



ENGAGEMENT, MOTIVATION, AND PERSISTENCE MEMO

STUDY CONTEXT AND LEARNING QUESTIONS

This EdSolutions study aimed to explore engagement, motivation, and persistence (EMP) for students in a math context. This study also examined strategies such as gamification, culturally responsive and sustainable education, and social-emotional learning, approaches that can help build a sense of belonging and increase EMP. This study engaged caregivers, teachers, and product developers to provide the Bill and Melinda Gates Foundation (BMGF) with insights on how to support student EMP in a math context to achieve optimal math learning outcomes.

Over a three-month engagement, EdSolutions is conducting a six-phase study. Figure 1 details each phase of the study.

Figure 1. Study Phases

- 0 Identifying Internal Strategy Connections**
interviews with BMGF team members to identify strategy connections and refine learning questions for the project
- 1 Defining Supplemental Market Segments**
context setting, defining key terms, major market trends, exploring multiple stakeholder frames for segmentation, outlining our proposed segmentation approach
- 2 Identifying Market Dynamics**
market - size, growth providers - key suppliers and market share, dominant products, indicators of quality, supplier trends buyers - segmentation, purchase drivers, unmet needs, impacts of policy and funding users - intended users, implementation, usage decisions, factors impacting success enablers - enabling conditions, active organizations, efficacy research, policy, philanthropy, convention
- 3 Opportunities**
recap of challenges opportunities: supply, demand, enablers
- 4 Recommendations**
zooming in on highest leverage opportunities in each category
- 5 Product Demos**
based on the above analysis, recommendations, and input from the BMGF team, we will invite 8-12 math providers whose products feature AI and/or motivation/engagement/gamification techniques to present their products in 3-4 live sessions and answer questions from the team

While the original study design did not include caregivers, ResultsLab was later asked to participate in the study and interview caregivers from the Caregiver Advisory Group. This study explored the following questions:

**Learning Question 1:**

What does engagement, motivation, and persistence in a math context look like to caregivers of students in grades 4-9?

Learning Question 2:

What creates a sense of belonging in the math classroom?

Learning Question 3:

What are some barriers to students being engaged in math?

Learning Question 4:

What are the impacts of engagement, motivation, and persistence on math outcome attainment?

METHODOLOGY

In early November, ResultsLab invited members of the Caregiver Advisory Group to participate in 30 to 45-minute virtual interviews on Microsoft Teams. The majority (75%) of participants in the Caregiver Advisory Group must either be parents of children who identify as Black/African-American or Hispanic/Latinx or who qualify for free and reduced lunch. After fielding an interest survey to establish a pool of potential interviewees, ResultsLab selected participants by considering geographic distribution of caregivers and student grade levels.

Ten caregivers with students in grades 5-9 participated in the study. Caregivers with students in grades 4-9 were eligible to participate, but none of the caregivers had students in 4th grade. Five of the participants identified as Black/African-American, three identified as White, and two identified as Hispanic/Latinx. Seven of the participants were women and three were men. Eight of the ten participants indicated that their students are eligible to receive free or reduced lunch. Three of the participants reside in Massachusetts, three reside in New York, and the remaining four reside in Illinois, Pennsylvania, Tennessee, and Virginia. Table 1 displays the distribution of grades. Three of the caregivers had more than one student in grades 5-9.

Table 1. Grade Distribution

Number of Students	5th Grade	6th Grade	7th Grade	8th Grade	9th Grade
	3	2	3	3	2

INSIGHTS



Learning Question:

What does engagement, motivation, and persistence in a math context look like to caregivers of students in grades 4-9?

Engagement

Caregivers offered a nuanced definition of engagement. They described behaviors their students exhibited when engaged in math, behaviors caregivers should exhibit to engage students in math, and behaviors educators should exhibit to engage students in math. When their students are engaged, they are attentive, excited, enthusiastic, captivated, and eager to learn.

