

“La Lotería” - Using a Culturally Relevant Mathematics Activity with Pre-service Teachers at a Family Math Learning Event

Olga M. Ramirez and Cherie A. McCollough

Abstract

This paper aims to raise awareness of how university content faculty prepare pre-service teachers to implement culturally relevant math activities involving Hispanic families in an after-school Family Math Learning Event (FMLE). By exploring the game of chance “La Lotería” from Hispanic culture with math objectives appropriate for elementary and middle school grades, this paper illustrates the potential impact on future teachers and Hispanic families participating in the FMLE.

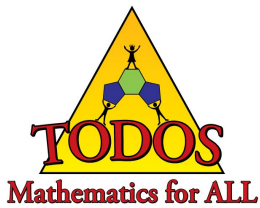
Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. What do you know about typical games played in Hispanic households?
2. How can the “bingo-like” board game “La Lotería” played by many Hispanic families be used to teach mathematical concepts?
3. What do you know about Family Math Learning Events (FMLEs)?
4. Why are the objectives listed in Table 1 (on the following page) important for pre-service teachers involved in a FMLE? To what extent are these objectives aligned with the mission and goals of TODOS: Mathematics for All?

Olga M. Ramirez (oram@utpa.edu) is a Full Professor in the Department of Mathematics at the University of Texas-Pan American. She teaches mathematics content courses for elementary and middle school teachers and is a proponent of culturally responsive and hands-on teaching.

Cherie A. McCollough (Cherie.Mccollough@tamucc.edu) is an Associate Professor in the Department of Life Sciences at Texas A&M University-Corpus Christi. She teaches life science content courses for pre-service K-12 science teachers and provides K-16 professional development.

Acknowledgement: The following article includes (with permission) images from LOTERIA: ®/© Calendarios y Pasatiempos & Don Clemente, Inc. 2011. Licensed by FM enterprises. All rights reserved.



“La Lotería” - Using a Culturally Relevant Mathematics Activity with Pre-service Teachers at a Family Math Learning Event

Olga M. Ramirez and Cherie A. McCollough

“La Lotería,” a colorful and historical game of chance, holds a special place in Hispanic tradition (see Figure 1). Many Hispanic families, especially those with parents and grandparents in South Texas and México, enjoy playing this game together. While “La Lotería” has structural similarities to U.S. bingo, Lotería boards are very colorful, featuring vivid pictures accompanied by a number and a word describing the scene. We incorporated this rich cultural resource into a Family Math Learning Event (FMLE) sponsored by the first author’s university and a local school and results are included in this paper.

Presenting such culturally responsive math activities at a FMLE helped inform pre-service teachers’ future classroom experiences by providing awareness early in their teacher preparation program of the importance of relating to Hispanic families in a manner that values their culture and everyday circumstances, consistent with the objectives in Table 1.

Culturally Responsive Mathematics Teaching

This work regarding culturally responsive mathematics and pre-service teachers (PSTs) is informed by the work of Ladson-Billings (1995, 2001), who notes the challenge that teacher educators (88% of whom are White) have leading PSTs to experience teaching diverse cultures. Ladson-Billings (1995, 2001) remarks that while our students are becoming more diverse, the majority of the teacher work force is white as are PSTs and their educators. Yet, mak-

ing radical changes to reorient teaching faculty to other types of cultures or values is labor intensive and leaves less time for traditional activities of research and publication (Young, 2011). Educators need to be aware of their own culture and of their perceptions of other cultures in order to gain understanding of the role culture plays in connecting to families as part of the learning process (Morrison, Robbins, & Rose, 2008).

Furthermore, PSTs are generally not provided with culturally responsive mathematics activities. They lack knowledge of cultures different than their own, and they experience a level of discomfort when challenged with the notion that they may have misconceptions of culture. They also lack awareness of how mathematics and culture improve teaching and learning (Gutstein, Lipman, Hernandez, & de los Reyes, 1997; McCollough & Ramirez, 2012b). Ladson-Billings (1995) suggests that in order to achieve equity and excellence in diverse classrooms, teachers should include student culture in the classroom as official knowledge. Additionally, families should also be included as research suggests that community-based experiences are more powerful than stand-alone multicultural education programs (Sleeter, 2001). Consequently, parent and community involvement in the public schools has become a venue that helps improve the quality of children’s cultural and educational experiences (Morrison et al., 2008). This involvement is said to help increase student achievement, is important for children of low socioeconomic status, and has

