lastinger listening tour

Landscape Analysis

Results of the 2023 Listening Tour

December 2024

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Executive Summary

Purpose of the Listening Tour

Funded by the Bill & Melinda Gates Foundation and the Helios Education Foundation, the University of Florida Lastinger Center for Learning conducted a listening tour across the state throughout the Fall of 2023 in order to bring together key education, philanthropic, community, and business leaders to engage in productive dialogue around identified needs and potential policy changes to improve mathematics instruction and achievement.

Scope of Analysis

The Lastinger Center held listening sessions in all 10 regions around the state and disseminated a survey across the state to ensure wide representation of stakeholder groups across the state.

Context

Recent NAEP (2022a) mathematics results have shown a general downward trend in achievement for grades 8 and 9, with results for Florida indicating a statistically significant increase in the proportion of 8th graders who were Below Basic in 2022 (42%) while there was a significant decrease in those who were Proficient or Advanced (23%; NAEP, 2022b). Moreover, a recent Florida Chamber Foundation (2001) report found that there were 900,000 jobs in mathematics-intensive fields (e.g., Health Care, Business and Finance) that were left unfilled, signaling a growing demand for a mathematically skilled workforce.

Key Questions

- Why is mathematics important?
- What is the ideal mathematics teaching and learning environment?
- What is the current state of mathematics teaching and learning?
- What major challenges limit mathematics education success?
- How could mathematics education be enhanced across the state?

Data Collection

A total of 94 focus groups were conducted across Florida with 349 K-12 students, K-12 teachers, K-12 coaches and administrators, early learning educators and directors, parents or caregivers, community and business leaders, and policymakers or elected officials. Moreover, a total of 6,331 students and adults across all of these stakeholder groups responded to an online survey that was disseminated across the state of Florida.

Key Results

Here are the major takeaways from the study.

Student Experiences in Mathematics Class	Students want more **interactive, collaborative, relevant, and interesting** learning environments.
	By secondary school, students view mathematics as **less helpful and less useful** for after they graduate.
Importance of Mathematics Beyond High School	**Financial literacy, statistics, algebra and basic mathematics** were frequently viewed as a vital foundation.
	Collaborating, problem solving, communicating, and reasoning were valued by business professionals over content.
Teacher Experiences and Opportunities in Mathematics Education	Teachers frequently reported a need for more **time**, access to **high quality professional learning** and **instructional materials**, and highly qualified **support staff**.
	High quality professional learning demands included **differentiating** instruction, student **misconceptions**, **hands-on** activities, **number** and operation, and **algebra**.
Mathematics Beyond the School Day	Parents and caregivers need **resources** to aid students to learn mathematics at home.
	Making sense of mathematics, **collaborating**, and **problem solving** were valued by parents/caregivers.
Early Learning and Its Role in Mathematics Education	Early learning educators and directors reported a need for access to, and funding support for, **high quality professional learning** and **instructional materials**.
	Directors reported a need for funding to increase educator compensation to retain staff and build capacity.

Recommendations

1. Enhance students' mathematics learning experiences through high quality mathematics professional learning.
2. Enhance students' mathematics learning experiences through access to high quality instructional materials.
3. Invest in parent/caregiver mathematics resources.
4. Build and leverage school-industry partnerships.
5. Invest in comprehensive support for early learning centers.

Overview of the Listening Tour

Purpose & Essential Questions

The University of Florida Lastinger Center for Learning aims to identify key policy issues within Florida's current K–12 mathematics education system that are impacting college access and completion rates as well as the state's workforce development pipeline. Together with key education, philanthropic, and business organizations, including Impact Florida, the Florida Philanthropic Network, and the Florida Chamber Foundation, the Lastinger Center engaged in a collective impact approach to mathematics education and achievement across early learning and K–12 contexts with an expanded base of stakeholders, including educators, school and district leaders, parents/caregivers, students, and business and industry professionals. A major goal is to build a collective narrative around the importance of mathematics instruction and success as a lever to advance Florida's SAIL to 60 goals.

To accomplish this goal, the Lastinger Center conducted a listening tour across the state in order to bring together key education, philanthropic, community, and business leaders to engage in productive dialogue around identified needs and potential policy changes to improve mathematics instruction and achievement.

Method

A mixed-methods research design was executed to gain both breadth and depth of understanding about current experiences and perceptions of mathematics education across the state. Focus group interviews were conducted with all stakeholder groups across the 10 regions in the state to gain a thick description of perceptions and experiences, while an online survey was fielded across the state to gain a breadth of the extent of perceptions and experiences.

Participants

Participants included K-12 students, as well as adults in the following stakeholder groups: K-12 educators, early learning educators, K-12 administrators, K-12 instructional coaches, early learning directors, parents or caregivers, community or business leaders, and policy makers or elected officials. Note these groups are not mutually exclusive (e.g., a K-12 educator could also be a parent), and sometimes would respond in interviews or survey items from these different perspectives that they hold.

For focus group interviews, across the 10 regions in the state, 94 focus group interviews were conducted in 30 cities, with a total of 349 participants. A complete breakdown of the number of focus groups and participants across stakeholder groups can be found in Table 1.

Table 1. Counts of focus group interviews and participants by stakeholder group.

Stakeholder	Focus Groups	Participants
K-5 Students	5	18
6-8 Students	3	17
9-12 Students	4	30
6-12 Students	***7***	***17***
All Students	***12***	***65***
K-5 Teachers	9	26
6-8 Teachers	6	14
9-12 Teachers	6	22
6-12 Teachers	***12***	***36***
All K-12 Teachers	***20***	***62***
Math/Instructional Coaches	16	40
School Administrators	10	17
District Administrators	13	36
All Administrators and Coaches	***28***	***93***
All K-12 Educators	***39***	***155***
Higher Education Faculty/Administrators	2	9
Early Learning Educators	6	7
Early Learning Administrators	11	41
All Early Learning Educators	***13***	***48***
All Educators	***54***	***212***
Government/Non-Profit/School Board	13	37
Business Professionals	6	13
All Business and Community	***18***	***50***
Politicians/Elected Officials	11	12

Parents/Caregivers	6	10
All Adults	***84***	***284***
Everyone	***94***	***349***

Across K-12 and early learning educator, coach, and administrator populations, experience ranged from first year educator to multi-decade veteran. Business professionals cut across multiple workforce sectors, including: Accounting, Banking/Finance, Business Investment, Construction, Health, Horse Training/Trading, Law, Marketing, News, Retail, and Tech. Business professional roles included: Presidents, CEOs, Owners and other C-Suite executives, sales directors, data analysts, managers, human resource specialists, financial analysts, and IT coordinators. Government and military included local Chamber of Commerce, economic development managers, and military personnel across several job functions, including pilots, engineers, and human resources. Community organizations and nonprofits included foundations, trust organizations, nonprofits supporting marine and boating industries, and other education community organizations.

The online survey was disseminated across the state. Respondents included 4,452 adults from all 67 counties and 1,879 students from 64 of the 73 public school districts in Florida. Table 2, below, shows the number and percentage of adult stakeholder groups that responded. Moreover, of the 1,879 students who responded and chose to provide their grade-band, 516 (27%) were Pre-K, 384 (20%) were elementary, and 194 (10%) were secondary students—785 students left the gradeband item blank. In addition, there was representation from every county in the state for adults (see Figure 1) and almost every county for students (see Figure 2).

Table 2. Counts of adult survey respondents by stakeholder group.

Stakeholder	**Number of Respondents (%)**
K-12 Educators	1,698 (38%)
Early Learning Educators	1,324 (30%)
K-12 Administrators	174 (4%)
K-12 Math/Instructional Coaches	125 (3%)
Early Learning Directors	433 (10%)
Parents/Caregivers	834 (19%)

Community/Business Leaders	92 (2%)
Policy Makers/Elected Officials	8 (2%)

**Note: Percentages do not sum to 100% because stakeholder groups overlap. For instance, if a K-12 educator was also a parent and decided to respond to both sets of items, they were counted in each category.*

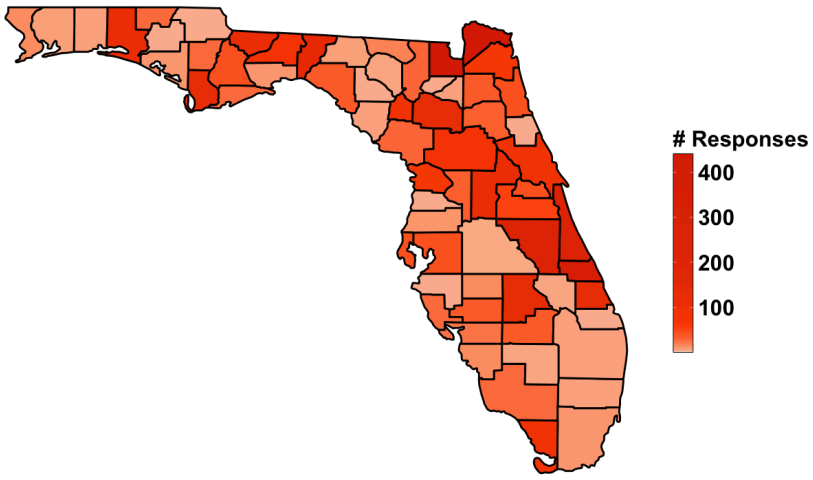


Figure 1. Heatmap of adult survey respondents by county.

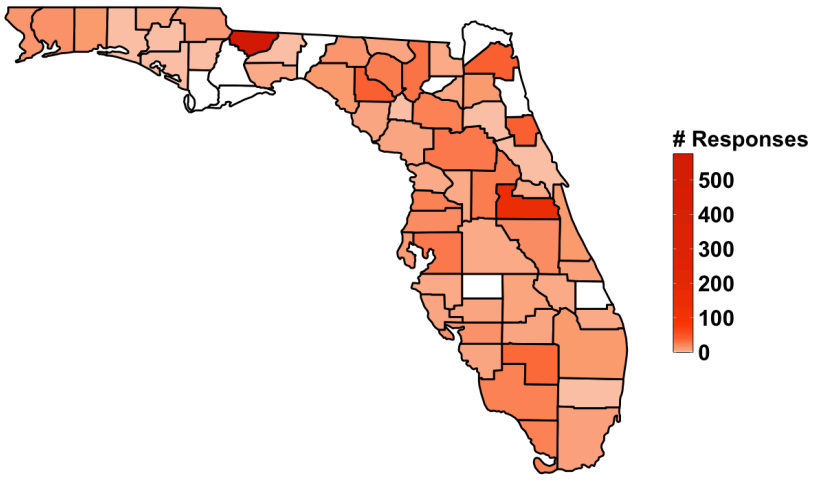


Figure 2. Heatmap of student survey respondents by county/district.