“ —

"So when I hear her also sounding excited. And getting it, you know, because there's a science to math, and when she feels like she's getting it and gets excited, then that to me is different from, like other subjects. She's very verbal in nature, so the verbal stuff always comes easy to her. The math stuff has not always come as easy. But you know, it's like a light comes into her eyes when she recognizes, like, 'Hey, I got this like, I can do this. This is fairly easy for me. Or at least it's not as hard as I thought that it was. I can actually do this.' To me, that's very exciting when I see that when she doesn't have the other subjects, I mean, she could just talk. She's very, very loquacious. You know, she just sort of engages with the other subjects, but the same light doesn't kind of come on."

—

- Caregiver of a 5th Grader

”

Similar to this caregiver, several caregivers explained that their students find math difficult, which makes their students less likely to feel engaged in the subject. Several of the students experienced anxiety, doubt, and frustration as they learned math. For these reasons, more caregivers focused on caregiver and educator behavior than student behavior. They felt that caregivers and educators must cultivate an environment where engagement can occur. Several caregivers stressed the importance of both caregivers and educators offering real-life applications of math.

“

"So it takes some time to go ahead and help her understand that math is everywhere every day. So that's how we went ahead and presented it to her, taking her to a supermarket and showing her. This produce, when it shows you this amount, it doesn't mean that you're going to grab it and it's going to cost this. It's per pound. So we're going to have to add it this many times to get how much we're going to pay for it. And even before that, when she was younger, we would go to Target and be like, 'OK, you only have 20 dollars. What do you want to buy?' So she would learn to use the price scanner, and she would look at the numbers. 'Oh, I don't have it, I don't have it.' She'll put things back. So we started it there."

- Caregiver of a 5th Grader

”

“

"I remember when I was a kid and I was like, 'When am I ever going to use this? I don't understand why. Why are you people bothering me with this? Just the other day, my husband and I did a small remodel in our kitchen. So we're in Home Depot and we're doing the math and we're like, ok and these angles and stuff like that. And then you're thinking about it like, 'Oh, that stuff was important.' But you don't think about that. And I think trying to put those things into context for kids that this is going to be something that you're going to use it in the future. I swear you are. My daughter wants to go into graphic design. So when her teacher was showing the FedEx logo and was like, 'It's not just the logo, it's what it represents.' And then the shapes and what it triggers in your brain. I think that makes a lot of sense when you can see it in the context of real world."

- Caregiver of a 9th Grader

”

Caregivers stressed that students must engage with math both inside and outside the classroom. Similarly, many caregivers explained that their students learn best when teaching is hands-on and interactive. They find it important for educators to accommodate different learning styles for students to be engaged in math.

“

"She is a very hands-on person. You can talk at her all you want, but unless you show her real examples where she could sit there and actually physically visualize it, a lot of the stuff doesn't always come through. And because you're in a room with all different types of learning, I mean you, I think you have to do all kinds of engagement."

It has to not just be verbal, not just be writing something on the board, but it needs to be more of just a visual example of what people are talking about."

- Caregiver of a 9th Grader

”

“

"Numbers can be a little bit more overwhelming than words. Because you kind of got to learn the concept before you can realize that the numbers are actually telling the story."

And so unless you figure out a way to tie it all in, it could be a challenge, especially if students are, like I said, more hands on or they're not necessarily visual. Because with numbers, you kind of got to be visual to see what it is and where it's going. But when you have students that are not necessarily that, it's a challenge."

- Caregiver of a 6th Grader

”

Motivation

Several caregivers associated motivation with drive, enthusiasm, and interest. When their students are feeling motivated, they are committed to learning math even when they are feeling overwhelmed. They may not understand the information, but they persist. Motivation also inspires them to complete their assignments without needing reminders from their caregivers. For many students, academic performance is an extrinsic motivator. Caregivers feel that their students lack the intrinsic motivation to learn math, but they care about their academic performance.

“ —

"Her motivation is honestly to do well. If she gets low grades, it emotionally and physically affects her. You can see her attitude going down and stuff like that. She does really well in Honors Geometry, except on tests. She gets hundreds on every in-class thing, on every project.

But tests, she bombs on and she has studied. She has test stress. So like her last test, she got a 64 and she came home and it was devastating to her."

- Caregiver of a 9th Grader

”

Conversely, some caregivers feel that their students are not motivated to achieve in math because they have no passion for the subject. The caregiver below provided his son's inner dialogue comparing his motivation for math to his motivation for football.

