TESOL Connections
Keeping English language professionals connected

Family Engagement Integrating Language and Science

by May H. Lee, Jennifer L. Cody, and Megan E. Lynch

Families of language learners deserve access to high-quality family engagement, which should be relational, build capacity of family and staff, and be linked to student learning (Henderson et al., 2007). Equitable family engagement leads to better outcomes for children (Barajas-López & Ishimaru, 2016), such as better attendance, higher achievement, improved attitudes toward learning, and higher graduation rates (García & Kleifgen, 2018).

The necessity of removing the home and school barrier has been documented extensively (Ishimaru & Bang, 2016). Family engagement models, such as the ecologies of parental engagement framework (Calabrese Barton et. al., 2004), engage families in having "an impact on what actually transpires around their children in schools and on the kinds of human, social, and material resources that are valued within schools" (p. 11). Bidirectional communication, positioning parents/families as knowledge-holders, and cultural understanding of the multiple ways families support their children are particularly important for teachers of English learners (National Academies of Sciences, Engineering, and Medicine, 2018).

Shifts in Terminology

Parent vs. Family

Family members, including grandparents, aunts, uncles, siblings, and niblings (i.e., a gender-inclusive term in place of nieces and nephews) play a large role in supporting and caring for students. Shifting to more inclusive language opens the door for any and all adults invested in a student's education and overall well-being to be included in family engagement events. Being inclusive of all family members broadens participation in a culturally sustaining way that honors different cultural views on caring for children.

Involvement vs. Engagement

Another language shift is moving from *involvement* to *engagement*. Family involvement invites parents to contribute to the projects, goals, and initiatives set forth by the school (Ferlazzo & Hammond, 2009). An example of family involvement, like volunteering in the classroom, while important, is dictated and regulated by the classroom teacher and/or school.

Family engagement, on the other hand, is constructed and done in partnership with parents/families. Family engagement opportunities may include home visits, participatory action research, and other events that are not "school-sanctioned" but developed and led collaboratively by families and school partners. Engagement requires strong relationships, a commitment to partnership, and continued collaboration. Noting the shift from involvement to engagement requires a different way of interacting with parents/family members.

Often, family engagement activities that take place in schools are unidirectional, where the teacher "gives" information while families and children "receive" the information. Two-way family engagement allows for families and children to engage in activities together where the facilitator/teacher provides a challenge/task in which the children with support from their families engage. For example, when families engage in collaboratively creating, "doing" can allow for children and families' funds of knowledge and other forms of cultural capital to be shared and validated.

STEM with Me Family Engagement Program

During the 2019–2020 and 2020–2021 academic year, Science 2020, a job-embedded professional learning project funded by the Office of English Language Acquisition, brought together faculty and teacher candidates from Pennsylvania State University with teachers in eastern Pennsylvania to codevelop a Pennsylvania K–2 standards-based numeracy program modeled after the school's long-standing reading program. Our partner school faced low academic performance in literacy and math (as measured by standardized assessments). When cocreating the program, it evolved into "STEM with Me," an after-school family engagement program intended to foster in students a love of STEM concepts and increase foundational math skills. The three-night event took place over 2 months outside of school hours.

Students and their families collaborated on building structures, creating patterns, and making ice cream. The program emphasized numeracy skills, like 1:1 correspondence, standard and nonstandard measurements, and cardinality. Yet engagement in the engineering design process and reinforcing fluency in numeracy were not the only goals. Challenging implicit school and community norms of "English-only" and leveraging all the linguistic resources of students and their families provided an opportunity to bring families closer together. Additionally, we strived for families to be able to draw upon and share cultural and community funds of knowledge to complete each evening's activities.

At the same time, the K–2 teachers and university faculty were able to closely observe interactions and get to know families. At each session, bilingual family liaisons were available to translate as needed. Though the STEM with Me overview and sample challenges we describe in this article contain elements of equitable family engagement, we realize that the program itself was created and designed by school partners. If we had the opportunity to do the program again, we would start by getting families involved in the creation of the curriculum and be codevelopers and cofacilitators of the work.

Engineering Design Challenges

In the following sections, we describe the purpose, culture and family connections, preparation, materials, and procedure for three sample activities within the STEM with Me curriculum.

Challenge 1: Build the Tallest Structure

Purpose/Intended Outcomes: Students have the opportunity to count and skip-count numbered blocks to build block towers and measure them with rulers (standard measurement) or string (nonstandard measurement) with encouragement and fun-making with their families (see the Figure. Teachers are able to see the ways students are encouraged, praised, and supported by family members, which can be later incorporated in the classroom.

STEM Concepts

- rote counting
- 1:1 correspondence
- number recognition
- number patterns
- skip counting
- measurement (standard and nonstandard)
- greater than, less than

Materials

- 2 sets of 20 foam blocks, equally sized
- permanent marker
- yarn or ribbon
- ruler

Preparation

Prepare the cubes by writing a different number on each face (side) of the blocks. This can be adjusted for different grade levels. You can repeat the same numbers on all six sides of the block or write numbers in increasing order on the blocks (Block 1: 1–6, Block 2: 7–12, etc.).