Table 1
Objectives for Pre-service Teachers Involved in a FMLE

OBJECTIVE	DESCRIPTOR
<i>Content Knowledge</i>	The pre-service teacher must prepare and deliver a culturally relevant math lesson that incorporates concept learning, procedures with understanding, and processes that support problem-solving to help develop their comfort and confidence with the math content.
<i>Teaching Skill and Pedagogy</i>	The pre-service teacher must practice planning and conducting a culturally relevant math lesson with an instructional activity that helps enhance their teaching and communication skills and that will bring them close to the learner early in their teacher preparation program.
<i>Professional Disposition</i>	The pre-service teacher must practice developing professional teaching behaviors that support the belief that all students can learn and that reflect a caring and supportive culturally respectful learning environment with families.

positive effects on the development of linguistic minority students (Tomás Rivera Policy Institute, 2007).

The main purpose for infusing culturally relevant mathematics in pre-service teacher preparation programs is to help PSTs examine their own cultural perceptions and, in turn, learn to apply what they know about their students' culture to mathematics. In addition, through FMLEs, the PSTs develop critical approaches to knowledge and skills they will need to be culturally responsive teachers. This work on culturally responsive mathematics has grown from projects with PSTs participating in FMLEs where culturally relevant examples, materials and activities are structured to encourage parent and child teams to work together to solve problems or investigate natural phenomena (McCollough & Ramirez, 2010; McDonald, 1997). In these events, parents and children self-select learning activities that have been designed by the PSTs and implemented after school in a venue such as the cafeteria or gymnasium, moving at their own pace with the pre-service teacher-facilitators providing materials and encouragement. Exploring how pre-service mathematics teachers incorporate mathematics in a culturally relevant and engaging way in a FMLE is a way for practitioners to merge formal mathematics classroom teaching with informal settings that bridge schools, mathematics, culture, and families.

Exploring “La Lotería” for a FMLE

In the first author's content mathematics course for teachers at her university, one of the PSTs knew that “La Lotería” was a popular game among Hispanics, especially in her family, and she wanted to prepare a mathematical lesson with historical connections related to this game. It did not take her long to notice something that spurred her curiosity. We had been studying the problem-solving strategy ‘look for a pattern’ and arithmetic sequences (Billstein, Libeskind, & Lott, 2007) and this helped her to notice that “La Lotería” boards had rectangular groupings of varying sizes. Could a pattern help her find all possible rectangles on the board? As she pondered these ideas, she concluded that this would be her FMLE activity and she began her research regarding the cultural relevancy of the activity and how to solve the problem.

This activity would be one among others implemented as part of a math content course FMLE requirement for which the pre-service elementary and middle school teachers, under faculty supervision, thoughtfully conceptualize, construct and implement culturally relevant mathematics activities as part of their undergraduate mathematics class that prepares them to see mathematics from a teacher's perspective. This assignment is required in a math content course taken prior to their final year of their student teaching internship. The 48 mathematics activities implemented for this assignment included 20 with a culturally relevant fo-

cus. This paper showcases the activities based on the popular game of “Lotería,” because of the ease with which Hispanic families gravitated to this activity while at the same time expressing curiosity about how mathematics could be learned with this familiar family game.

Aside from sharing the historical and traditional aspects of the Lotería board game at the FMLE in a Hispanic community, the pre-service teacher working on this project would connect how mathematical principles can help families see mathematics even in basic things as board games. This is important since board games may motivate students to learn and use mathematics (Ramani & Siegler, 2008; Siegler & Ramani, 2008) to determine good winning strategies. Furthermore, board games have been used in pre-service teacher programs to help local school students develop an understanding of various mathematical concepts (Jiménez-Silva, White-Taylor, & Gómez, 2010) and to motivate them to practice skills previously learned (Jiménez-Silva, Gómez, & White-Taylor, 2010).

“La Lotería” Cards and Cultural Connections

Another PST found on Wikipedia (2009a) a picture of all 54 colorful “La Lotería” cards such as: “El Diablo” (The Devil), “La Dama” (The Lady), “El Catrin” (The Gentleman), “El Paraguas” (The Umbrella), and “La Muerte” (Death). Unknown to the PSTs prior to their research, “La Lotería” boards historically depict a form of folk art as each of the colorful cards have images of popular Mexican figures. There are many variations of these colorful cards, including “La Lotería” boards with images of fruits and other unusual figures from the Day of the Dead celebrated in Mexico on the second day of November which parallels the Western celebration of All Souls' Day celebrated on the first day of November (Chisholm, 1911, as cited in Wikipedia, 2009b). Also, a PST was fascinated by how the Rodriguez and Herrera (1999) book accompanied each Lotería card with an artist's linoleum print and a poet's linguistic riffs. In that book's forward, Rupert Garcia explains that “La Lotería” came from a secular, colonial Spanish card game that arrived in México during the latter 18th-century, first played as a parlor amusement game by the colonial social elite, but eventually played by all social classes.