“ —

"I don't have to get an A. I can still pass the class or get a decent grade without actually doing much.' Whereas for example, if he wanted to be a quarterback or he wanted to play a certain position, he's motivated because he loves what he's doing and he is passionate about it. And he knows that in order for him to do well, he needs to outplay certain players who have potential, who have similar interests at the same position that he's trying to play.

So I think the level of engagement is different based on what is motivating you, what is pushing you to go and, you know, get those things completed."

- Caregiver of 6th Grader and 8th Grader

”

Persistence

Caregivers used similar language to define both motivation and persistence. They define persistence as the ability to persevere despite obstacles. When their students are feeling persistent, they set goals and remain accountable to those goals. They also do not hesitate to seek help and utilize available resources.

“

"You see the change in their behavior. You see them wanting to know more, wanting to sort of learn more. Asking for more support without being told to ask for support. You know, they take extra steps to learn certain things, learn the math, learn the different ways you can come to an answer.

You definitely see the extra steps that are being taken without being told."

- Caregiver of 6th Grader and 8th Grader

”

As mentioned in the section on engagement, many of their students find math difficult. Persistence can be difficult for students to maintain in the face of anxiety, doubt, and worry.

“

"When she's not feeling and she's not feeling it, so she's not persistent.

She actually wants to give up at times."

- Caregiver of 6th Grader

”



Learning Question:

What creates a sense of belonging in the math classroom?

Caregivers felt that educators can create a sense of belonging by being intentional in their efforts to connect with the students. Some students feel this connection when educators make learning personal. Other students feel this connection when educators provide needed support.

“ "When they started multiplication in double digits and double and triple digits, her teachers would rewrite the math problems to include the students' names and include things that they would like.
So when her friend's problem came up, she was like, 'I'll read it! I'll read it!' And they would be like, 'That sounds like you.'"

- Caregiver of a 5th Grader

”

“ "The teacher has the way she sees things, the student has the way they see things, and then there has to be some type of a medium. And so I think that once we found out what that medium was, they were able to level set. And so where my daughter thought that the teacher was ignoring her when she would raise their hand to ask questions that it wasn't that at all, the teacher was just distracted with other things. And so what the teacher did was move her to the front of the classroom that way she became more visible to her and she could realize the urgency of needing to tune in to her needs to be able to support her. And then the teacher realized that once my daughter got it, she's able to help other students get it as well."

- Caregiver of a 6th Grader

”

Caregivers also mentioned that students learning math with their peers can help to create a sense of belonging. When interacting with their peers, they feel empowered to ask for help. They feel empathy from their peers when they are struggling. These interactions also boost their confidence.

“

"They have groups that they communicate through on their phone, like a group chat that they support each other with. They feel very confident speaking to their friends about, 'Hey, I need help with X, Y and Z.'

They don't feel any kind of way about it because they also support their peers with other subjects. They utilize those things."

- Caregiver of 6th Grader and 8th Grader

”

“

"I would imagine that this happens on a peer-to-peer basis, but feeling comfortable to admit when they are struggling with the concept or empathy, I guess, is what that comes down to. So it goes both ways.

It's like celebrating when they are really understanding it and they have shown persistence to get to the right answer and to have it clicked with them. And on the opposite, if they are struggling and having the support, the peer support to get to it."

- Caregiver of 5th Grader

”



Learning Question:

What are some barriers to students being engaged in math?

Similar to their commentary on engagement, many caregivers focused on barriers that exist in the contexts where their students are learning math. Some caregivers felt that educators' lack of engagement is a barrier to their students' engagement. Their students are not eager to learn when educators fail to make the topic engaging.

“

"He's not as engaged anymore. I don't know if something has happened in his life or he's like, you know, 'They're old enough. I help them along in the beginning, and now they should be able to do this on their own.' So he's not engaging with them as much. And now it's more of the persistence that you got to do this. 'You got to do this, you got to do this. And that's it. It's in the book. It's in the book. Look it up in the book.' Well, you're the math teacher, you're supposed to be teaching. If you're not engaging them and making it sound interesting, like you did in the very beginning, you're going to lose them. And that's what I feel is happening now is he's losing them. I know he's losing my daughter, but I think he's losing all of the kids."