On the adult survey, respondents reported on several demographics, and there was wide variability. In addition to a wide range of race/ethnicity categories and ages reported (see Figure 3 and Figure 4), despite heavy recruitment for fielding the survey through schools,

districts, and early learning centers, there were also many different work sectors reported (see Figure 5). There was little variation in sex/gender, with 94% of adult survey respondents reporting that they were Female.

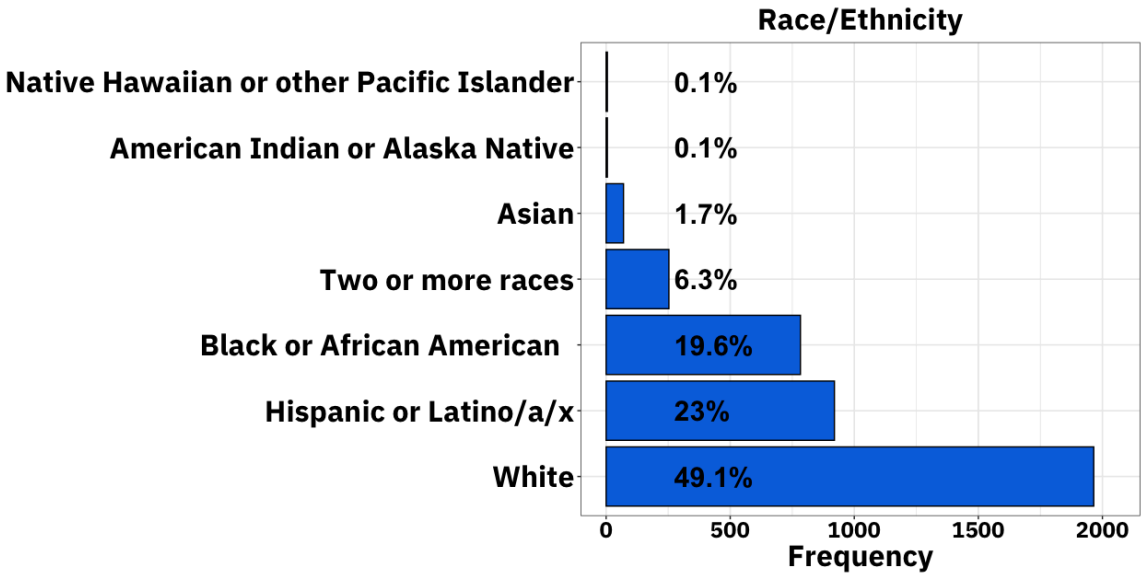


Figure 3. Race/Ethnicity reported by adult survey respondents.

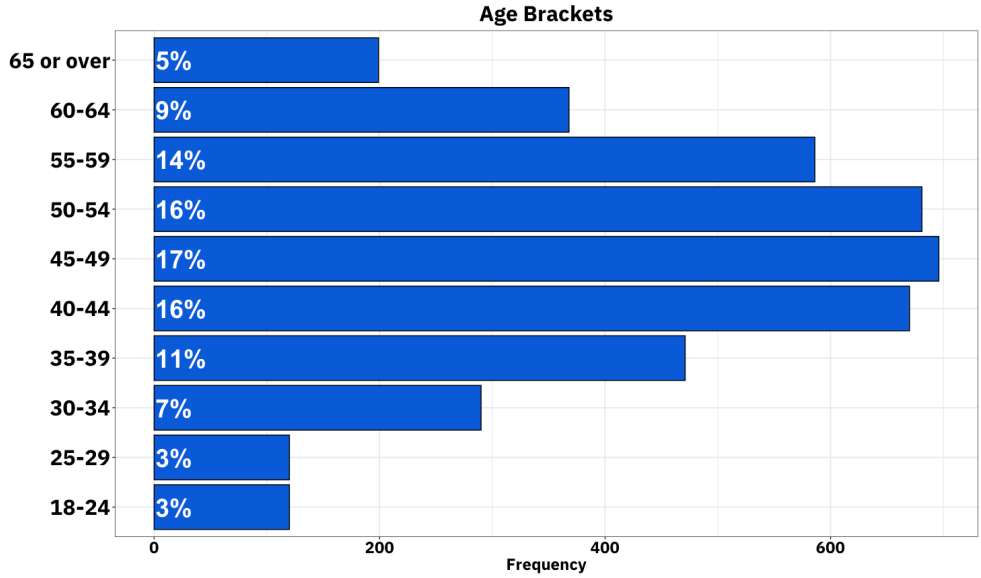


Figure 4. Ages reported by adult survey respondents.

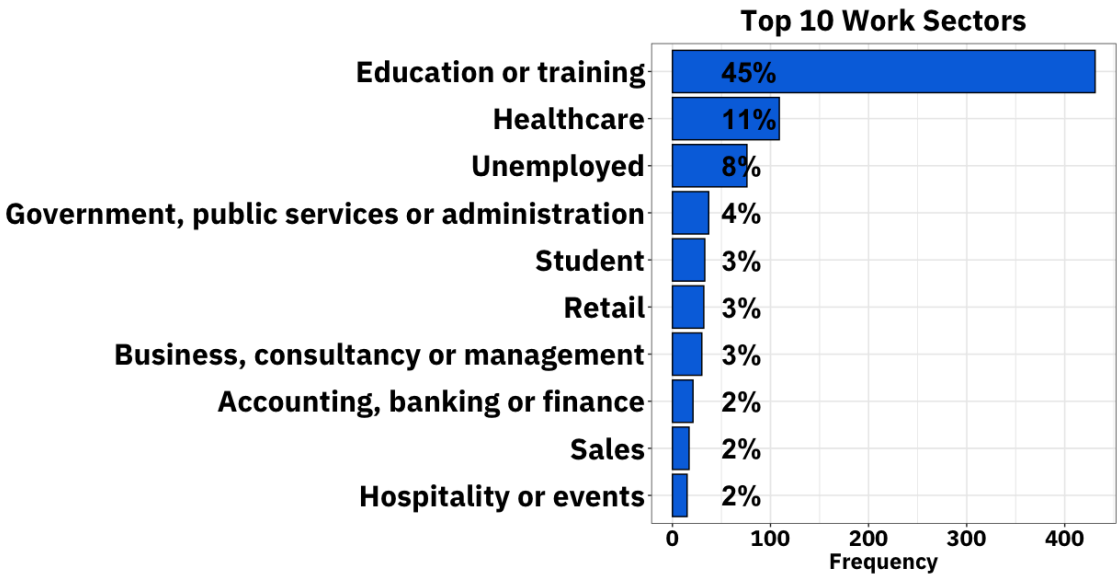


Figure 5. Top 10 work sectors reported by adult survey respondents.

Data Collection

Focus Group Interviews. Interview protocols were developed to be unique for each stakeholder group, but focused broadly on a) participant experience in K-12 mathematics education as a student, b) participant perspective on benefits and challenges of mathematics education currently, and c) participant perspectives on how mathematics education could be enhanced in the state. Interviews were audio recorded and transcribed, amounting to about 50 hours of recorded audio.

Surveys. Separate student and adult surveys were developed to capture a) current perspectives on the broad state of mathematics education, b) what mathematics classrooms look like, and c) what major challenges are faced by all stakeholder groups. For the adult survey, items were developed from several existing national and international surveys of teachers, including the 2012 Programme for International Student Assessment (OECD, 2014) and the 2019 Trends in International Mathematics and Science Study (TIMSS & NCES, 2018).

The development process began by establishing the items that were most appropriate for teachers in order to establish current trends, challenges, and needs in mathematics classrooms. Once those items were determined, parallel versions were created for all other stakeholder groups to ensure alignment and coherence across the survey. Moreover, items were examined for alignment with the Florida B.E.S.T Mathematical Thinking and Reasoning standards (MTRs; FLDOE, 2020).

To illustrate, in an attempt to create a list of ways that current mathematics teachers engage their students in mathematics, the 2012 PISA assessment was first consulted because the associated surveys during that year focused in depth on mathematics. Moreover, a major finding of the 2012 PISA was that when teachers frequently reported using "cognitive-activation strategies", students were significantly more likely to report "high levels of perseverance and openness to problem solving, are more likely to favour mathematics as a field of study over other subjects or to see mathematics as more necessary than other subjects to their careers," have positive engagement with school, and have positive "intrinsic motivation to learn mathematics and mathematics self-beliefs" (OECD, 2013, p. 139). Figure 6, below, shows a list of items teachers were asked on the 2012 PISA that had validity evidence to support their use as a measure of the use of cognitive-activation strategies.

Table 16.29 Item parameters for cognitive activation in mathematics lessons (*COGACT*)

Item	Thinking about the mathematics teacher that taught your last mathematics class: How often does each of the following happen?	
ST80Q01	a) The teacher asks questions that make us reflect on the problem	-
ST80Q04	b) The teacher gives problems that require us to think for an extended time	
ST80Q05	c) The teacher asks us to decide on our own procedures for solving complex problems	
ST80Q06	d) The teacher presents problems for which there is no immediately obvious method of solution	
ST80Q07	e) The teacher presents problems in different contexts so that students know whether they have understood the concepts	-
ST80Q08	f) The teacher helps us to learn from mistakes we have made	-
ST80Q09	g) The teacher asks us to explain how we have solved a problem	-
ST80Q10	h) The teacher presents problems that require students to apply what they have learned to new contexts	-
ST80Q11	i) The teacher gives problems that can be solved in several different ways	-

Figure 6. Screenshot of list of items making up the cognitive activation in mathematics lessons construct from the 2012 PISA teacher survey (OECD, 2014, Table, 16.29, p. 331)

Expanding this list, we also used a set of items from the 2019 Trends in International Mathematics and Science Study (TIMSS) Grade 8 Mathematics Teacher Questionnaire (TIMSS & NCES, 2018). One item included similar items to those on the 2012 PISA that helped to expand the list and get a broader understanding of the range and frequency of different ways teachers engage students in learning mathematics. Figure 7 below shows the list of items where teachers were asked about how frequently they do various things.