Procedure (for kindergarten)

1. You have two sets of blocks. Find blocks with 1, 2, 3, 4, and 5 written on them.
2. Put the blocks in order left to right from 1–5.
3. Say the number out loud together.
4. Scatter the blocks out of order.
5. Find the 1 block and place it on the table.
6. Find the next number (2) and stack on top of the number 1.
7. Complete this until all blocks (1–5) are stacked in order.

Figure 1. Student stacking blocks during “Build the Tallest Structure” challenge.

8. Stack the blocks 1–10. For a more challenging task, try skip counting your blocks by 2s, 5s, or 10s.
9. Make it a game! Use the yarn to measure which structure is taller.
10. Try building new towers with more or all of the blocks.
11. Measure with yarn to compare your new towers. Which structure is taller/shorter? Which has the greater number of blocks and lesser number of blocks?
12. Try to make towers shorter or taller by using different types of skip counting.

Culture and Family Connections

- Repeat the activities by counting in as many languages as you know.
- Compare and measure using the imperial and metric systems.
- Share metaphors and other figurative language from your cultural background that make comparisons (e.g., madder than a wet hen) or measurements (e.g., the whole 9 yards)

Challenge 2: Marshmallow Toothpick Shapes and Towers

Purpose/Intended Outcomes: The challenge is to build a bridge that can hold as many pennies as possible using mini-marshmallows and toothpicks.

STEM Concepts

- symmetry
- compose and decompose numbers
- addition and subtraction
- doubles (+1 & -1)
- make 5, 10, and 20
- currency
- arrays
- 2D and 3D shape cards

Materials

- 20 mini-marshmallows
- 20 toothpicks

Procedure

1. Make two separate piles: one with all of the marshmallows and one with all of the toothpicks.
2. Using these materials, make a pile of five items. For example, place three marshmallows and two toothpicks together.
3. Continue until all combinations of materials that make five are practiced.
4. Count out five marshmallows and five toothpicks. Put the rest to the side.
5. Consider building shapes using only five marshmallows and five toothpicks.
6. Continue making as many shapes as possible with those materials. Use the shape cards provided or use your imagination!
7. Now that you have explored various 2D and 3D shapes, build a bridge that is strong enough to hold as many pennies as possible.
8. Design and build your bridge.

9. Test your bridge design by placing one penny at a time on the bridge.
10. Make predictions and observations about bridge design.
11. Time permitting: Repeat to see if your bridge can be built stronger.

Culture and Family Connections
Examine old family photographs and re-create structures (houses, buildings, bridges, etc.) from families' histories and from the community using the toothpicks and marshmallows.

Challenge 3: Ice Cream Making
Purpose/Intended Outcomes: Collaboratively make ice cream while creating space to share recipes and traditions verbally, visually, and in writing.

STEM Concepts
- measurement
- properties of matter
- states of matter

Materials
- 2 quart-size and 2 gallon-size plastic bags
- plastic spoons
- measuring cups and measuring spoons
- balance or scale
- newspaper or plastic tablecloths
- 6 cups ice
- 1/3 cups rock salt/ice cream salt
- 4 tablespoons sugar
- 2 cups half & half
- 2 teaspoons vanilla extract (optional)

Procedure
1. Label quart-size bags #1 and #2, and gallon-size bags #1 and #2.
2. Measure out 1 cup of half & half and pour in quart-size bag #1. Repeat in quart-size bag #2.
3. Measure out 2 tablespoons of sugar and add to quart-size bag #1. Repeat in quart-size bag #2.
4. Optional: Measure and add 1 teaspoon of vanilla to each quart-size bag.
5. Measure and add 3 cups of ice to gallon-size bag #1. Repeat with gallon-size bag #2.
6. Measure and add 1/3 cup of rock salt/ice cream salt to gallon-size bag #1. *Do <u>not</u> add salt to gallon-size bag #2.*
7. Place quart-size bag #1 into gallon-size bag #1.
8. Place quart-size bag #2 into gallon-size bag #2.
9. Shake both bags vigorously for 7–10 minutes, or until ice cream has hardened in bag #1.
10. Remove both quart-size bags and compare/contrast. Discuss how they are the same and/or different and why.

Culture and Family Connections

- Read family recipe cards or cookbooks together. Find recipes and cookbooks in languages that are used at home.
- Write and share recipe cards with other family members. Translate recipes into multiple languages.

Conclusion

Family engagement in this way, over time, can build and strengthen relationships between family and school partners. Activities like the examples provided in this article can provide an opportunity for students and families to share their experiences, and for teachers to interact with families beyond back-to-school nights and parent-teacher conferences.

In our school, two-way family engagement highlighted how ways of being and ways of knowing at home and within the community can be incorporated and valued in school. Often, we see a school-to-home connection; seldom do we get to consider how home practices can be incorporated into school. Through these interactions, school partners are able to not only familiarize such connections but begin to build them into classroom instruction in more culturally sustaining and equitable ways.

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