Immersed in the historical origin of “La Lotería,” the PSTs purchased “La Lotería” cards at local stores (or from Amazon.com) and played the game. Much like U.S. bingo, when a Lotería card is drawn and the player has a picture of the card on his/her “La Lotería” board, the picture is covered with some type of counter such as a coin or (as often done in Hispanic homes) an uncooked pinto bean. The winner of “La Lotería” is the first to make any of the winning moves depicted in Figure 1. Students can verify that there are 12 ways a person can win: four ways by rows, four

ways by columns, one way by the corners, two ways by diagonals, and one way by center rectangle).

Interviewing Families

To gain understanding and sensitivity of culturally relevant math activities, each of the 52 PSTs was asked to do four in-person interviews prior to the FMLE – interviewing two people about the Lotería activity and two people about a Quinceañera activity. Thus, 104 people in the community served by the first author’s university were interviewed about the Lotería board game. The interviewees’ ages spanned 13-85 and 86% were female. Responses to the interview questions in Table 2 indicated that 96% were very familiar with “La Lotería” and 92% agreed that it was a good way for Hispanics to preserve their culture. They felt this way because “La Lotería” is a game that has been played for many generations and is part of the social life of many Mexican families.

In addition, they felt that the game provides children an opportunity to practice their ancestral language of Spanish and to learn the spelling of Spanish words correctly, as this may be one of the few times their children are exposed to the written language of Spanish.

When asked if they could relate the game to mathematics, 77% stated that probabilities were involved in playing the game. While they did not specifically mention what probability concepts are learned by playing this game, it was ap-

Table 2
Interview Questions

- ◇ Are you familiar with the game “La Lotería”?
- ◇ Do you know how to play this board game?
- ◇ Do you or members of your family play this game? How often? If so, do they pay to play?
- ◇ When the dealer calls out each card, what are some of the quips (or rhymes) they state?
- ◇ Where do you think this game originated?
- ◇ Do you think that playing “La Lotería” in family gatherings is a good way for Hispanics to preserve their culture or to have children learn some Spanish words? Why?
- ◇ Can you relate this game to mathematics in any way? If so how?
- ◇ Can you find all the rectangles in one card? How many? Can you find a pattern?
- ◇ Is there anything else you would like to share about the game “La Lotería”?