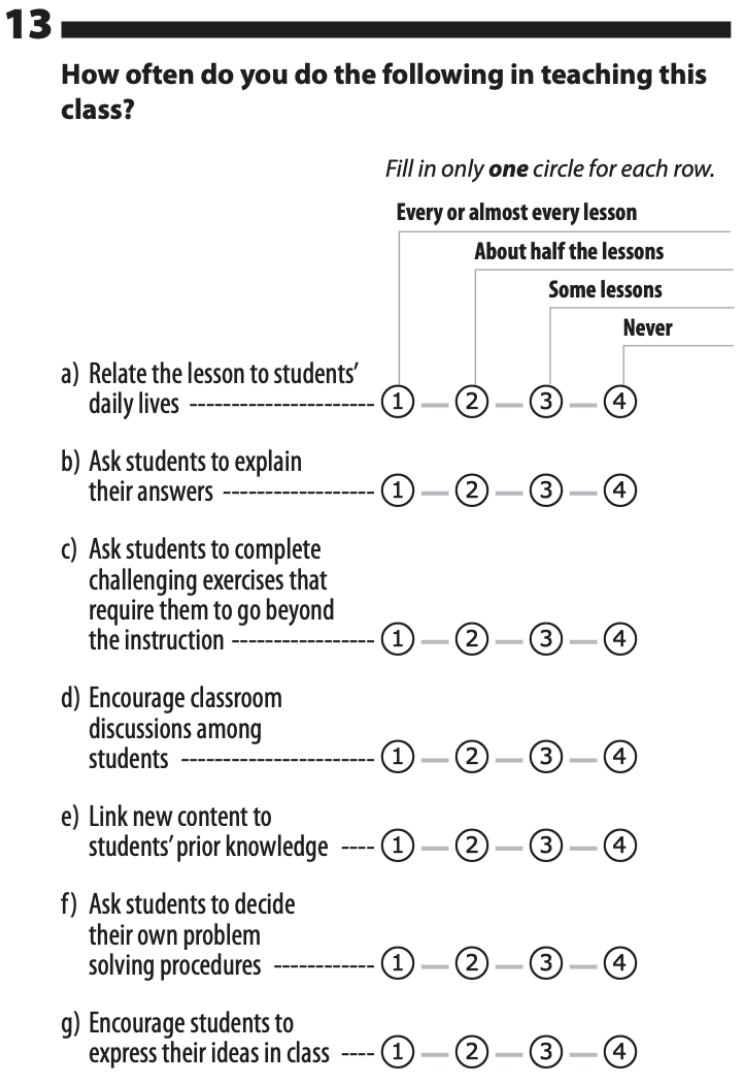


Figure 7. Screenshot of list of items from the 2019 TIMSS Grade 8 Teacher Questionnaire (TIMSS & NCES, 2018, Item 13, p. 6) about how frequently teachers do different things.

After combining these items together, and examining it for adequate alignment with the B.E.S.T. MTRs (FLDOE, 2020), the language was then adjusted slightly to fit the flow of the survey. Afterward, the items were modified to be presented to instructional or mathematics coaches and school and district administrators. A further round of modification was completed, with some items being removed, to create an item asking everyone about which of these types of practices were important to be successful in the workplace. In this way, there was alignment across the survey, creating the ability to compare what students experience frequently, what teachers want to see more of in professional learning, what coaches and administrators see frequently in classrooms, and what business professionals need their employees to be able to do.

Analysis

Focus Group Interviews. Thematic coding was used within focus group interviews and then across stakeholder groups to ensure consistent coding within stakeholder group interviews. Analysis was conducted within and across stakeholder groups to identify salient patterns and identify descriptive themes.

Surveys. Survey data was cleaned, filtered by stakeholder group, and analyzed using descriptive statistics and data visualization.

Results

Student Experiences in Mathematics Class

Within the broad category of student experiences in mathematics class, three major themes emerged from analysis of focus group interviews and survey data: Students desire 1) a deeper, more comprehensive mathematics experience, 2) more engagement with their peers when learning mathematics, and 3) a robust understanding of mathematics. These themes emerged across conversations about student sentiments towards mathematics and mathematics class, the ways students typically engage in mathematics during mathematics class, and recommendations students made for changing how they experience mathematics class.

In focus group interviews with students across K–12, they described their current mathematics learning environment as typically involving passive participation. Frequent common experiences included the teacher explaining how to solve problems, students copying procedures into their notes, learning procedures through repetitive practice - representing an instructional practice commonly referred to as 'I do, we do, you do.' Students recounting these experiences typically framed this as either negative, or not ideal, and negative views of mathematics were more frequent in higher grade levels. Moreover, as students talked about these experiences, they relayed their desire for a different kind of learning experience. For instance, the following two quotes from high school students in different districts were particularly expressive of this viewpoint:

> *"Yeah, some teachers just throw content at you and say, "This is how you do it, do it," instead of going into why it works the way it does, which does not help*." (High School Student)

> *"The most that I catch myself, like, not paying attention is whenever it's just straight lectures and a full out because we're not interacting. We are interacting by answering questions, and answering questions on the board and stuff like that, but it's not the same as us doing it and us trying to get it out by ourselves."* (High School Student)

These themes are further illustrated by results of the student survey. In particular, students were asked about a) how they felt about their mathematics class, and b) how often they experienced different types of activities in their mathematics class. A stark contrast can be seen in elementary and secondary student sentiments toward mathematics (see Table 3).

Table 3. K-12 student sentiments toward mathematics.

Elementary Student	Secondary Student	Item
67%	51%	Math is **helpful** outside of school.
57%	35%	I **use math a lot** outside of school.
82%	58%	Math is **useful** when I get older.
41%	14%	I **talk** about math a lot with family.
41%	28%	I **like** math class a lot.

By the time students reach secondary grade levels, students view mathematics as substantially less helpful, less useful, and less enjoyable, and, unexpectedly, they spend less time talking about mathematics with their family.

In addition to talking about their current experiences in mathematics class, they were also asked about what they would like their class to be like. In these discussions, students frequently reported that they considered their peers to be a valuable source for learning. For instance, many students described wanting more opportunities to talk about mathematics with their peers, including explaining their solution strategies, listening to how their peers solve problems, asking peers for help, and engaging in friendly mathematics competitions and games. For instance, showcasing how experiences change from elementary to high school, one elementary student said:

> *"I like that the teacher gives us a chance to talk to our friends so we can get ideas from them and think about the question in different ways."* (Elementary Student)

In contrast, a high school student claimed:

> *"People make better scores when they're working together and they're able to*

communicate and talk." (High School Student)

These experiences of mathematics class, and the contrast between how elementary and high school students experience it, was further validated by student reports of how frequently they experience different activities on the student survey (see Table 4).

Table 4. Proportion of K-12 students reporting frequent mathematics class activities.

Elementary Student	Secondary Student	Item
66%	41%	**Explain** their thinking to others.
60%	46%	**Work with others** to solve problems.
52%	32%	**Talk** about each others' solutions.
63%	39%	Write **words/sentences** to solve problems.
54%	24%	Draw **pictures** to solve problems.

By the time students reach secondary grade levels, students report substantially fewer opportunities to learn mathematics in cognitively active ways (OECD, 2014; 2020), such as explaining and justifying their thinking to others, collaboratively constructing arguments, and using multiple representations to solve problems. Moreover, not only are these types of activities aligned with the Florida Mathematical Thinking and Reasoning (MTR) Standards (FLDOE, 2020) and well-established known predictors of student achievement in international assessments (e.g., OECD, 2014; 2020; 2024; Mullis et al., 2019), there is also evidence that these ways of engaging in mathematics support students in persevering in the problem-solving process, and they have been found to be correlated with lower levels of mathematics anxiety, higher self-efficacy, and, subsequently, higher achievement (OECD, 2014; 2020; 2024; Mullis et al., 2019).

Overall, across all focus group interviews with students, students expressed a desire for mathematics to make sense, to understand how and why mathematics works, to experience mathematics as relevant and applicable to the real world, and for mathematics to be fun and interesting. Building on these conversations, students were asked what they would like mathematics class to be like. Beyond broadly requesting more collaboration with their peers, students frequently indicated a desire for a more positive and supportive learning environment that leads to a deeper understanding of mathematics. For instance, many students wanted a learning environment in which asking for help—from both the teacher and other students—was viewed as normal and welcoming. For instance, one high school student offered:

> *"I feel like it would be easier if you could have a teacher that could really come up and really just talk to you, get in your head and make you, like, help you understand what's going on."* (High School Student)

Another high school student expressed wanting more experiences similar to her current mathematics class:

> *"I feel like the way my teacher does it, she makes sure that we all understand, then she's very, like, to ask her questions, she's always open to help. So I feel like it's just a very safe class to be in, but also, like, I'm learning so much."* (High School Student)

Another way that students talked about this was in connection to recognizing that their teacher needed more support in the classroom. They simultaneously expressed a desire for more individualized attention and one-on-one help, while understanding that there was not enough time for everyone to get this level of support from the teacher, leading them to appeal to a related desire for more interaction with their peers. One middle school student recommended:

> *"If, like, someone doesn't understand the equations or something, instead of going up to the teacher, they can ask the students that actually understand it."* (Middle School Student)

It is noteworthy that students frequently recognized the types of classroom learning environment characteristics that are known to be associated with positive student outcomes (OECD, 2014; 2020; 2024; Mullis et al., 2019), and are aligned with the Florida B.E.S.T. standards (FLDOE, 2020).

Finally, there is a strikingly similar sentiment among adults in both focus group interviews as well as the adult survey about their K-12 mathematics experiences. For instance, across every single focus group interview with adults, there were 285 coded responses in which participants described a memory of their K-12 mathematics experience. Of those 285, only 44% of the time did someone express an overall positive memory about learning mathematics. Further building on these experiences, on the survey, 25% of respondents indicated that they were not very successful in mathematics throughout K-12, and respondents who reported that they mostly experienced direct instruction—which is the type of instruction students most typically reported experiencing—were less likely to report that it was helpful for their learning of mathematics than those who experienced at least some frequency of inquiry-based mathematics instruction (see Figure 8).

