Section I laid out research-based ways that school and community educators can engage families in STEM learning and discussed how to democratize STEM education, particularly in the cases of Latino and African American families, and adults with math anxiety. In Section II, we build on this research by presenting four different approaches and program models to engaging families in STEM.

In Chapter 5, Duch and Genetian explore the efficacy of a mathematics-focused intervention constructed with a behavioral economics approach. This approach acknowledges that families—especially those from low-income homes—are busy juggling day to day demands that can make decision making and engagement in children’s learning difficult. However, low-cost program modifications can reverse this trend, especially among hard-to-reach families.

In Chapter 6, McWayne, Mistry, Breneman, Zan, and Greenfield describe how the “funds of knowledge” approach can help early childhood educators incorporate immigrant families’ rich cultural resources into science, technology, and engineering curricula. Through a longitudinal project to promote parent-teacher discussion groups and joint learning, the authors show how this approach to family-school-community partnerships is particularly powerful for dual language learners.

In Chapter 7, Chavolvski and Jaris introduce collective impact approaches which recognizes that no single organization can improve students’ STEM achievement alone; but rather all parts of the STEM ecosystem must join together. They highlight how their program successfully brings students, families, educators, and engineers together—both virtu-
ally and in-person—to engage in design challenges and increase families’ and students’ knowledge, confidence, attitudes about STEM.

Finally, in Chapter 8, Uscianowski, Almeda, and Ginsburg show how dialogic reading approaches—where parents actively engage with children during story sharing—can be extended to digital media. By focusing on one interactive mathematics storybook, the authors demonstrate how these digital tools can be used to foster family engagement in children’s mathematical learning.

Collectively, this section demonstrates that, by working together and recognizing each other’s expertise, educators, and families can develop meaningful programs and curricula that motivate children to learn the STEM skills they need to succeed in today’s technological and economic climate. The chapters also highlight how digital media and technology are not only an area to be studied and explored, but also an effective mechanism to reach and engage families.
CHAPTER 5

USING A BEHAVIORAL ECONOMICS PERSPECTIVE TO BOOST FAMILY ENGAGEMENT IN THE GETTING READY FOR SCHOOL PRESCHOOL INTERVENTION

Helena Duch and Lisa A. Gennetian

Alice is a coach for a 10-week parenting program that includes supplemental workshops and parties to demonstrate fun ways to interact with young children on math and reading; like all dedicated service providers, Alice takes outreach and recruitment seriously. She knows from her prior experience that getting parents to show up at least once early on is a stepping stone to further engagement. Alice combines her own successful experiences with the best-known strategies out there, including one-on-one phone calls and offering food and child care. Despite these best efforts, attendance is often disappointing and can be spotty. Some parents say they are interested, and some even say they will attend, but many times these same parents do not follow through. The challenge Alice faces in engaging parents resonates for many dedicated service providers. The behavioral economics framework offers a new perspective—and a new set of tools—to
engage parents in programs and educational opportunities to reduce these kinds of intention-to-action gaps, where parents fail to follow through, even with the best of intentions.

This chapter introduces concepts from behavioral economics as an approach to boost family engagement and describes an application of these concepts in preschoolers’ mathematics for one specific program, Getting Ready for School. Described in more detail below, the interdisciplinary perspective of behavioral economics offers a complementary set of new tools that marshal and recognize how mental resources and contextual factors can influence—and thus interfere with—parents’ decisions to participate and follow through with activities that are believed to support young children’s development.

WHAT IS BEHAVIORAL ECONOMICS?

Behavioral economics is a blended theoretical perspective from economics, social psychology, and cognitive decision making, and views family engagement as the result of a series of small decisions that parents make and are encouraged to make repeatedly (Gennetian, Darling, & Aber, 2016). Behavioral economics views the brain not as a computer, but as a complex system that is influenced by other people’s actions and opinions, with cognitive resources that can be enhanced or drained (loosely referred to here as “mental bandwidth”). Behavioral economics explicitly considers the ways in which parents’ situations affect their decision making. This is especially important in the context of early childhood interventions, many of which are targeted to income-poor families who are struggling to make their finances meet basic day to day necessities; this juggling can further strain mental resources—such as attention—which are necessary to participate in intervention programs (Gennetian & Shafir, 2015; Mullainathan & Shafir, 2013).