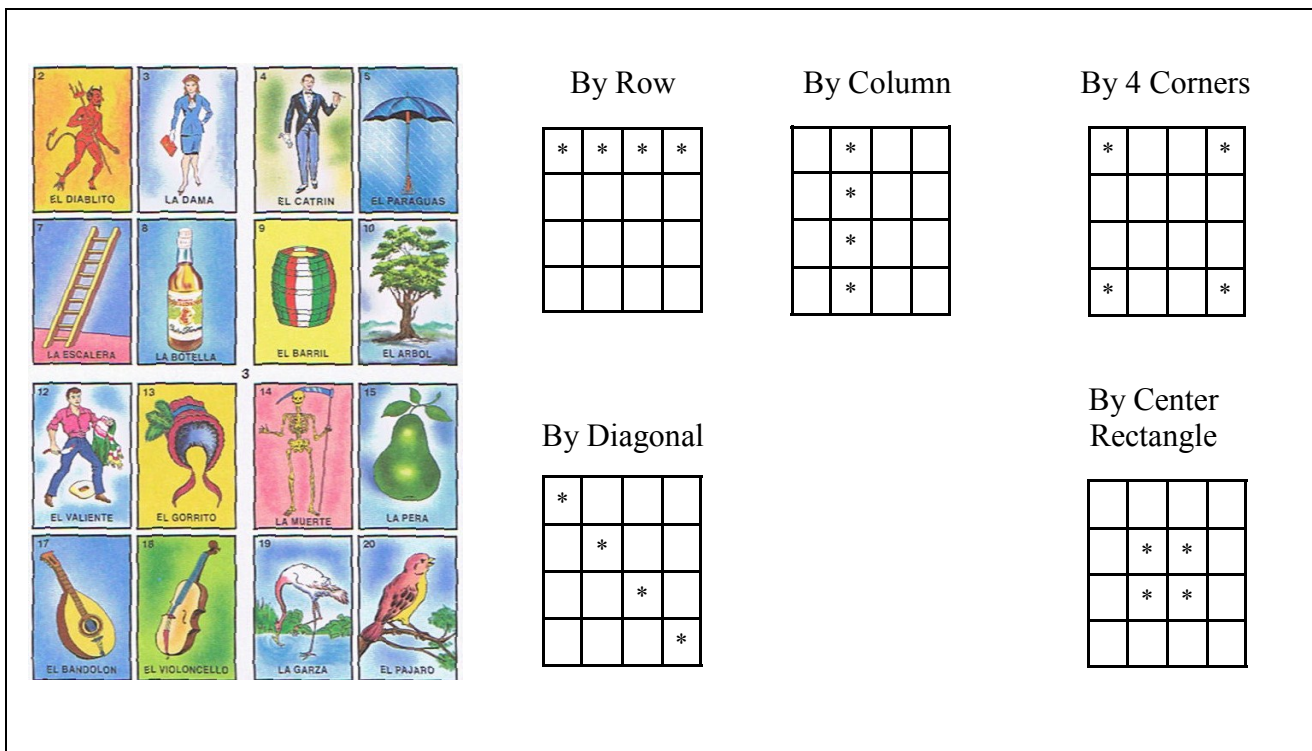


Figure 1. Sample “La Lotería” board and types of winning moves.

parent that the respondents felt that this game is a game of chance and they knew that the more game boards they play, the more chances they have of winning. Further connections that could be made include the relative likelihoods of each of the winning patterns in Figure 1 (e.g., the probability of winning with a horizontal row is four times greater than winning with “four corners”). Also, playing with money offered the opportunity to do counting as well as operations like addition or subtraction.

In classroom discussions, PSTs shared that they were impressed with the interview responses and felt that the interviewees showed genuine interest in “La Lotería.” Also, the

PSTs reported that an elderly lady mentioned that when a card was drawn, the announcer (also called the dealer) would often call it out with whimsical humor and a poetic flair that resembles what Garcia states in his introduction of Rodriguez and Herrera (1999) that when a “La Lotería announcer chooses a card from the deck, he doesn’t simply call out its name, but rather, he either improvises a short poem or uses a stock phrase that makes a poetic allusion to the character on the card” (pg. xiv). For this reason, families like to appoint as the dealer a lively individual who will offer some funny or interesting quips, poems, stock phrases, or quotes. Some sample quips and quotes collected

Table 3
Sample Quips and Quotes Used when Playing “La Lotería”

Card	Spanish Quips and Quotes	English Translation
Rooster	¡El Gallo que alardea y alardea, despierta la mañana ha venido!	The Rooster that crows and crows: wake up! the morning has come!
Death	¡La Muerte, no tengas miedo; un día vendrá, pero estarás listo!	Death, do not be afraid; one day it will come, but you will be ready!
Sun	¡El Sol, la manta para el pobre!	The Sun, the blanket for the poor!
Shrimp	¡Camarón que se duerme se lo lleva la corriente!	The Shrimp that falls asleep is swept away by the tide!

