Motivation, Engagement, and Persistence in Math Study

K-12 Practitioner Panel
Online Journal Complete Findings
April 2023

Digital Learning Products (DLPs) are a promising means to supplement supporting student MEP outcomes but must be implemented in a way that considers equitable access and support for practitioners to know when to put them in action.

Digital Learning Products (DLPs) have great potential to support student MEP outcomes as they can address barriers such as lack of interest or feelings of shame in being behind.

For a teacher to leverage DLPs to support MEP, the tools must be financially accessible, there must be trainings to onboard teachers to the tools and show them how to use it and when, the school must have the technological and internet capabilities in place.

Through scaffolded structures so that students can learn at different paces or an ability to deliver real-time feedback, DLPs are a positive way to meet student learning needs in a way that also embraces technology that is such a significant part of their lives. Practitioners express that while they see improved outcomes in MEP, improved academic performance, or application of content as a result of DLP use, they still have some wariness about their implementation. Barriers to DLP to implementation include teacher training, access to technology, and questions of whether students are learning or just playing games.

If DLPs are a primary means to cultivate MEP outcomes, it will also be necessary to identify how to support schools in overcoming these barriers of accessibility. In a broader context of tension around practitioner agency, DLPs should be considered as one of many ways to facilitate student MEP and math teachers and coaches should be trusted to know when they will best serve the needs of math learners. Finally, it is important to recognize that while DLPs have great promise for improving student MEP and thus learning outcomes, they must be considered along side student needs and barriers to MEP such as home life and math mindsets.

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Motivation, Engagement, and
Persistence in Math Study

OVERVIEW

STUDY PURPOSE & CONTEXT

?

> **What are practitioner perspectives on student motivation, engagement, and persistence in the math classroom and how might this knowledge shape strategy of the C*MEP team?**

In Q1 of 2023, there was growing interest in the field to explore concepts of motivation, engagement, and persistence with math teachers *to better understand how these concepts present in the classroom and how curriculum can be developed,* and Digital Learning Platforms (DLPs) can be leveraged to support students' motivation, engagement, and persistence and eventually lead to better math outcomes.

Through a two-phase study approach, complete with an online journal, followed by in-depth interviews or focus group discussions, this study captures practitioner perspectives to inform ongoing explorations of Motivation, Engagement, and Persistence (MEP) in the math classroom.

Findings from this study will be used to improve the field's understanding of what Motivation, Engagement, and Persistence look like in the math classroom and how these learner states can be cultivated and maintained with the right Digital Learning Products (DLPs) and approaches. The following slides in this deck highlight emergent findings from Phase I of the study and identify potential areas of further exploration in Phase II.

PHASE	APPROACH
Pre-Study Work February 2023	Slack Pulse Check Questions
Phase I: Short-Term Questions April 2023	Align insights to date on math practitioner MEP definitions and perceptions to inform survey design Survey distributed to math practitioners
Phase II: Longer-Term Questions TBD	In-Depth Interviews or Focus Group Discussions*

PHASE I ENGAGEMENT
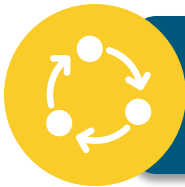
Who was eligible to participate and how many engaged in Phase I of the study?

This study began with an exploration of practitioner perceptions of Motivation, Engagement, and Persistence in a Slack pulse-check questions. Using pulse-check insights, math teachers and coaches, serving students from all grade bands and states, were invited to engage in Phase I by completing an online journal of multi-select questions and open-ended responses on MEP in February of 2023.

Of the 70 people who expressed interest to participate in the online journal, 53 participants were eligible to participate. Of those eligible, 42 respondents submitted a complete online journal responses.

Online journals took participants approximately 30 minutes to complete, for which they received an incentive of $50 to Amazon or PayPal. The following slides detail qualitative findings from the online journal analysis.
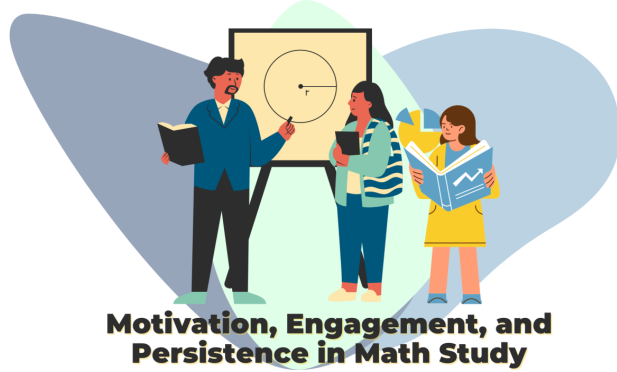
76% of people who expressed interest were eligible to participate

79% of people who were eligible to participate submitted responses

What role do study participants have at their school? (n=42)

Instructional Coach, 19%	Teacher, 81%

Motivation, Engagement, and Persistence in Math Study

PHASE I: INSIGHTS

MOTIVATION, ENGAGEMENT, PERSISTENCE IN THE CLASSROOM

"I believe that it is important for all students to feel successful in my math classroom. Motivation, engagement, and persistence are important criteria in the math classroom. It is okay for teachers to entertain students from time to time However, a teacher should not have to entertain students all of the time in order for them to learn. There has to be some intrinsic motivation within students so they will want to learn. They have to see themselves as active participants in the learning process."