- Caregiver of a 9th Grader

”

Furthermore, they felt that educators should do more to engage caregivers in their students' learning. Several caregivers explained that they are not familiar with the newest methods of teaching math and find it difficult to support their students as they learn. They feel powerless to help and find this experience frustrating.

“

"I belong to the parent associations and go to all these wonderful meetings with our district, and we see that if parents don't have the information, they can't go ahead and help their kids at home. I think if they're not getting test scores back, they really don't know how their child performed on that test.

But if there is no one-on-one with teachers, if there are no math workshops, then they're not going to know what exactly their student is dealing with and how to go ahead and show them different strategies, work with them and let them know that math is used every day."

- Caregiver of a 5th Grader

”

“

"I get a lot of things from my students saying math is just too hard. They don't understand it. Some of the things that I was saying when I was in school, where letters come in with numbers, you know, silly things like that.

But then when I show them my math compared to what they're learning? That's where I really see a little barrier, like 'Why can't I just learn this way? Why do I have to break all that down? I don't understand.' And I don't have an answer for that. So, yeah, they get frustrated with the new way of math."

- Caregiver of 8th Graders

”

Several caregivers wished that schools would do more to support caregivers as they seek to support their students' learning.

“

"I think the parent voice is so important to highlight. We have parents that are blind deaf that we often don't think about. These are the people that are in our neighborhoods but we sometimes forget to go ahead and include them, include their children.

Students with IEPs are really often forgotten even from the beginning of kindergarten and by fifth, sixth, seventh grade, it's often too late to get them back."

- Caregiver of a 5th Grader

”

“And it's tough because as a parent, it's like you want to help. And it's almost a mission impossible. But today's math is not what I learned in school, and so that's one of the biggest barriers I see as a parent is we as parents can't help our children, the students, because we don't know how the teachers are teaching them. Last year, one of my daughters had similar issues with math. So we brought it to the principal's attention. The principal actually created a night for parents to come and learn how their students are learning math so that we can help them at home. I found that to be really helpful, and it was only one night, but it was one night where I got to get a little bit of a piece of information. But it wasn't enough, you know, since it's like they've been teaching these kids for a whole year and I have to learn in five minutes, one night, right, and go home and then try to teach them. It used to be two plus two is four, but now you got to break two down into one plus one and then one plus one to get those. So yeah, that's my spiel about math, my kids. That's it's difficult to help them when I don't know it myself.”