Barriers such as these may be particularly heightened in the area of early math exposure (or STEM more generally), as public knowledge about its value during early childhood is relatively nascent and less normalized than early language or overall early brain development. Further, the fundamentals of math and the ways in which math are already used in day-to-day living are not well understood. Thus, parents often make false assumptions about math as complex theorizing, highly formulaic, or, worse, can type-cast math as only being suitable for certain children with real or perceived inherent analytic capacity.

Many early interventions that support and promote family engagement in children’s STEM or math development presume that once structural or personal barriers (like child care or transportation) have been addressed,
parents are able and willing to respond, and will do so. The behavioral economic lens considers ways in which parents’ attention can be redirected toward program goals, understanding that they are busy juggling other demands; that their multiple identities as workers, friends, spouses, protectors, and nurturers may not equally align with program objectives; and that the ways in which other trusted parents and peers choose to act, and related social norms, can influence their decisions. Behavioral economics also considers the ways in which the context of decisions can influence choices. This has implications for the design of interventions; for example, choosing a desired default option when an active decision is not made can be leveraged to increase parents’ engagement, as well as children’s interactions and experiences (Thaler & Sunstein, 2008). Examples of several highly utilized design enhancements and tools that emerge from the behavioral economic lens are described in the Appendix of Gennetian, Darling, and Aber (2016).

**FAMILY ENGAGEMENT AND MATH: WHY IT MATTERS**

Disparities in academic achievement among U.S. children are already apparent in elementary school, suggesting the importance of the home and early school environment in the development of academic skills (Janus & Duku, 2007). The multitude of ways that parents and families interact with children during the years before formal schooling can be broadly understood as one component of family engagement that provides a foundation for subsequent school readiness and skill development (Van Voorhis, Maier, Epstein, & Lloyd, 2013). While there is a strong evidence base for the role of family engagement in literacy development, recent studies also point to the influence of math development during these early years as an additional significant predictor of future socioemotional and academic outcomes (Duncan et al., 2007; Huntsinger, Jose, & Luo, 2016).

Early math skills do not develop in isolation; they grow with language and social skills, and require support from parents and other family members. Although parents are more likely to engage in literacy activities on a weekly basis with their children, as little as one math related activity a week can have significant implications for children’s development (Berkowitz et al., 2015; LeFevre et al., 2009). Many factors inform the level of family engagement in math with their children, including parental education, parental math anxiety, cultural norms, mindsets and attitudes about math development, and access to a math-rich home environment, which includes easy access to children’s books, puzzles, and blocks (Berkowitz et al., 2015; Cankaya & LeFevre, 2016; LeFevre et al., 2009; Ma, Shen, Krell, Hu, & Yuan, 2016; Skwarchuk, 2009). A growing base of evidence also suggests
the importance of indirect math learning opportunities, which parents often do not consider “math,” such as reading a book that includes math language, or sharing experiences such as cooking or shopping during which children can practice basic math skills (Bradley & Corwyn, 2016).

**USING BEHAVIORAL ECONOMICS TO IMPROVE FAMILY ENGAGEMENT**

Parents play a pivotal role in the development of math skills in preschool aged children, making this a critical point at which to intervene and conduct further research. Behavioral economics offers a framework for helping practitioners like Alice understand and creatively design approaches to address the obstacles parents tell us interfere with their engagement in supplemental programs, including math and STEM. Best practices available to family engagement program developers from conventional frameworks often point to educational workshops, brochures/pamphlets, and related digital formats as outreach and implementation strategies to share information and encourage parent buy-in and participation. In addition to not recognizing the challenges related to mental bandwidth, these strategies are often not rooted in, or expanded from, the math-related activities parents may already be doing with their children, nor designed in ways to pinpoint anxieties (see Chapter 2 in this volume). The following quotes from parents, and strategies to address them, illustrate how behavioral economics can offer new strategies for parent engagement:

*"They told me about this meeting, and I totally forgot about it."* While conventional frameworks might suggest that more information alone will matter (e.g., more brochures in children’s backpacks), the behavioral economics lens points us to the role of limited attention and distractions and suggests the value of more targeted and personalized reminders.

