample of mothers from varying socioeconomic statuses should be included in future studies to improve the findings. Observational data, lengthier interview sessions, and additional forms of data analysis would also be helpful to provide richer and more applicable information. Future research could also utilize information from the children of parent participants and observe the impact of parental roles

on student achievement and student efficacy in mathematics. If it is found that the findings from this study are representative of larger groups of parents, then future research needs to address the view of these mothers as teachers. Additionally, we would need to explore practices and programs that could aid in mothers increasing their understanding and involvement in their children's journey to mathematics success.

Implications for Teacher Educators and Parents

The results of the present study extend previous research literature in two important ways that hold implications for teacher educators and parents. First, the use of attribution and expectancy–value theories offered unique perspectives on the reasons parental support offered in mathematics to children may differ that have not been previously discussed. Previous research identified “how” support is offered by different parents; notions of mothers' need for achievement in parental roles that are tied to views of teachers and curriculum offers important new insights explaining the “why” behind the “how” support is offered.

Additionally, although the sample size was small and means of data collection were modest, the study leaves open the door for important future research regarding the possible improvement of parental involvement in mathematics learning. For instance, applications of attribution theory from the standpoint of teacher preparation or parental support may aid parents in changing their causal beliefs about their ability in mathematics and thus change their actions and roles in helping their own children learning mathematics. For example, educators might be prepared to aid parents through a refocusing of the parent's ascription of poor ability in mathematics to the “rules” that the parent is using to reach that conclusion (Weiner, 1988), calling attention to possible erroneous thinking or alternate explanations instead of simply trying to convince them their ability is the result of bad luck. This, in turn, may result in a different causal ascription and increased parental involvement. Methods courses or other education courses might also be extended by adding a component on communication with families regarding content and curriculum.

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(please see next page for Appendix)

Appendix. Interview Protocol

1. Ask all demographic information—the parent (acculturation, education, income, job status, number of family members, etc).
2. How do you remember learning about mathematics when you were a child?
3. Do you like mathematics yourself? Why or why not?
4. What words best describe mathematics?
5. Do you think mathematics is an important subject? Why is it important for your child to do well in mathematics? Can you relate mathematics to your life experiences?
6. What do you think it takes for someone to be good at mathematics?
7. What do you think is more important in mathematics teaching—discovery and real world application or a high knowledge of procedures, memorization, and practice opportunities? Why do you feel this way?
8. “I think that the way mathematics is taught in classrooms today is effective”...what are your thoughts on this statement? Why or why not?
9. What’s your impression of the average school’s preparation in mathematics for its students? Is it low, midrange, or high? Why do you think this?
10. What do you think about your child’s mathematics teacher’s competences in teaching and their knowledge and skills in mathematics?
11. How apt do you feel in monitoring you child’s progress and motivating your child to do well in mathematics? Why do you feel this way?
12. Describe your involvement in helping your child learning mathematics? For example, how much time do you spend with him/her doing math homework each day? What kind of learning resources/materials do you acquire for him/her? Do you hire private tutors?
13. What do you feel your role is in communicating clear goals and expectations to your child for their mathematical learning?
14. How prepared do you feel to help your child with their learning of mathematics? Why?
15. What strategies do you use at home to help your child with mathematics?