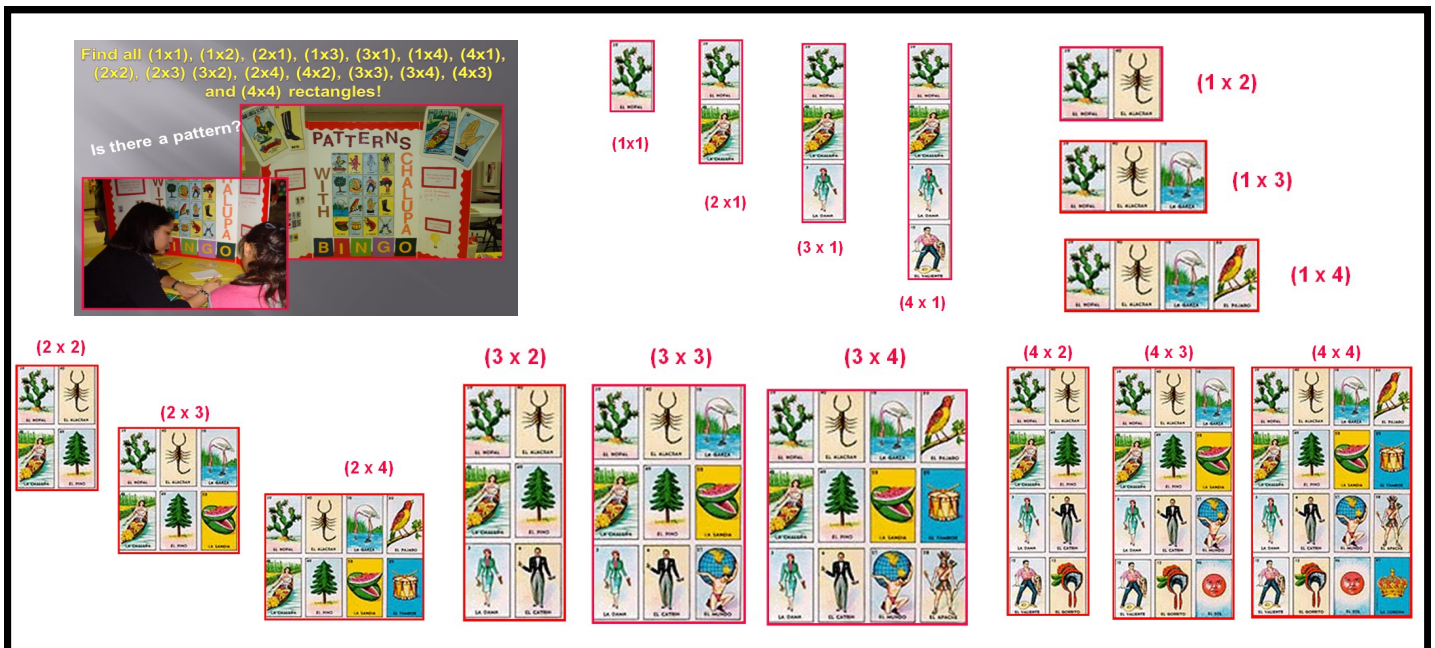


Figure 2. FMLE participants finding the rectangles on a “La Lotería” game board.

by students during the interviews are listed in Table 3, with English translations supplied by the first author.

PSTs found that the Lotería game is a favorite pastime for elderly Hispanics, but can often be a game played by entire families for hours at a time. Interviews indicated that games are often played with an entry “pot” fee per game (ranging from a nickel to a dollar), but some families play without the entry fees (as would any use in schools). However, an essential characteristic that PSTs discovered about Hispanic families playing “La Lotería” is that this group event brings families together to have fun and to socialize while helping children learn Spanish as previously stated. In addition, playing this game also gives them the opportunity to discuss with their elders cultural connotations portrayed in the colorful Lotería cards.

One PST who was interested in “La Lotería” for the FMLE asked the Hispanic family audiences to find all the rectangles on the Lotería game board. She knew this would be a challenging problem and she began by seeing what the families would do without much guidance or minimal assistance. Figure 2 illustrates the tri-fold poster she used for

her presentation. When some families focused only on individual (1×1) oblong rectangles, the PST was ready to help them identify different arrays of oblong rectangles using strips with rows and columns cut from the Lotería cards as noted on Figure 2.

The PST showed them how rectangles overlapped with one another on the game board. After families’ initial attempts, she furnished them with a problem-solving strategy known as the systematic list strategy (Johnson, Herr, & Kysh, 2004) as shown on Table 4. The table was provided (without the answers already filled in) so the families could organize their thinking to record their findings while searching for the various types of rectangles on the Lotería board. Once the families used the systematic list strategy, they were more successful at finding more of the known 100 rectangles on the 4 × 4 “La Lotería” board as so noted on Table 4. After this and subsequent FMLEs where the systematic list was used as part of a “Lotería” activity, the PSTs often shared in the content course with their classmates and instructor the effective use by families of this problem-solving strategy. This authentically supports the instructor’s communication to the PSTs of the importance

Table 4
Systematic List Strategy for Finding Rectangular Arrays

Rectangular array dimensions	Number of such arrays	Rectangular array dimensions	Number of such arrays	Row Total
1 × 1	16	1 × 1	Already counted	16
2 × 1	12	1 × 2	12	24
3 × 1	8	1 × 3	8	16
4 × 1	4	1 × 4	4	8
2 × 2	9	2 × 2	Already counted	9
3 × 2	6	2 × 3	6	12
4 × 2	3	2 × 4	3	6
3 × 3	4	3 × 3	Already counted	4
3 × 4	2	4 × 3	2	4
4 × 4	1	4 × 4	Already counted	1
GRAND TOTAL				100

of math problem-solving strategies. PSTs would also mention that the families who used the systematic list to guide their thinking and to organize the number of rectangles often found more of the rectangles than the families who randomly looked for the rectangles. Other representative comments some family members made regarding this activity included “We didn’t know how to get started” and “The table helped us a lot!” The value of 100 conveniently offers an opportunity to ask questions involving percent (e.g., what percent of the possible rectangular arrays is a certain size).