*"He loses interest very fast with numbers."* "I don’t see him advance. Like I see him a little bit more into play than learning." By incorporating the child’s perspective, giving feedback to parents that playing is learning, or re-crafting the rewards such that benefits are accrued today (vs. the ambiguous future), the behavioral economic lens offers new tools to help shift parents’ fixed mindsets and inaccurate assumptions.

*"When I first began I was like, “I can’t do this game. I’m not doing this.”* Whereas other frameworks might suggest education to alter parents’ attitudes, behavioral economics suggests that one strategy to overcome low parent confidence is to incorporate positive affirmations of parents as capable “teachers.”
Getting Ready for School (GRS) is a preschool intervention that integrates early math, literacy, and self-regulation skills into a single add-on intervention that can supplement curricula already implemented in preschool classrooms. At the heart of GRS is a strong belief in the power of parents and teachers working together to provide foundational experiences in emergent math, literacy, and self-regulation skills. Both the home and preschool environments independently influence child development (Andersson, Sommerfelt, Sonnander & Ahlsten, 1996), thus both environments must be supported. In fact, multipronged interventions targeting parents, teachers, or both often find a joint approach to be most efficacious (Beauchaine, Webster-Stratton, & Reid, 2005; Whitehurst et al., 1994).

The home component of GRS has developed into a matrix of services that allows families to engage with the intervention in distinct ways:

1. **Parent activity book.** At the core of GRS is a parent activity book, with nine units that mirror the classroom units. Activities are meant to be integrated into family life, for example going on a number hunt while out for a community walk, or forming pattern sequences with objects found in the home. They are designed to be fun ways for parents and children to interact and simultaneously encourage the development of early learning skills and knowledge.

2. **Weekly teacher-parent letters.** On a weekly basis, teachers complete a home/school connection letter that lets parents know about the kinds of activities and skills that children are learning at school and directs them to suggested activities in the parent book that may reinforce those activities in the home.

3. **Parent workshops.** Eight workshops are offered throughout the academic year. Workshops are interactive and offer parents or other caregivers the opportunity to learn basic concepts about the development of early math, literacy and self-regulation skills, practice activities and share experiences with other families.

4. **GRS Parties.** Parties take place during pick up time in the classroom and invite parents and children to interact with the materials and receive tips and coaching from teachers. In addition, parties provide food and raffles for books and toys.

5. **Digital and social media.** GRS offers families several ways to engage with program materials digitally. A program website includes videos of each of the activities in Spanish and English for families who want specific demonstrations on implementation. The videos are also available through tablets that are on loan in the classroom.
and can be checked out and brought home. Families are invited to join private Facebook groups where materials and activities specific to each classroom are shared.

BOOSTING FAMILY ENGAGEMENT IN GRS WITH BEHAVIORAL ECONOMIC ENHANCEMENTS

Although GRS set up these myriad programmatic options to reach out to families, similar to other early childhood programs, uptake was uneven, with little evidence that the program was reaching those families who could benefit the most. Simultaneously, data from the program demonstrated that increased family engagement yielded more growth in school readiness skills for the children (Marti, Xu, Repka, Gennetian, Kennedy, & Duch, 2017). With this in mind, and with a strong desire to reach more families, the program set up a partnership to assess ways in which family engagement could improve by applying insights from the field of behavioral economics. Engaging parents in the types of math activities such as those developed in GRS can be particularly challenging. Our preliminary analysis suggested that GRS workshops on the topics of children’s self-regulation and literacy drew the highest attendance rates, while workshops on math had the lowest attendance rates.