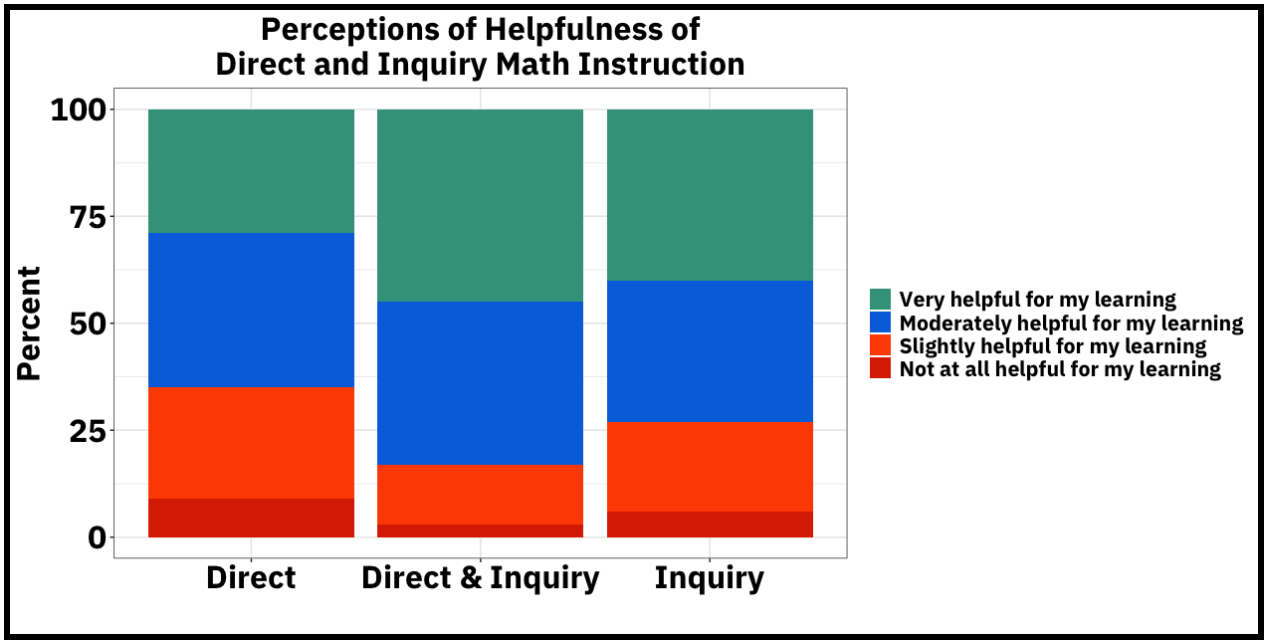


Figure 8. Adult survey respondent perceptions of helpfulness of different types of mathematics instruction for their learning of mathematics while they were in K-12 school.

Importance of School Mathematics Beyond High School

Across all focus group interviews, as well as in the adult survey, participants were asked about their perspective on the importance of mathematics. As could be expected, there was widespread agreement that mathematics was important for post-secondary success, regardless of whether that was college or career-oriented.

Statistics, Algebra, Collaboration, Communication and Problem Solving are Important Post-Secondary Skills

Across focus group interviews, there was general consensus that mathematics was vital for productive participation in society as a global citizen. The most frequent topics brought up across the state of Florida included comments about personal finance or the kinds of daily interaction that require the use of mathematics, such as grocery shopping, banking/loans, and critical consumption of the news or other sources in which quantitative information is presented. Such comments typically focused on basic mathematical skills, and the ability to apply them in real world situations, although frequently included topics from data and statistics, as well as advanced financial mathematics. In addition to particular mathematical skills, important mathematical practices that were frequently discussed included critical thinking and reasoning, as well as creativity in solving problems.

Beyond participation in society, participation in the workforce was frequently discussed across all focus group interviews. Within this context, mathematics was frequently deemed as an important factor in being more effective or efficient at your job, informing business-related decisions, advancing workforce development, and increasing future career opportunities. In fact, among the Business/Community Leader stakeholders, the most frequent topics about the importance of mathematics revolved around 1) mathematics as an aid to being more effective and efficient at your job, 2) financial mathematics, 3) being able to apply mathematics to real world problems, and 4) data handling and statistics.

Providing a larger sense of scale, on the adult survey, *everyone* was asked about the types of mathematics skills that were important to be successful in their work sector, and *business and community leaders* were asked about which mathematics skills were important for their current or prospective employees to be successful. Table 5, below, shows the top 5 mathematical skills reported for each of these items.

Table 5. Top five important mathematics skills among everyone and employers.

	Mathematics Skills Important to be Successful in Your Work Sector (*N* = 967)	**Mathematics Skills Important for Your Current or Prospective Employees to be Successful (*N* = 49)**
#1	Listen to others as they explain their ideas (82%)	Know where to find and how to use a variety of resources to solve problems (88%)
#2	Know where to find and how to use a variety of resources to solve problems (80%)	Explain your reasoning to others (86%)
#3	Work collaboratively with others to solve problems (79%)	Work collaboratively with others to solve problems (84%)
#4	Explain your reasoning to others (70%)	Listen to others as they explain their ideas (84%)
#5	Develop your own ideas on how to solve problems (70%)	Work on problems that require thinking for an extended amount of time to solve (80%)

It is noteworthy that memorizing facts, procedures and formulas was the lowest ranked for both of these items, and that the use of mental math was ranked 13 and 9, respectively. An important finding that was consistent across both the focus groups and the survey was that these ways of *engaging in the practice of mathematics* were much more important than being able to calculate something from memory. This point was particularly salient across focus group interviews with business/community leaders. In the following quote, a business leader in

the horse trading/training industry was describing an issue he recently had training an employee.

> *"In trying to teach [the employee], [the employee] wants to memorize steps. Click here, click that, this, this, pick that, do that. I'm like, no, no, no, no, no, no. Don't, and maybe it's the way I think, I don't know, but don't just try to memorize steps because you're not gonna understand why you're doing it. Think about what you're trying to accomplish. And then let's figure out the tools here that we can accomplish, with which we can accomplish it."* (Business Leader)

As you can see in this quote, the business leader was pointing to the need for his employees to have problem solving and reasoning skills, later claiming that the specifics of how to calculate something is much easier to train an employee how to do on-the-job, but that these sorts of skills that require *engagement in the practice of mathematics* are very difficult for him to teach. Similarly, another business leader from the health industry offered an example of how he interviewed potential hires to illustrate the vital need for his employees to have these kinds of skills be fostered before he hired them:

> *"[In interviews] I actually gave a hypothetical situation. Here's a problem in a community. It was of the incidence rate of teenage pregnancies. How are you going to go about collecting data? And they had like 30 minutes to write just a basic answer, but they didn't have a computer I wanted to see how they reasoned through that and if they knew what kind of data they had to access to make some informed decisions. And I chose people based on that. So workforce, oftentimes you need to be able to demonstrate some of those skills and that you don't always have your computer to tell you what the answer is."* (Business Leader)

These two quotes are representative of what business and community leaders talked about when they were asked about how mathematics was important for the kinds of work that they do and that they expect their employees to be able to do. In every part of the state, critical thinking, reasoning, and problem solving were brought up as vital skills while talking about mathematics. Although critical thinking, reasoning, and problem solving are certainly fostered by other disciplines, such as science, literacy, social studies and history, these conversations were explicitly focused on these skills within the context of K-12 mathematics.

Despite specific mathematical content domains not surfacing in many of these conversations—aside from a vague mention of "basic math"—data and statistics, geometry, and

algebra were mentioned in several Business/Community Leader stakeholder interviews. Data and statistics were brought up most frequently because nearly everyone talked about their need to be consumers of statistical information, and many about their need to use spreadsheets to create statistical summaries of data themselves—even if they were not in an analyst role, pointing to the increasing need for statistical literacy due to the ubiquitousness of data availability and the expectation to use it to justify decisions. Geometry was mentioned the least, but when it was, it was within the context of construction or in our conversations with military personnel whose job entailed optimizing space availability on aircraft, for instance. These people also frequently mentioned optimization problems that included weight limits, weight distribution, fuel consumption, and other factors—pointing to a need for understanding and applying algebra. In addition to these contexts, algebra was also frequently brought up while talking about the use of spreadsheets, such as the statement below from a business leader in the accounting industry:

> *"In our industry, if you can't speak in algebraic terms, we can't use you. I mean, it's a whole, kind of a hard truth, but if you don't understand basic algebra, I can't teach you Excel. You know, I'm not gonna spend 20 hours doing something to teach you, if you're not coming out of school with that knowledge. Just from a billable rate, it doesn't make sense to sit there with somebody. If you can come out with algebra and statistical knowledge, that's great. That means I can teach you how to historically record things and that we can go into probability and we can go into immaterial misstatements, depending upon the company sizes. We can go into projections. I will take that employee every day of the week in a heartbeat."* (Business Leader)

In other words, taken together across what all Business/Community Leader stakeholders said in interviews and on the survey, there is a level of mathematical knowledge required by the workforce beyond basic mathematics that includes a strong foundation in algebra and statistics, and in some cases geometry. More importantly, there is a widespread demand for collaborating and communicating with others while using mathematics to think critically, reason, and to be creative in solving problems. Memorized facts, procedures and formulas, mental mathematics, and following step-by-step instructions for solving a problem were rarely mentioned as important skills.

Opportunities for Enhancing College and Career Preparation

Building on what various stakeholder groups determined to be important mathematics skills and practices for post-secondary success, this section focuses on what participants expressed

as areas in which the state might invest in order to actualize post-secondary success. In every focus group interview, participants were asked about what they would like to see changed that would benefit mathematics education across the state (see Table 6).

Table 6. Top five requests for changes to improve K-12 mathematics education by stakeholder interview groups.

	Everyone	**Teachers**	**District Admin**	**Business/ Community**
#1	More Teacher Training Opportunities	More Teacher Training Opportunities	More Teacher Training Opportunities	Respect, Value, Support and Trust Teachers
#2	Higher Teacher Pay	Flexibility for Student Needs	Higher Teacher Pay	Invest in Business-School Collaborative Partnerships
#3	More Highly Qualified Teachers	Higher Teacher Pay	More Highly Qualified Teachers	Less Testing
#4	High Quality Instructional Materials	Family Support	Increased Flexible District Funding	Invest in Positive PR for Mathematics
#5	Family Support	High Quality Instructional Materials	More Highly Qualified Instructional Staff Support (Coaches, Aides)	Family Support

A common pattern that can be seen from Table 6 is that teacher professional learning, highly qualified teachers and staff, high quality instructional materials, support for parents and caregivers, and increased funding are common needs across the state. One district administrator captured much of these needs, stating:

> *"We need people [teachers] that are content specialists, like that know the math and not only know the math but know how to teach, know how to implement those high-yield routines, know how to get the kids engaged in cooperative learning, know how to do small group rotations. You know, all of those things that we know are best practice, and just recruiting and retaining those teachers. I*

think that is, just, the constant turnover is what's really debilitating." (District Administrator)

In the excerpt above, the kinds of instructional practices the district administrator is listing are those that are well-aligned with students' expressed vision of the mathematics classroom in the previous section, and with the Florida B.E.S.T. MTRs (FLDOE, 2020). In this way, through high quality professional learning aligned with the MTRs, high quality instructional materials to support teachers in implementing the professional learning, highly qualified support staff that can provide the more intensive student support and teacher coaching, and investment in supports for parents and caregivers, a more robust, comprehensive approach will allow for teachers, schools, and communities to leverage all the resources available to them to enhance the teaching and learning environment.