For younger children in attendance, another PST took the opportunity to introduce the rectangular array model of multiplication with the picture models of the Lotería rectangular arrays as shown on Figure 1. She also illustrated how to model the Distributive Property of Multiplication over Addition [$a(b + c) = ab + ac$, where a , b , and c are counting numbers] by using La Lotería cards that depict examples such as: $2(2 + 3) = 2(2) + 2(3)$ as shown in Figure 3.

Another mathematical question posed by another PST to the families included asking them to guess how many “Lotería” game boards (each with 16 different pictures) could be created with the set of 54 Lotería picture cards. She helped them begin to generate an answer pattern by using the problem-solving strategy of simple cases shown on Table 5. This was a bit difficult to teach, but the families realized with some help that the number of possible different 4×4 “La Lotería” boards (i.e., arrangements of 16 images chosen without replacement from a set of 54 distinct images) was enormous (a 27-digit number!) but that there was a way to determine the answer. Because the location of an

image on the card can affect whether one of the winning moves noted in Figure 1 is attained, this could provide a motivation in a formal instructional setting to discuss why the mathematical term “permutation” is more appropriate than “combination.”

The mathematical problems posed in using the Lotería board game, are not necessarily unique to the Lotería game. However, by using the Lotería card instead of a traditional bingo card or other rectangular array, this culturally familiar game draws Hispanic adults and children to look at the Lotería card in a new and interesting way. Whether the Lotería board game is used to pose the oblong rectangle problem, used as a means to show rectangular arrays with multiplication connections, or used as the launching pad for asking how many Lotería board games can be created with the 54 Lotería cards, the PSTs (as well as their course instructor) who did or witnessed the Lotería activities at this FMLE and at subsequent FMLEs suggest that the cultural familiarity with the game excites and motivates the Hispanic families to solve the mathematical problems because of the Lotería game’s cultural connection. The Hispanic families’ cultural identification with the Lotería game is so strong that mathematical problems, despite their difficulty, do not seem to pose a threat to them. This is important in creating a welcoming and non-threatening Family Math environment for Hispanic families to learn and enjoy mathematical activities.

Discussion

The FMLE experience helped the PSTs realize the value of culturally relevant mathematical topics. They noted that the Hispanic families felt comfortable when they saw activities

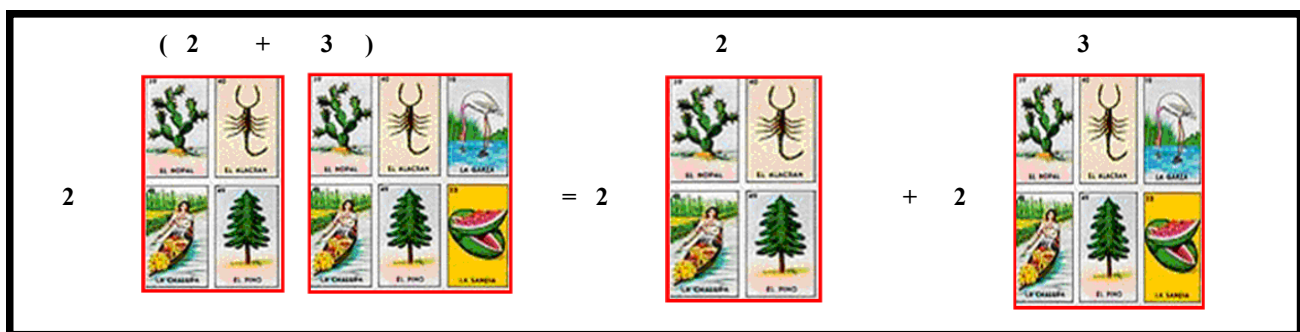


Figure 3. The distributive property of multiplication over addition using “la lotería” cards.

Table 5 “Simple Cases” Strategy for Finding Number of Boards	
Given a Lotería board with n positions	Number of Possible “La Lotería” Boards Using 54 Cards
1	54
2	54×53
3	$54 \times 53 \times 52$
4	$54 \times 53 \times 52 \times 51$
...	...
16	${}_{54}P_{16} = \frac{54!}{(54-16)!} = \frac{54!}{38!} = \frac{54 \times 53 \times 52 \times 51 \times \dots \times 3 \times 2 \times 1}{38 \times 37 \times 36 \times \dots \times 3 \times 2 \times 1}$ ${}_{54}P_{16} = 54 \times 53 \times 52 \times \dots \times 39$

that involved something they recognized and that was part of their heritage. In fact, they noted that parents made comments such as “Wow! I didn’t know I could help my children with math using these games we have at home.” These PSTs also learned that to engage family members of various age groups, they needed to adapt their activities for multiple mathematical levels. Furthermore, they were better able to comprehend the value of using appropriate mathematical vocabulary to make the topics personally meaningful and to avoid teaching mathematical concepts with non-contextualized approaches that use rote memorization with irrelevant content.