To understand the types of decision-making and mental bandwidth barriers that might be getting in the way of family engagement, including family engagement in math, we first gathered information from parents about the actual GRS experience on the ground, from interviewing families in focus groups to surveys. This helped us to develop a few hypotheses about ways to integrate new types of designs and strategies into the existing GRS delivery process, described above. In 2015–2016, we implemented a bundle of behavioral economic enhancements with a random subset of families with children who attended Head Start programs in New York City, and who were receiving GRS. The majority of the families in our study were Hispanic, had a high school degree or GED, and about one third were employed full-time at the beginning of the school year. The bundle of behavioral economic enhancements included:

- **A personalized written invitation to the kick-off meeting rather than the generic letter-sized flyer that had typically been used.** To convey some social proof, or external importance, of the event from a trusted source, the invitation explicitly mentioned that the child’s teacher would also be in attendance; and, to prime parents’ identity as not only their children’s nurturer but also their first
teacher, the invitation included a GRS branded image with the latter message (Allcott, 2011; Allcott & Mullainathan, 2010; Goldstein, Cialdini, & Greskevicius, 2008). To prompt parents to focus more attention on the personalized message, the postcard-sized invitation also included handwritten information about the location and time of the meeting (see postcard in Figure 5.1).

- **Commitment reminder via text to facilitate the translation of parents’ intention to attend the kick-off meeting into action.** We asked parents to reply “Y” if they planned to attend the event (see Figure 5.2 for example text).

- **Activity trackers instead of typical letters home from teachers to support the objective of increasing time spent on GRS activities outside of the classroom.** The activity trackers not only reinforced the fun nature of GRS activities—discarding the sense of homework-like responsibility conveyed by the previous letters—but also encouraged repeated parent-child engagement throughout the week (see Figure 5.3 for activity tracker).

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Analyses showed consistent favorable impacts on family engagement as a result of this bundle of BE enhancements. Parents in the behavioral enhancement group were more likely to attend the beginning-of-year kick-off meeting; on average, returned twice as many activity trackers to their child’s teacher; and spent a half hour more per week on GRS activities at home. The findings are particularly exciting as they suggest change not only in parents’ in-the-moment decisions, but also cascading effects on parenting habits: parents in the behavioral enhancement group were more likely to attend GRS workshops without any additional reinforcement, and were more likely to return activity trackers multiple times.
BOOSTING FAMILY ENGAGEMENT IN GRS MATH WITH BEHAVIORAL ECONOMICS

With the 2015–2016 cohort data, we also learned that while family engagement appeared favorably related to children’s literacy and behavioral outcomes, there was a less clear relation to math outcomes. This made us wonder if behavioral economic approaches could also encourage higher engagement of parents in the math-related programming and math activities of GRS. We drew from existing research about math and math engagement and intersected this with what we had already learned about the ways in which parents’ mental bandwidth interacted with engagement in GRS more generally. Anxiety over math (computational) ability is high for much of the general population, including mothers (Ashcraft, 2002; Ashcraft & Ridley, 2005). Parents struggle with connecting math to everyday experiences, and lack goals and knowledge (Canon & Ginsberg, 2008). Such concerns are further fueled by misconceptions by preschool teachers about the appropriateness of teaching math to young children, beliefs among preschool teachers that children are “born” with innate math ability, and that language and literacy are more important than math (Lee & Ginsburg, 2009).

The 2016–2017 behavioral economic enhancements aimed to normalize math by interweaving fundamental math components appropriate for young children’s development into day-to-day tasks and activities, and to empower parents about their capacity to teach and share in math-based tasks with their young children. In practice, this translated into text-based content pushed out to parents with personalized, targeted messages that incorporated a math concept (e.g., “more/less” to normalize math terms for parents) with a math-based task. For example:

• (More/less) Ask Lee which is more-2 big plates or 3 spoons. Not the plates, even though they’re big. Math is a part of your everyday life.