International research has found that the kinds of instructional practices described by the district administrator in the above excerpt tend to lead to higher student mathematics achievement. In 2022, when reporting on the mathematics assessment results of the National Assessment of Educational Progress (NAEP), NAEP stated that they had observed "the largest score declines in NAEP mathematics at grades 4 and 8 since 1990" (NAEP, 2022a), with only 25% of 8th grade students considered proficient (NAEP, 2022a). Moreover, NAEP (2022b) results showed that there was a statistically significant increase in the proportion of Florida 8th graders who were Below Basic in 2022 (42%), while there was a statistically significant decrease in the proportion of Florida 8th graders who were Proficient or Advanced (23%). Similarly, in the state of Florida, 54% of 8th grade students scored at or above grade level on the 2024 Florida Assessment of Student Thinking (FAST) standardized mathematics assessment (FLDOE, 2024), and 55% of students scored at or above grade level on the Algebra I End of Course Exam (FLDOE, 2024).

In alignment with what Floridians value as important mathematics skills, and with what Florida business professionals value in their current and prospective employees, and similar to what students wanted to see more of in their mathematics classes in the previous section, state and national standards documents over the last two decades have attempted to shift attention toward sharper coherence, vertical progression, and ways of engaging in mathematics, referred to as the standards of mathematical proficiency (NRC, 2001) and the Florida Mathematical Thinking and Reasoning (MTR) Standards (FLDOE, 2020). Although these standards documents are each distinct, they have substantial overlap and are generally in agreement with one another. Furthermore, recent studies of international comparisons of mathematics achievement have found that when students engage in mathematics in classroom environments in which these mathematical practices are encouraged, students not only have higher levels of mathematics achievement, but they also express higher levels of interest in

pursuing careers that require more mathematics (OECD, 2014; 2020; 2024; Mullis et al., 2019).

This collective vision of the mathematics classroom learning environment, as expressed across all stakeholder groups in the state, cannot occur without appropriate levels of support to enhance the current Florida mathematics education system. A large trend in the data was a desire to increase mathematics teacher quality—including that of instructional coaches and other support staff. Results from a U.S. longitudinal, nationally representative study showed that when students consistently experienced teachers with a) experience, and b) advanced degree(s) and expertise in mathematics content and pedagogy—with content and pedagogy expertise being the most influential—students were much more likely to graduate high school and college (Lee & Lee, 2020). In contrast, when teachers are not highly qualified, students tend to have poorer outcomes (Buddin & Zamaro, 2009).

Mathematics Teacher Experiences and Opportunities

Across all 39 K–12 educator focus group interviews with 62 teachers and 93 administrators and coaches, participants were asked about their perspectives on the challenges, successes, and needs in relation to mathematics teaching and learning. Moreover, 1,698 K–12 educators and 299 administrators and coaches responded to survey items about their current experiences, perceptions, and needs.

A Vision for Rich Integration of the Florida B.E.S.T. Mathematical Thinking and Reasoning Standards

From the adult survey, among 659 K-12 mathematics teachers, 91 coaches, and 68 school administrators who responded to an item about classroom practices they use or observe frequently, the following were among the most frequent across all three groups (see Figure 9 below).

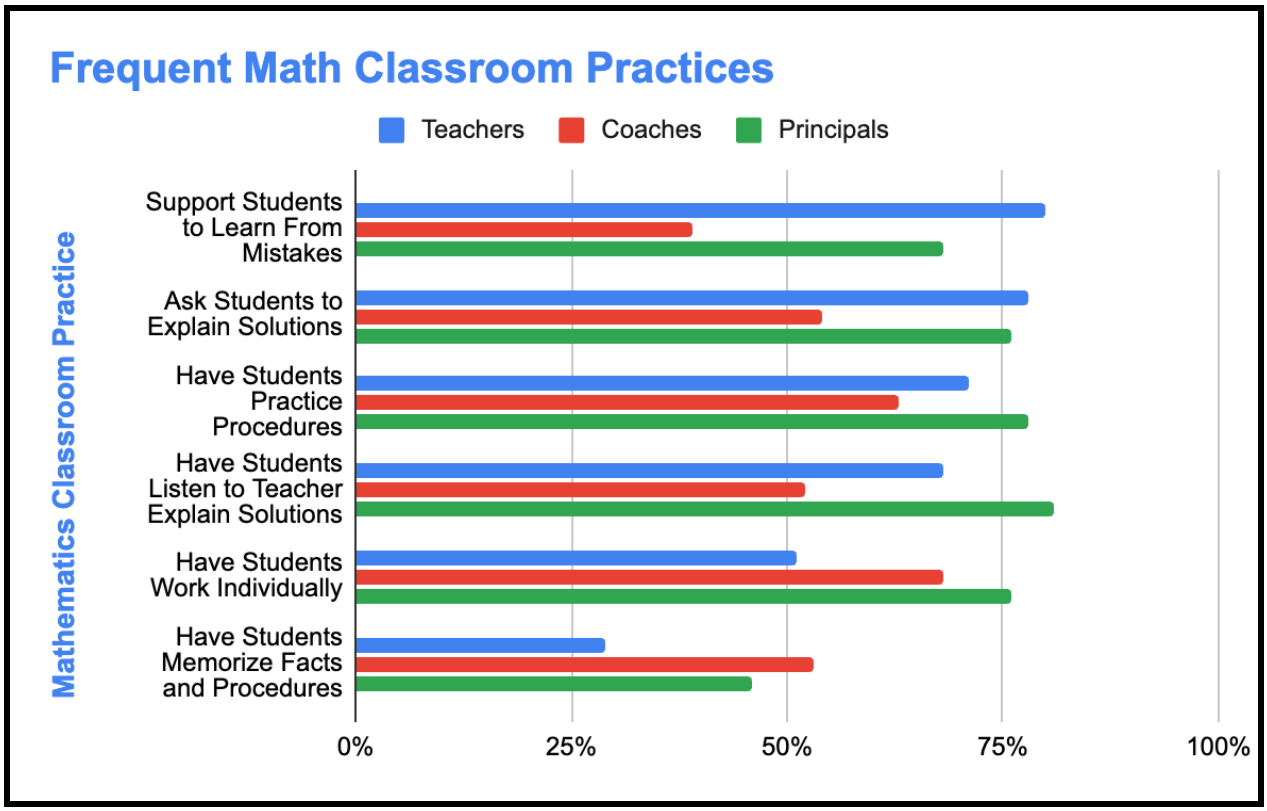


Figure 9. Most frequent mathematics classroom practices reported by teachers and observed by coaches and administrators.

It is noteworthy that there were some near agreements in how frequently students were asked to, for instance, practice procedures. However, in many cases, there was misalignment in what mathematics/instructional coaches observed and what teachers reported, with the largest discrepancy being for supporting students to learn from mistakes (teachers: 80%, coaches: 39%) and another noteworthy practice involving students memorizing facts and procedures (teachers: 29%, coaches: 53%). These inconsistencies are similar to the experiences reported in the prior section on student experiences.

Examining these trends in relation to the Florida B.E.S.T. Mathematical Thinking and Reasoning Standards (MTRs; FLDOE, 2020), Figure 10 includes those items that most closely relate to these standards, as reported by teachers, coaches and school administrators.

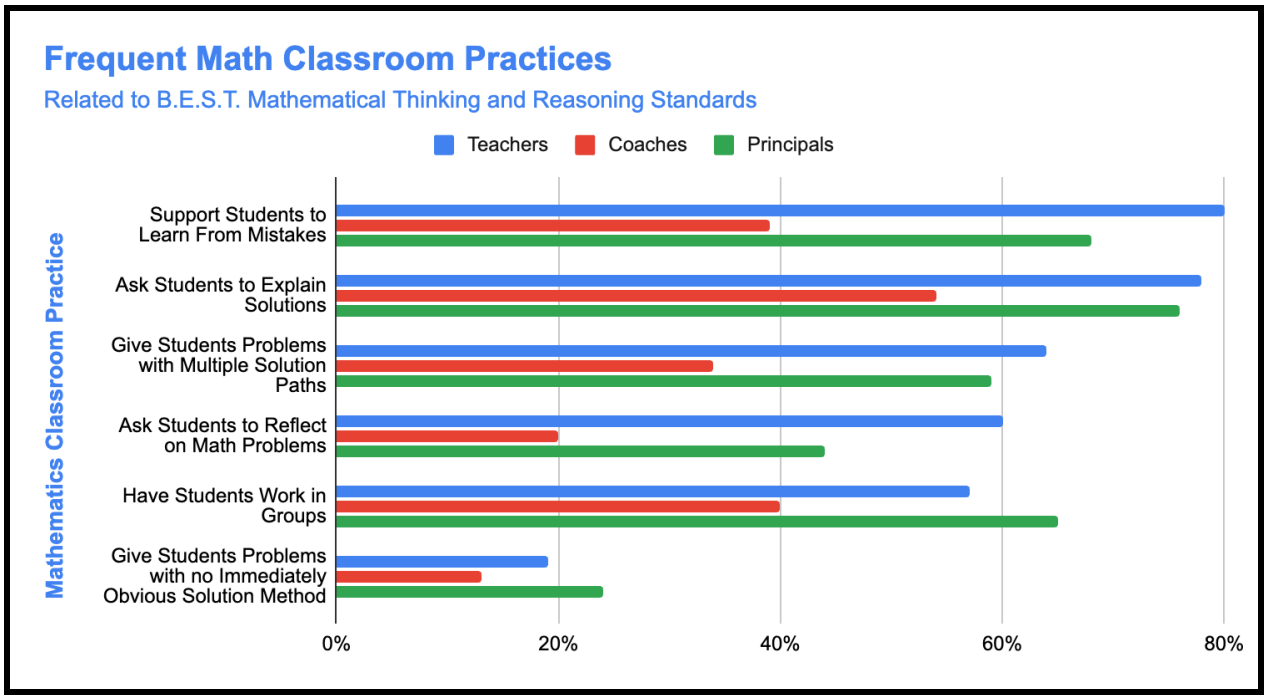


Figure 10. Most frequent mathematics classroom practices reported by teachers and observed by coaches and administrators that overlap with the Florida B.E.S.T Mathematical Thinking and Reasoning Standards (MTRs; FLDOE, 2020).

On these items, teachers and school administrators frequently were in close alignment, but coaches reported seeing these kinds of mathematical practices much less frequently. It is worth mentioning that these differences could be due to the types of instruction and purposes with which coaches observe mathematics instruction. However, the misalignment is similar to the difference in the kinds of experiences that students described in the prior section. Moreover, further evidence from teachers about the kinds of instructional practices they desire to have more professional learning on (see Table 7) indicates that these are areas in which teachers want to improve, and thus it is more likely that the misalignment between coaches and teachers is a result of a difference in the depth of which these practices are observed, as opposed to whether they are happening at all.