The implementation of culturally relevant mathematics activities suggest that participation by pre-service mathematics teachers in FMLEs can be a powerful facilitator of learning for all involved (McCollough & Ramirez, 2010; McCollough, Ramirez, & Canales, 2009). Those who participated in FMLEs had the rich opportunity to observe mathematics learning in progress, and perhaps experience their only opportunity as a PST to work with Hispanic families. Often, a PST expressed surprise at the students’ and parents’ high ability to learn and solve problems, beyond what the PST had expected for their number of years of formal education. This suggests that informal educational settings such as FMLEs have the potential of informing educators that ability is not limited to those with formal educations. Since we have observed that PSTs in our local

context have little or no knowledge of student and parent background knowledge, FMLEs may serve an important purpose in providing experience in working with students and parents of different cultures, changing prior misconceptions and creating positive perceptions of those cultures (McCollough & Ramirez, 2012b).

Future mathematics teachers report that they learn to see mathematics in relevant and engaging situations, to integrate mathematics with authentic and fun activities, to make mathematics culturally relevant, and to enjoy teaching mathematics. Because these PSTs are provided an authentic environment within their community to foster connections between theory and practice, they increase their confidence in teaching science and mathematics (McCollough & Ramirez, 2010, 2012a, 2012b). These pre-service teachers become familiar with and change their thinking about diverse student groups before starting their semester of student teaching. Most importantly, the teaching experiences using culturally relevant math activities such as the one highlighted in this paper include opportunities for self-reflection in examining perceptions regarding teaching (in family settings) students from minority ethnic groups and different socio-economic groups. By implementing the Table 1 objectives, PSTs realized that their knowledge of math was paramount, that pedagogical skills improved with practice, and that “all students can learn” was not just a slogan. Indeed, these types of rich culturally

responsive FMLE opportunities may help shape future classroom experiences and lead to the success of all students (especially Hispanics) in mathematics.

Notably, we encountered numerous challenges as we incorporated culturally responsive mathematics lessons in our work, but none were insurmountable. Teaching PSTs how to incorporate culturally relevant mathematics in FMLEs reminded us of Cochran-Smith (2004) who states that teachers must “teach against the grain” both within and around the culture of teaching at their particular schools. This applies to accepting the challenge of teaching culturally responsive lessons even if the school or district is charged with using a prescribed lockstep curriculum with little room or precedent for tailoring lessons to students’ culture. Further, they must depend on the strength and convictions of their beliefs that their work ultimately makes a difference in the arena of social responsibility. Paris (2012) writes that multiethnic and multilingual students must be supported with culturally sustaining pedagogies, fostering and sustaining “linguistic, literate and cultural pluralism as part of the democratic process of schooling” (p. 95). Without these efforts, students will continue to lose their heritage and community practices in order to achieve in U.S. schools (Paris). For this reason, the authors continue to implement culturally responsive mathematics/science in their PST curriculum. Each author also conducts Family Math/Science Learning Events within her respective pre-service teacher preparation program that serves a large Hispanic community.

References

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.
- Billstein, R., Libeskind, S., Lott, J. W. (2007). *A problem solving approach to mathematics for elementary teachers*. Boston: Pearson.
- Chisholm, H. (1911). All souls’ day. *Encyclopædia Britannica* (11th ed.). Cambridge, UK: Cambridge University Press, p. 709.
- Cochran-Smith, M. (2004). *Walking the road: Race, diversity, and social justice in teacher education*. New York: Teachers College Press.
- Edge, D. (2000). *Involving families in mathematics education*. Reston, VA. National Council of Teachers of Mathematics.
- Gutstein, E., Lipman, P., Hernandez, P., & de los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, 28(6), 709-737.
- Jiménez-Silva, M., Gómez, C. L., & White-Taylor, J. D. (2010). Revisiting board games: A new twist on a familiar activity. *Teaching for Excellence and Equity in Mathematics*, 2(1), 22-26.
- Jiménez-Silva, M., White-Taylor, J. D., & Gómez, C. (2010). Opening opportunities through math board games: Collaboration between schools and a teacher education program. *Issues in the Undergraduate Mathematics Preparation of School Teachers*, 2(1), 22-27.
- Johnson, K., Herr, T., & Kysh, J. (2004). *Crossing the river with dogs: Problem solving for college students*. Hoboken, NJ: John Wiley & Sons, Inc.
- Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, 32(3), 465-491.
- Ladson-Billings, G. (2001). *Crossing over to Canaan: The journey of new teachers in diverse classrooms*. San Francisco: Jossey-Bass Inc.
- Lesser, L. (2010). An ethnomathematics spin on statistics class. *Notices of the North American Study Group in Ethnomathematics*, 3(2), 5-6. <http://nasgem.rpi.edu/files/2055/>
- McCollough, C., & Ramirez, O. (2010). Connecting math and science to home, school and community through pre-service teacher education. *Academic Leadership: The Online Journal*, 8(2), 1-14.
- McCollough, C., & Ramirez, O. (2012a). Pre-service teachers implementing culturally relevant science and mathematics through family learning events. Poster presented at the annual meeting of the American Educational Research Association, Vancouver, Canada.
- McCollough, C., & Ramirez, O. (2012b). Cultivating culture: Preparing future teachers for diversity through family science learning events. *School Science and Mathematics*, 112(7), 443-451.
- McCollough, C., Ramirez, O., & Canales, J. (2009, April). *Pre-service teacher education: Connecting math and science to home, school and community*. Paper presented at the meeting of the American Educational Re-