• (Sort & compare) Ask Lee to sort the coins in your pocket. Are there more of any kind? Math is a part of your everyday life.

Some messages additionally included an image that visually conveyed a math concept in a usable, friendly manner such as:

• (Reading numbers) On the subway? Ask Lee to find 1, 2, 3, 4 and 5 in subway ads. Math is a part of your everyday life.
• (Measurement) Have Lee put objects (a spoon, crayon, and toothbrush) in order from little to big. Math is a part of your everyday life.

Finally, borrowing on the success of the personalized invitations tested in the prior year, we designed a personalized invitation to the GRS math workshop, emphasizing the variety of math concepts (e.g., “Shapes, numbers, patterns are all math”) and the importance of math for future success (e.g., “Math today is a stepping stone to your child’s success.”)
We are still learning about the effectiveness of these approaches and impacts on parents’ time spent with their children on GRS math activities with the 2016–2017 cohort of Head Start children. However, our preliminary analyses suggest that these behavioral economic enhancements had favorable influences on parent attendance at math workshops.

Figure 5.3. Activity tracker.
LESSONS LEARNED: BOOSTING FAMILY ENGAGEMENT WITH TOOLS FROM BEHAVIORAL ECONOMICS

Our work using behavioral economics in GRS has provided many useful lessons that may help other programs as they consider how to better reach and engage families in their young children’s learning, particularly around the area of math. Below we outline and summarize a few of these lessons:

• **Start with a good diagnostic process.** Surveys and focus groups with families helped us understand their needs and motivations, which allowed us to identify bottlenecks that go beyond the usual structural barriers, such as transportation and lack of time. Infusing a behavioral economics lens and thinking about issues of mental bandwidth, program uptake, and maintenance can be very useful in identifying new ways to support engagement with your program.

• **Offer a range of ways for families to engage with schools.** In any given program, families are heterogeneous, so it is unlikely that one family engagement modality will work for all. When we started our work with GRS, we used more typical family engagement activities, such as workshops and letters/fliers for parents. As we learned more about program families, we expanded our program to reflect their diversity.

• **Move away from attendance into sustained ways to support and measure engagement at home.** As we discussed above, schools and programs often shortchange themselves by narrowly defining involvement as a set of discrete events that parents do or do not attend. Instead, at GRS, we moved into a more sustainable way of figuring out how families spend time together supporting their children’s learning, and how we can capture these interactions through activity trackers. We have broadened our view of engagement to ensure that we measure and track other ways in which teachers support parents and parents support children.

• **Design tailored solutions that are easy to implement and scale up.** The tools from behavioral economics offer small, low cost nudges that can help programs move the needle toward success. These nudges are typically small, easy to implement, can be streamlined into existing program practices, relatively low cost, and will contribute towards increased engagement and participation. A robust program is essential, but behavioral economics can help support your efforts and expand the reach of the program, sustainably, to families who might benefit the most.
• **Emphasize attendance at a gateway event.** At GRS, we realized that the kick-off event provided program orientation and was thus a gateway to all other activities. If parents attended that kick-off event, they learned about what was coming next in the year and how they could support their children’s development. As a result, we place strong emphasis on increasing attendance to the kick-off. We suspect orientation is a key event for many schools and believe some of the behavioral economics strategies we used (personalization, priming of parents as first teachers) may help others boost participation.

• **Personalize your communication with parents.** Personalized invitations, content and outreach via text messages, and Facebook (and comparable digital or social media approaches) have yielded significant improvements in our family engagement efforts. While personalization may seem burdensome, it is feasible to implement at scale with the many text-based and social media platforms that have mail-merging types of features. There is a one-time effort at the start of the year to enter everyone’s information into a dataset, but once that information is available, it can be used across platforms and can have a sizable impact on family engagement.

The behavioral economics framework offers a new perspective and a new set of tools to improve parents’ engagement in math and other programming. By attending to the contextual factors that might impact mental bandwidth—even among parents who are motivated to act—educators can ensure better access to their programming by the parents who need it most.

**REFERENCES**