Table 7. Top five requests for mathematics-specific professional learning from K-12 teachers.

	Professional Learning Request	**% of Teachers**
#1	Differentiating Instruction to Meet the Needs of Diverse Learners	85%
#2	Learning about Student Misconceptions	79%
#3	Learning Hot to Implement Hands-On Activities and Manipulatives	66%

#4	Monitoring Student Understanding	60%
#5	Deepening Knowledge of Math Content Being Taught	58%

To further elaborate, across the focus groups, teachers frequently expressed a vision of mathematics classrooms as being a learning environment where students enjoy learning, engage in interactive lessons, and work on relevant mathematics where student sensemaking and deep understanding are key focal points of learning objectives. Consider the following quotes from a middle school mathematics teacher and an elementary mathematics teacher when asked about what the mathematics classroom would like in an ideal situation.

> *"In a perfect world, I think that students would be able to make those connections and teachers would be able to aid them in bridging that gap to make those connections to those real-world concepts."* (Middle School Mathematics Teacher)

> *"I would like to see more concrete, hands-on, using manipulatives, more classroom discussion, because I don't feel like we do enough talking about math in the classroom."* (Elementary Mathematics Teacher)

Statements such as these, in which teachers desired to have a more interactive classroom learning environment where students could develop a deeper understanding of the mathematics, were fairly ubiquitous. More specifically, the types of experiences teachers reported wanting to be able to provide more of for their students align with many of the Florida B.E.S.T. MTRs (FLDOE, 2020), such as collaborating to solve problems (MTR.1.1, MTR.4.1), drawing connections across mathematical ideas to develop deeper understanding (MTR.2.1), engaging in real-world problem solving situations (MTR.7.1), and reasoning with and about mathematics (MTR.2.1, MTR.5.1, MTR.6.1).

Barriers and Opportunities to Teachers' Visions of Mathematics Classrooms

Across focus groups with K-12 mathematics teachers, when asked about the challenges they faced in actualizing their visions of the mathematics classroom, there were five needs that were discussed frequently across nearly all focus groups:

1. More Time & Less Testing
2. High Quality Teacher Professional Learning
3. High Quality Instructional Materials
4. More Highly Qualified Teachers and Staff

5. Higher Teacher Pay

One high school teacher described the challenge that she faces in her classroom in which she has many students with different needs like this:

> *"I need another me in the room. Can you make that happen? I mean, you [the interview team] were in my classroom today, and at the end of the day, if I had a second person like, it's, it's nice. And I remember some years back, nothing against anybody, but ESE teachers had to get certified in a particular area so when they were in your room they were certified in that subject area and they could support, and they can help, right? But now they don't have to be, so even though you may have support, but math may not be their background, you know what I mean? Which makes it very challenging."* (High School Teacher)

In the excerpt above, the teacher is relaying a major issue she faces, in which the support staff she has access to for the students in her mathematics class typically do not have have the level of expertise that she really needs in order to achieve the vision of the mathematics classroom laid out in the previous section. Building on this frequent challenge that teachers reported, consider the following exchange between three teachers in the same focus group interview:

> **High School Teacher 1:** *"The support that I would want would be more teacher resources for how to dig in deep in that content. So how to refresh me on how to teach them those specific things. I think that we have, you know, like the curriculum for the students and the teacher planning tells you a little bit, but I think digging in deep, if we're going to get them to that next level, digging in deep and having those kinds of either PDs or resources for teachers to make sure they're experts in what they're teaching."*
>
> **Elementary Teacher:** *"I agree because I'm not, you can't teach a kid a strategy that would be helpful for them if you don't know it yourself or understand what it's doing."*
>
> **High School Teacher 2:** *"And I thought before, as you were speaking, and [they] said, I was thinking about, well, we probably need more support, but if the support can be there, but if you don't know the concept to help all groups, 'cause we can have up to 20 kids in the classroom. So it's beneficial, yes, we have teacher assistants,*

but sometimes that's a little slim. And so if you have a teacher assistant that's not understanding the concept, you have to teach the teacher the concept. So I think that goes into play to have a professional that actually dives into teaching the concepts appropriately and mastering that is important."

Elementary Teacher: *"And those resources so that your teacher's assistants, if you do get to have one, that they can be learning that stuff as well."*

As seen in the above excerpt, teachers are expressing a challenge in not only needing the support staff to be able to support the diverse needs of their students, but also to have support staff that can support them as teachers as they work to enhance their instructional practices and to deepen their knowledge of the content they teach. Moreover, they point out that the challenge is exacerbated when support staff do not have the level of expertise needed because they, as the teacher, must also provide professional development to the support staff so that they can be more effective in the classroom. These types of challenges directly relate to the other major challenges that teachers frequently mentioned, especially that planning and instructional time would be provided and protected, and that they would have access to high quality mathematics professional learning and high quality instructional materials—and time to engage with it and build it into their planning and instruction. Further complicating these challenges is the realization that much of the professional learning that teachers have access to occurs outside of the school day, and yet teachers have reported that they are already at capacity with 54% of teachers responding to the adult survey that have no more than 3 hours *per month* to dedicate to professional learning—despite the desire to participate in it.

Beyond these direct challenges to teachers' classrooms, there are further external constraints on teachers and schools to implement their vision of the mathematics classroom, of which some of these challenges are a symptom. Earlier this year, the Florida Department of Education (2024) reported that a) during the 2023-2024 school year, 3,486 mathematics courses were taught by a teacher without an appropriate mathematics certification, and b) that there would be a projected 570 mathematics teacher vacancies and 2,209 elementary teacher vacancies for the 2024-2025 school year. The kinds of challenges that K-12 educators reported across all focus groups appear to be a widespread problem that spans the entire state.

It is important to recognize that the challenges that teachers discussed were closely related to a deep desire to move toward the kinds of learning environments and mathematical practices described in the Florida B.E.S.T. MTRs. In short, the kinds of experiences that students,

teachers, coaches, administrators, and business professionals have all expressed a vision for across Florida.

Collectively looking across the vision of the mathematics classroom as described by students and business professionals in the prior sections, and as described by teachers, coaches and administrators in this section, there is a common desire to more fully integrate the MTRs into the mathematics classroom. In order to achieve this, there are multiple levels of support needed across schools, districts, state, and community organizations and businesses to ensure that teachers have a) protected time for planning, instruction, and high quality professional learning, b) access to high quality instructional materials, and c) support staff with adequate expertise to support diverse mathematics learners.

Mathematics Beyond the School Day

Across all focus groups with adults, conversation frequently turned to the importance of parents/caregivers in students' experiences and success in mathematics. Moreover, around 470 parents/caregivers responded to survey items about their perceptions of the importance of mathematics for their student(s) and their comfort in supporting their student(s) at home and advocating for them at the school. Relatedly, over 900 teachers, coaches and school or district administrators responded to survey items about how much parental involvement is emphasized in their school(s), as it concerns mathematics education.

Extending Mathematics Learning Through Parent and Caregiver Support

Across all 84 focus interviews with 284 adults, the topic of parents/caregivers struggling to support mathematics learning outside the school day came up 69 times across 23 different focus groups across the state (31% of all adult focus groups). Such conversations focused on a) that parents/caregivers frequently struggle to support mathematics learning at home, and 2) a desire to see funding and resources invested across the state to support parents/caregivers at home. Consider the following quote, where a parent describes a common experience:

> *"I have raised two children through the Florida education system, and one of the things that I found challenging from a parent's point of view is my children are taught math differently than the way I learned it. So there were a lot of … arguments in our house when it came to homework time because I would try to help them with their homework and they would say: "Mom, that's not the way our teacher is teaching me how to do it." And I'm like, "Well, we're gonna get to the same answer, just I learned how to get to that end result differently." So I think*

> *that giving parents more support with how to support their children through their education would be something that's really beneficial. We need to give parents the tools to be involved in their children's education."* (Parent)

In the above excerpt, this parent is expressing the common experience many parents/caregivers described in which they are simply not aware of how the mathematics is being taught at school, and are unable to adequately support their student at home. This kind of experience is not surprising, with 65% of parents/caregivers who responded to the survey reporting that they received only direct instruction in their K-12 mathematics school experiences, which implies a mathematics learning environment that involved more focus on a) rote memorization of facts and procedures and b) practicing procedures. For instance, another parent stated it this way:

> *"When my first-grader asks for help in math, I have to tell him, "Excuse me." I got to YouTube to teach [myself[, and then I go teach him. And that's how I help him, you know? But I struggle with math. I struggle."* (Parent)

This is a contrast to the kinds of experiences that are promoted in the Florida B.E.S.T. Mathematical Thinking and Reasoning Standards (MTRs; FLDOE, 2020)—a vision of K-12 mathematics classrooms shared by students, teachers, administrators, business leaders, and parents/caregivers alike (see previous sections for more details). For instance, in the survey, only 29% of teachers reported frequently having students memorize facts and procedures, while frequently reporting having students explain their solutions (78%) and solve problems that can be solved in many different ways (64%)—see the previous section on Mathematics Teacher Experiences and Opportunities for more information.

In other words, parents/caregivers generally have the mathematical content knowledge to solve many of the mathematics problems their students bring home for homework. However, the strategies and ways of thinking that teachers are engaging students in so that they can, for instance, reason with and about mathematics (MTR.2.1, MTR.5.1, MTR.6.1), and draw connections across mathematical ideas to develop deeper understanding of the mathematics (MTR.2.1, MTR.5.1) as they work toward an aim of developing a deep mathematical proficiency, are not well understood by parents/caregivers because they never experienced these kinds of learning environments in their own mathematics education. It is important to note that parents/caregivers also highly value these same practices. On the survey, parents/caregivers reported that it is important for their student's mathematical success that they solve real world mathematics problems (80%; MTR 7.1), make sense of mathematics (73%; MTR.1.1, MTR.2.1, MTR.5.1), solve mathematics problems in multiple ways (68%; MTR.2.1), and to discuss ways of solving mathematics problems with other students (60%; MTR.4.1). Therefore, in general,

parents/caregivers want their students to have a richer mathematical learning experience than they were afforded, but they are ill-equipped to support that kind of learning at home.