- search Association, San Diego, CA.
- McDonald, R. (1997). Using participation in public school “family science night” programs as a component in the preparation of pre-service elementary teachers. *Science Education*, 81(5), 577-595.
- Morrison, K. A., Robbins, H. H., & Rose, D. G. (2008). Operationalizing culturally relevant pedagogy: A synthesis of classroom-based research. *Equity and Excellence in Education*, 41(4), 433-452.
- Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology and practice. *Educational Researcher*, 41(3), 93-97.
- Ramani, G. B., & Siegler, R. S. (2008). Promoting broad and stable improvements in low-income children’s numerical knowledge through playing number board games. *Child Development*, 79(2), 375-394.
- Rodriguez, A., & Herrera J. F. (1999). *Lotería cards and fortune poems: A book of lives*. San Francisco: City Lights Books.
- Siegler, R. S., & Ramani, G. B. (2008). Playing linear numerical board games promotes low-income children’s numerical development. *Developmental Science*, 11(5), 655-661.
- Sleeter, C. (2001). Preparing teachers for culturally diverse schools: Research and the overwhelming presence of Whiteness. *Journal of Teacher Education*, 52(2), 94-106.
- Stenmark, J., Thompson, V., & Cossey, R. (1986). *Family math*. Berkeley, CA: Lawrence Hall of Science, University of California, Berkeley Press.
- Tomás Rivera Policy Institute (2007). *Understanding Latino parental involvement in education: Perceptions, expectations, and recommendations*. Los Angeles: Author. Retrieved from ERIC Database. (ED 502065)
- Wikipedia (2009a). Lotería board game. In Wikipedia’s free encyclopedia. Retrieved September 30, 2009 from <http://en.wikipedia.org/wiki/Loteria>.
- Wikipedia (2009b). All Soul’s Day. In Wikipedia’s free encyclopedia. Retrieved September 30, 2009 from http://en.wikipedia.org/wiki/All_Soul's_Day.
- Young, E. (2011). The four personae of racism: Educators’ (mis)understanding of individual vs. systemic racism. *Urban Education*, 46(6), 1433-1460.

Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. Why are activities such as FMLEs important teacher preparation activities? Read, summarize, then discuss at least two articles from Edge (2000).
2. Find a culturally relevant topic in Hispanic culture and discuss the mathematics that can be associated with the activity. An example is Lesser (2010).
3. Do some research and create a culturally relevant math activity lesson for a target audience of students in elementary or middle school whose culture is different than your own. Use the objectives and descriptors in Table 1 as a guide. To what extent are the objective descriptors found in Table 1 applicable to the activity? If weak, modify the activity so that it can utilize the principles inherent in each of the objective descriptors.

Note: For interesting activities, you can use the *Family Math* book (Stenmark, Thompson & Cossey, 1986) or you can refer to <http://lawrencehallofscience.stores.yahoo.net/familymath.html>.

4. Study a math game that can be useful in planning a math lesson for a FMLE target audience. Create a free-standing tri-fold poster (47.5” wide by 36” high) for the math game and present the activity to a target audience. You can refer to the website <http://www.funmathsgames123.com/>.
5. From your experiences with items 1-4 above, do you have suggestions that can help teachers enhance mathematics learning for children of cultures other than your own? How do your suggestions align with the goals and mission of TODOS?

“DARE to Reach ALL Students!”