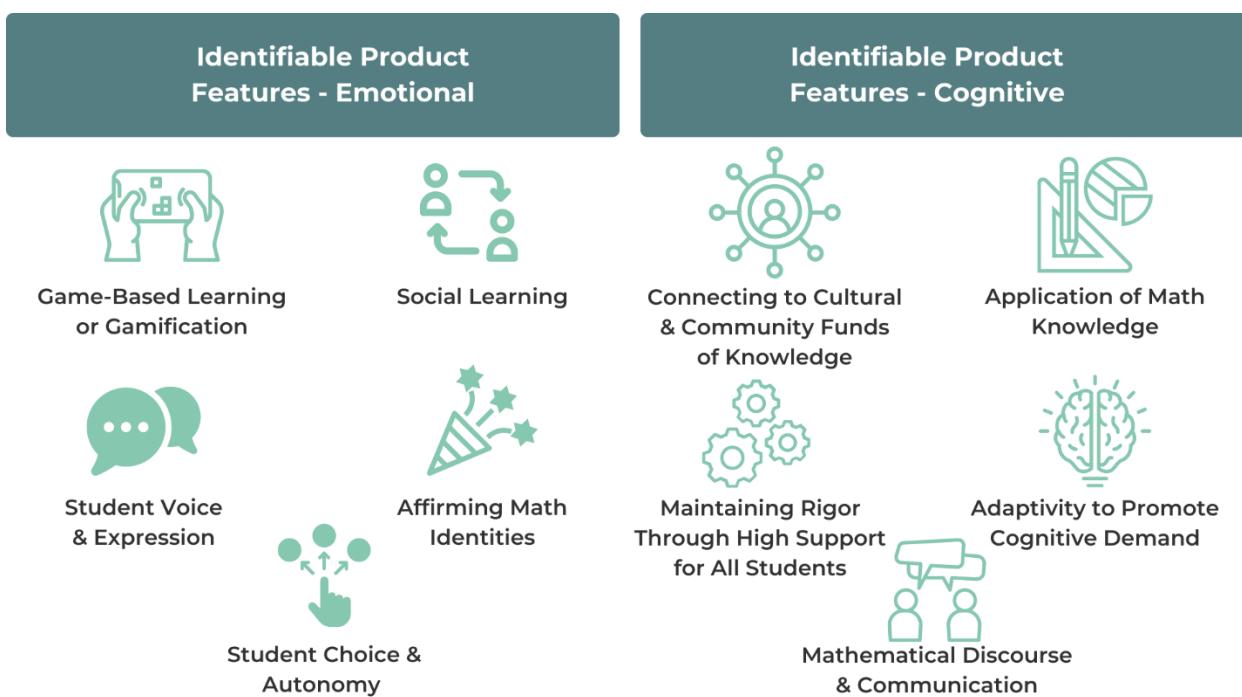
- Caregiver of 8th Graders



Learning Question:

What are the impacts of engagement, motivation, and persistence on math outcome attainment?

Figure 2. Methods for Supporting Emotional and Cognitive Engagement



When shown Figure 2 and asked about methods that foster engagement among their students, most caregivers mentioned gamification. They felt that game-based learning makes math fun for their students. Their students also enjoy the competitive nature of game-based learning. Game-based learning also supports student voice and expression, as many games create opportunities for students to personalize their characters in the game.

“ —————

"I just think that when you can make something fun to do, then it makes it easier for one to be able to grasp."

- Caregiver of a 9th Grader

————— **”**

“ —————

"It's also a little bit of competition to see who wins. And my children are competitive, which is why they don't participate in sports.

But it's that drive. You can see their little brains working."

- Caregiver of a 5th Grader

————— **”**

“

"So again, that game, they're able to personalize the character. So when you see a pink unicorn with all this glitter, everyone knows that's Matilda.

The students are really able to personalize the characters, but they want their character. Yes, it's their character."

- Caregiver of a 5th Grader

”

“

"She creates her own avatar. She's seeing her avatar walk through this kingdom. I think that's sort of helpful. It's fun to anticipate where she's going within the kingdom.

She's also problem-solving, so there's a goal, there's an achievement that's possible. It's not just doing problems to do problems."

- Caregiver of a 5th Grader

”

Caregivers felt that engagement, motivation, and persistence in math creates students who are confident, have higher self-esteem, and have more positive attitudes.

“ "I think students who are active and who loves math and who actively engage in math, you tend to see different outcomes, and, you know, not only the motivation, but the confidence, the self-esteem you see, you see them very confident in their ability because now they know that they're doing something that most kids don't want to do or don't like to do. And this is something that they can sort of gravitate towards and utilize that as leverage and how they approach their classes and their peers and things of that nature. So I believe that the more they learn math, and the more they engage in it, the more successful they become, the more confidence they exhibit. The behavior is more positive. They're open to try a lot of different things."

- Caregiver of a 6th Grader and 8th Grader

”

“ "Hopefully, if they have remained persistent, they've gotten to the end of really understanding it and getting it. And they have self-pride and confidence out of that, you know, hard work.

It's hard work. But it pays off if you stick to it, and that definitely would apply to math."

- Caregiver of a 5th Grader

”

They also explained that engagement, motivation, and persistence in math can launch lifelong success. Students would begin to see that the possibilities are endless.

“

"Well, I think optimal success. I think that the sky's the limit.

It may even open up their minds to do, you know, roles as adults in areas of finance, carpentry, you know, those different things that are mathematical or even science, you know, based, you know?"

- Caregiver of a 6th Grader

”

“

"They're going to want to continue to do well in math. And then it just trickles on to other academics because that is pretty difficult and if you can conquer math, you're going to feel like you can do other things. That just gives the students the drive to never want to quit, you know?"

And again, that relates to in and out of school when they come into different situations where they feel it's difficult, they can relate that to the academic life and say, 'I made it through this. This is the way I can handle this situation.' So it's not just, you know, pen and paper. This is life experience as well."

- Caregiver of 8th Graders

”