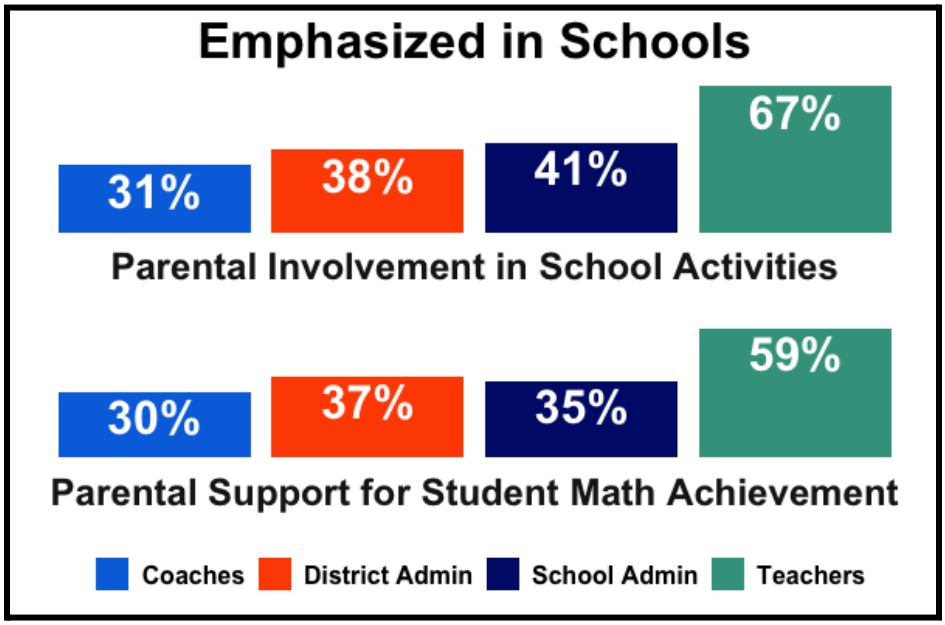


Figure 11. Proportion of K-12 teachers (N = 694), coaches (N = 100), school administrators (N = 71), and district administrators (N = 52) reporting on the survey whether parental involvement is emphasized in their schools.

An additional take-away point from the excerpt above is when the parent says "we need to give parents/caregivers the tools to be involved in their children's education." Parents and caregivers have deep desires to be involved, but as can be seen in the survey of K-12 teachers, coaches, and school and district administrators, when asked about how much parental involvement is emphasized in their schools, it was generally quite low (see Figure 11). Furthermore, when parents/caregivers were asked about their comfort level engaging with their student at home or with teachers or administrators, only 49% reported they were comfortable helping their student with mathematics homework, and only 45% reported feeling comfortable talking with their student's teacher about how they teach mathematics (see Figure 12).

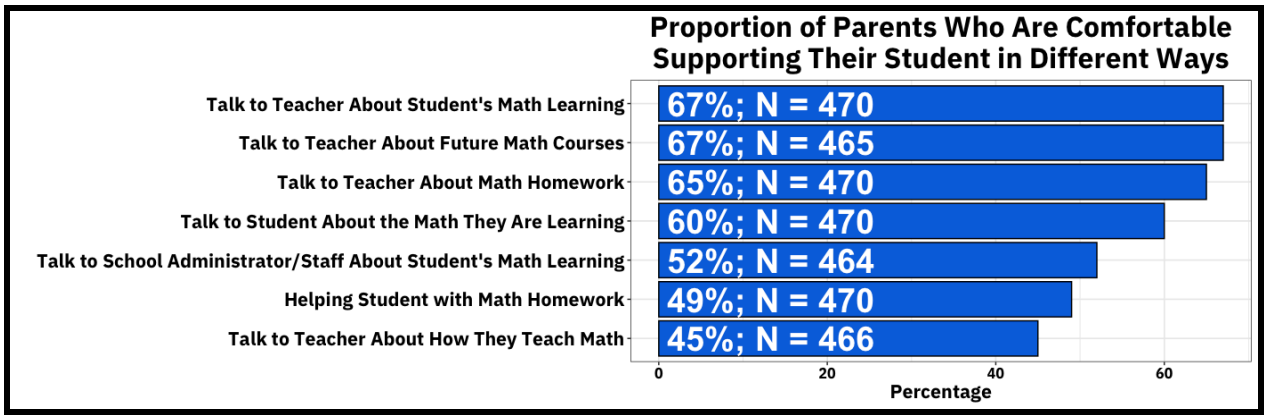


Figure 12. Proportion of parents/caregivers (N = 481) reporting that they are comfortable engaging with their student, teacher or school about mathematics learning.

During an interview, one Florida House of Representatives District Representative reflected on the challenges parents/caregivers face in supporting mathematics learning at home, saying:

> *"You know, the one thing I wish I could do, and I want to do, is us creating more, putting more resources behind the professional development for our teachers when it comes to math—but not just for our teachers. I also think that we should look at a way to, how we can create math labs for parents. Because if parents can understand how to teach math, they can teach their children at home. It's the same thing we do for reading. I think we should look at that for math. I remember we used to have Saturday schools. What about us putting funding behind programs, or, with non-profit organizations, where parents can come on weekends to a math lab to show how to learn math? I think those are the type of things that we, as a legislative body, should be thinking about as we continue to become this huge, growing state—the third largest state in the union. I think, you know, we should take this extremely serious. (Florida House of Representatives, District Representative)*

The comparison to the kinds of support that exist across the state for reading was frequently commented on during focus group interviews, emerging 26 times across 15 focus groups. One school district leader stated it succinctly:

> *"There's always been a very big push with reading, and math has always been neglected. This is probably the first I've ever seen math start to get the forefront of any of this and it's beautiful to me. But it's always been neglected. Like, at every school, there's reading coaches, there's reading interventionists, there's all these*

things devoted to reading, which, don't get me wrong, reading is absolutely important, but there's nothing for math." (Florida School District Leader)

This observation of the differing levels of support was duly noted by teachers as well, with one elementary teacher commenting that "parent/caregiverss want to help, but they're just not able to. So then that creates a disconnect between the school [and parents/caregivers], and then the students at home." Another expressed a common sentiment from K-12 educators, stating that "parents are our natural allies, and so we need to learn how to work with them."

It is clear from all data sources that parents and caregivers want a richer experience for their students, they want to be involved, and all other stakeholders recognize the importance of parental involvement in a student's mathematical education. Moreover, all stakeholder groups recognized the need for widespread infrastructure to provide parents/caregivers and schools with the supports necessary to overcome the challenges and actualize this vision of a rich mathematical experience outside of the school day. Such supports, as offered by stakeholder groups during focus groups, could include school and community mathematics events where parents/caregivers can experience the kinds of rich mathematical environments promoted in the Florida B.E.S.T. MTRs, such as family math nights or parent academies. Additionally, schools can provide direct support to parents and caregivers through informational flyers, videos, resource kits (e.g., manipulatives), and play-based activities. Finally, during focus groups, multiple stakeholder groups recommended that schools provide freely-available mathematics tutoring programs after school.

Early Learning and Its Role in Mathematics Education

Across all 13 focus groups with 48 early learning educators and administrators, all were asked about their perspectives on the challenges, success, and needs in relation to mathematics teaching and learning. Moreover, 1,324 early learning educators and 433 early learning center directors responded to survey items about their current experiences, perceptions, and needs.

Deepening Early Learning Educators' Mathematical Backgrounds and Experiences

Across all adult focus group interviews, stakeholders were asked to share a memory that has stuck with them about their time learning mathematics across K-12. In general, there were slightly more positive memories than negative ones, with K-12 teachers expressing positive memories 42 times and negative memories 32 times. However, among early learning educators and administrators, not only were there nearly twice as many negative memories

about learning mathematics as positive memories (32 vs 17, respectively), but there was at least one negative memory shared in every one of the 13 focus groups. In fact, when asked about how they use mathematics in their work, many of them initially struggled to express how they use mathematics because they didn't quite view it as a legitimate use of mathematics because of their prior experience in learning mathematics. For instance, one early learning director was explaining how they use lots of mathematics to manage budgets, complete travel reimbursement processes, and use formulas in spreadsheets. At the end of her explanation, she said "*it's also a different kind of mentality than sitting down doing math problems. It's more so helping your organization stay within their limit that they have to spend*." Despite the very real and legitimate use of mathematics that was being used to operate the early learning center, to her, using mathematics meant solving mathematics problems similar to what is traditionally included in a school mathematics curriculum where the focus tends to be on carrying out memorized procedures.

To further add to the backdrop of early learning educator and director perceptions and backgrounds in mathematics, among 1,097 early learning educators who responded to the item, 38.3% had no college or technical degree about two-thirds, 66.4% had no Bachelor's degree. In addition, gaining credentials also presented a challenge for early learning educators, with 58% reporting that they had obtained the Staff Credential from Florida Department of Children and Families, and less than half reporting other types of credentials (see Figure 13). Although nearly all survey respondents reported obtaining at least one credential, the number of credentials available, and the type of preparation they provide, creates a challenge for early learning centers in knowing what background they may be bringing. Finally, when asked how long they had been teaching in Florida, 27% of early learning educators reported less than one year, indicating that early learning educators are much more transient than K-12 mathematics teachers—among whom only 4% reported teaching in Florida for less than one year.

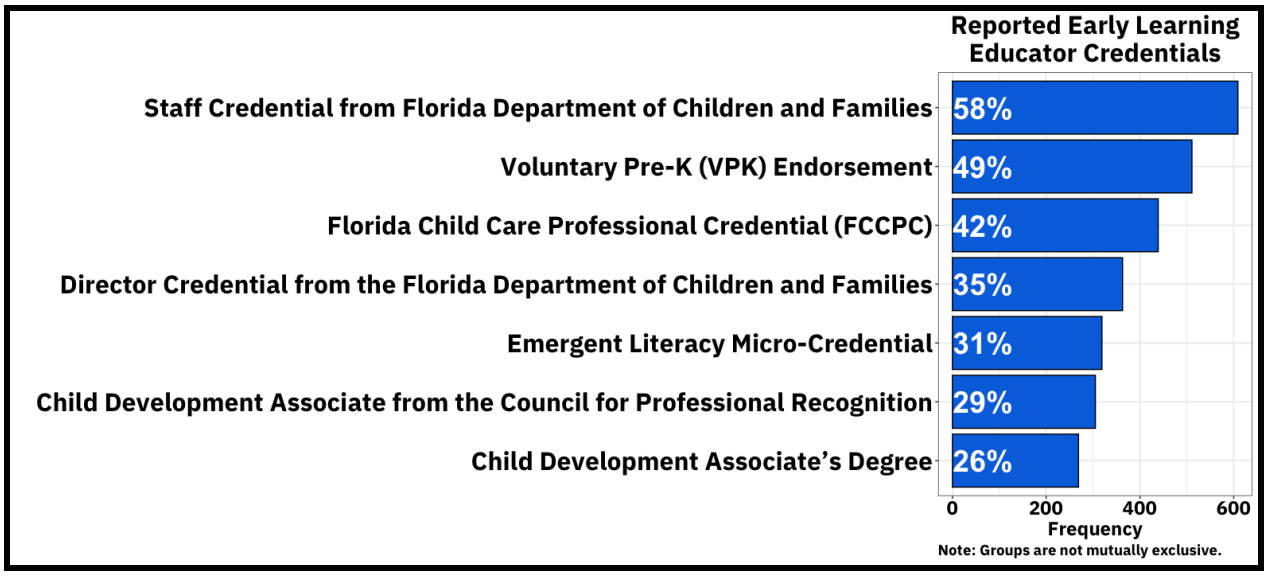


Figure 13. Proportion of early learning educators (N = 1043) reporting the credentials they hold (percentages do not sum to 100 because each person may hold multiple credentials).

Combining together the largely negative mathematics experiences with the lack of mathematics content knowledge and knowledge of teaching, and overlaid with the seemingly high turnover rate, it is not surprising that one of the most frequent challenges that early learning educators and directors discussed during focus groups was the lack of highly qualified teachers and professional learning opportunities to be able to enhance the mathematics education they provide to children, birth through age 5, in their centers. Indeed, 35% of early learning educators reported that they had not engaged in any professional learning in the past 3 years. Moreover, when asked about the kinds of mathematics-specific professional learning were most in need, early learning educators reported that their top needs were learning how to implement hands-on mathematics experiences (81%), how to facilitate activities that promote mathematical thinking (77%), and to deepen their knowledge of number, patterns, size, shape awareness, and the relationship between objects and space (73%). While reporting such wide-spread need for mathematics-specific professional learning, 51% of early learning educators reported that they would be able to spend no more than 3 hours *per month* on professional learning. Finally, when early learning directors asked what areas they needed more professional learning support, 50% or more selected each of the possible options, indicating that there is widespread need for all types of mathematics-specific professional learning. For example, consider the following quote from one early learning center director:

> *"The teachers we have coming in aren't strong on education. They're coming in starting for what we pay them, and then on top of that, they're not coming in with everything. Like, we don't have teachers coming in with Associate's degrees in*

literacy and teaching math, like, all of this is what we are teaching them to go inside the classroom and teach these kids." (Early Learning Center Director)

When asked about the ideal teaching and learning environment, early learning educators and center directors expressed a vision in which a love/enjoyment of mathematics was fostered in a student-centered, play-based, hands-on classroom where children could make sense of mathematics as connected to the world around them, and as they experienced the world through their interaction with it. These conversations typically included a recognition of the deep need for high quality professional learning, and these topics were ubiquitous, surfacing 70 times across 12 focus group interviews.

It is important to recognize that the lack of well-prepared educators and high quality professional learning is not due to a lack of recruitment efforts, or of center directors to provide professional learning opportunities, but rather is a result of the current landscape and existing infrastructure in place to support the statewide early learning education community in reaching these goals, as discussed in the next section.

Barriers and Opportunities to Enhancing Early Learning Educators' Mathematics Education

This section builds on the prior section that detailed the backgrounds and experiences of early learning educators and the challenges that brings to early learning centers. Across focus groups with early learning center directors, when asked about the challenges they face in enhancing the mathematics learning environment in their centers, the top two most frequent topics of conversation were meeting early learning center requirements and the limited funding available to operate the center. In general, there was concern about the expectations put on early learning educators, who lack training, to integrate standards, screen children, host conferences, attend required training, and be held accountable for how children perform on the assessment at the beginning of Kindergarten. Not only do these require additional operating costs so that a) the Center can adequately support educators through high quality professional learning, b) educators can be appropriately compensated for attending the professional learning, and c) educators can receive compensation that is commensurate with their background, experience, and responsibilities, but the next most common set of challenges early learning educators and directors was access to high quality quality professional learning and access to high quality instructional materials to support implementation.

Across focus groups, conversations about the need for high quality professional learning surfaced 41 times across 12 focus groups, while the need for high quality instructional

materials was discussed 23 times across 8 focus groups, with many of the conversations overlapping. In the quote below, one early learning center director is describing the challenge of finding a curriculum that can support early learning educators who do not have the mathematics instructional or content knowledge to modify and adapt curriculum so that mathematics is integrated across the school day in ways that align with the Florida Early Learning and Development Standards for Birth to Kindergarten (FOEL, 2017):

> *"Our curriculums need to have much more math component in it. Like I said, it's great that you [another focus group participant] have the math mind, you know, the background, but someone like myself, or one of the younger teachers that doesn't, we're having to go in there as directors of that and say, "Look, we need to try." And we don't have a problem doing that, but it would be really nice if these curriculums could actually embed more math than they already do, because there really is very little on that, and we need the training."* (Early Learning Center Director)

At this point, another early learning center director interjects, bringing to the surface a frequent issue in which early learning educators don't have adequate mathematical content knowledge of the mathematics they teach and why math is important to teach:

> *"And I really think the why behind that. We understand why we teach social-emotional skills. They understand why literacy is important. But they don't know. I, I can't tell you why math is important. I just have to follow the standards. But why do you need it every day?"* (Early Learning Center Director)

This presents a great challenge for early learning center directors who don't have access to, or adequate funding for, high quality instructional materials or high quality professional learning to support their educators to implement the rigorous Florida Early Learning and Development Standards for Birth to Kindergarten (FOEL, 2017). Moreover, these quotes further illustrate that even many directors don't have the deep mathematical instructional and content knowledge to support their educators and they are relying on the larger state-funded Coalitions to provide the professional learning, yet those Coalitions frequently do not have the capacity to support all the needs in their region. This is probably one reason why 35% of early learning educators reported on the survey that they had not engaged in any mathematics-specific professional learning in the prior three years.

Although the barriers to enhancing early mathematics learning are numerous, they present many opportunities. It is a positive finding that early learning educators and directors have deep desires to enhance their professionalism by deepening their instructional and content

knowledge to positively impact the students they teach. Therefore, funding support to provide access to high quality mathematics-specific professional learning, high quality mathematics instructional materials, and to adequately compensate educators commensurate with their responsibilities could make large changes to the quality of mathematics teaching and learning happening in early learning centers across the state, increasing childrens' opportunities to be Kindergarten-ready. Moreover, it would begin to address another frequent topic of conversation that emerged 16 times across eight focus group interviews: early learning educators desire to be respected as professionals and not be seen as babysitters.

Recommendations

Enhance Student Mathematics Learning Experiences Through High Quality Mathematics Professional Learning

Students expressed a shared desire to have an active, enjoyable, collaborative learning environment where they could make sense of real world, relevant mathematics. Students' vision of the mathematics classroom environment was shared by teachers, administrators, parents/caregivers, and business professionals, with the latter claiming that problem solving, collaboration, communication, and mathematical reasoning are vital mathematical skills to success in the workforce. To support teachers in achieving this vision of the mathematics classroom, which aligns with the Florida B.E.S.T. MTRs (FLDOE, 2020), teachers should be provided access to, and time to engage in, high quality professional learning focused on fostering this kind of mathematics classroom learning environment.

Enhance Student Mathematics Learning Experiences Through Access to High Quality Instructional Materials

In order to ensure successful implementation of high quality mathematics professional learning, teachers need access to high quality instructional materials that will promote an active, collaborative mathematics learning environment focused on real world, relevant mathematics problem solving situations that support students to make sense of, and reason with, mathematics.

Invest in Parent/Caregiver Mathematics Resources

Parents and caregivers frequently reported being unable to support their student's mathematics learning at home and feeling uncomfortable approaching their student's mathematics teacher to talk about how they teach mathematics, despite also expressing a

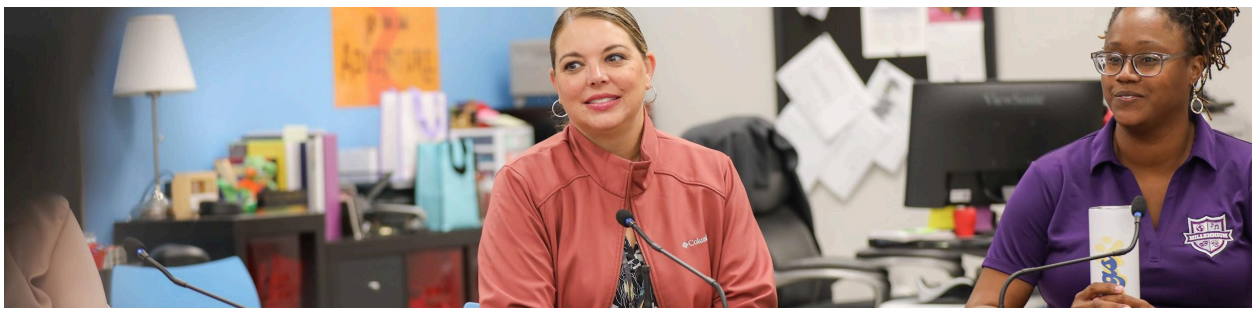
deep desire to be more involved and supportive. Furthermore, all other stakeholder groups recognized the importance of parent/caregiver involvement in students' mathematics education. Especially with a renewed focus on integrating the Florida B.E.S.T. MTRs (FLDOE, 2020), parents and caregivers are going to need even more resources and support to build capacity to support mathematics learning at home. Such supports should include ways of providing information and take-home resources, freely available after school tutoring for all students, as well as providing opportunities for parents and caregivers to experience the mathematics that their student experiences at school.

Build and Leverage School-Industry Partnerships

One finding was that there was a disconnect between how mathematics is typically taught and experienced by students, and how business professionals described using mathematics in the workplace. To enhance students' mathematics education experience and better prepare them to enter the workforce in which engagement in mathematics thinking and reasoning is ubiquitous, there are many opportunities for businesses to invest in schools through such things as internship programs and teacher training opportunities, building partnerships that create mutual understanding of one another's needs and challenges, thus situating students to have higher success rates after graduation as well as deeper knowledge of the types of college and career opportunities available to them.

Invest in Comprehensive Support for Early Learning Centers

Early learning educators and center directors widely agreed that there is immediate need for funding support and access to high quality mathematics professional learning and high quality mathematics instructional materials in order to support early learning educator capacity to implement the Florida Early Learning and Development Standards for Birth to Kindergarten (FOEL, 2017) and achieve the aim of Kindergarten readiness. Moreover, in order to retain early learning educators and adequately build capacity, funding is needed to increase compensation commensurate with the responsibilities and accountability standards they are held to—which rival those of K-12 teachers in many cases.



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