-Middle School Math Teacher, California

This section explores (1) how math teachers and coaches observe motivation, engagement, and persistence in their math classrooms in contribution to working definitions for each concept, and (2) outcomes that are more likely to occur when a student is motivated, engaged, and persistent.

By understanding practitioner perspectives of MEP, we can better understand how to support development of products and services to contribute to MEP outcomes in ultimate contribution of student math outcomes.

Practitioners were asked to describe signs of student MEP. Qualitative theming revealed that practitioners relate similar "look fors" for MEP in student attitudes, actions + interactions, and comprehension.

STUDENT ATTITUDES	STUDENT ACTIONS & INTERACTIONS	STUDENT COMPREHENSION
• Practitioners describe student attitudes when they're **motivated** and **engaged** similarly. When students are motivated or engaged, they demonstrate positivity, enthusiasm, and excitement in their learning. • Practitioners describe **persistence** differently. When students are persisting, they demonstrate determination, stick-with-it-ness, and a sense of pride in their learning.	Practitioners described students' actions and interactions consistently between MEP. When students are **motivated**, **engaged**, or **persisting**, they are more likely to: • Be collaborative with their classmates, asking questions of each other or their teacher, and offering to help each other; • Make multiple attempts at a question and are more likely to try out different approaches to solve a question; • Actively follow along and remained focused and on task; • Actively use the related materials, tools, and manipulatives	Practitioners describe student comprehension across **MEP** as: • Students being willing to share their answers, demonstrating creative solutions, or attempting multiple paths to the same answer • Students wanting to correct their mistakes and ability to articulate what they're doing, why, and how to apply it • Students recall past learnings to help current problem and can make connections between what they're learning to real life

Cheering when I tell them we are going to play math games

Excited about math

Failure is okay...we are learning

Student explanations to peers

Asking how to fix "it"

Dry erase boards and markers collaboration

Applying work to real life

Not being content with 'just getting' an answer, they want to know why

Practitioners acknowledged that MEP presents differently across sub-populations in the classroom and that they must be attuned to unique signs of MEP in their own classroom context to tailor instruction and meet student needs in a way that is relevant for them.

Students of different cultural backgrounds may not express engagement in the same way – just because they are not making eye contact doesn't mean they are not engaged

Some student populations are more vocal than others and may show engagement through verbal contributions while others may be more reserved and show engagement by a willingness to work independently

SPED and ELL students may need supports in moving from engagement to motivation and persistence as they experience comprehension challenges while other students lack the social emotional learning to regulate and persist

"I love to see the students being excited and anticipating what to do and how to figure out, the calculations of a specific math problem. I find my ELL's are having some struggles with the word phrases, but when I break down the math vocabulary and use relevant examples it really helps."

-Middle School Math Teacher, California

"Some students listen and watch, think internally, in their heads, and need prompting to show their work. Students that lack strong reading skills tend to short-cut, and need prompting to show their work or try again."

-Elementary School Teacher, New Mexico

Overlapping insights about what happens when a student is motivated, engaged, or persisting reveal trends around MEP outcomes related to student attitude, mindset, participation, and progress.

	MEP Enables Student Changes			
	Attitude* Changes	**Mindset Changes**	**Participation Changes**	**Progress Changes**
When a student is **MOTIVATED:**	They exhibit more positivity, enthusiasm, satisfaction, more interest in learning, and increased confidence, self-efficacy, sense of purpose	They try multiple methods to reach a solution, use active and flexible thinking, experience deep understanding and can make connections between what they're learning and real-life	They are willing to engage in productive struggle; Focus and desire to work or put in effort; Asking questions	They have improved learning outcomes, turn in higher quality work, and achieve "eventual" success.
When a student is **ENGAGED:**	They experience more enjoyment in learning, exhibit more confidence, desire to share what they're learning with others	They move from answering questions to trying to understand the context more deeply and how to use the insights. They draw connections and use active thinking.	They exhibit less learning avoidance and more willingness to show their work, focus on building relationships, actively communicate, ask a lot of questions.	They turn in higher quality work, they retain what they learn better, have better comprehension, and can better self-assess their progress towards goals.
When a student is **PERSISTING:**	They increase their self-esteem and confidence boosts that appear as pride and satisfaction; Self-efficacy and determination	They use flexible thinking and try multiple paths to reach a solution.	They experience productive struggle and make more use of the available tools.	They make progress in their learning and understanding, overcome obstacles and challenges to reach academic success.

*Attitude = how students feel; Mindset = how students this; Participation = how students act; Progress = how students perform academically

The ways that teachers describe the cues and results of MEP are so similar that it lends to asking if rather than being distinct concepts they beget each other instead.

When students are motivated, they engage, and when they remain motivated over time, they persist in their engagement. Rather than focus on the cues of MEP, it may be more helpful to dive deeper into considering what the ingredients are that contribute to motivation, engagement, and persistence so that we can leverage them and help students achieve more positive academic outcomes. The way practitioners discuss MEP may indicate that they see motivation as a necessary condition for both engagement and persistence.

Rather than focusing on the manifestations of motivation, engagement, and persistence, organizations may instead focus on the outcomes of student attitudes, actions, interactions and comprehension that happens when students have a positive mentality, the tools to engage multiple methods and use flexible thinking, engage in productive struggle, and show signs of higher quality work and comprehension.

"Students wo are motivated are usually engaged throughout the lesson and enjoy the learning; they are usually persistent even when the concepts are difficult causing the teachers to go back or other motivated students to help. I have seen this in diverse population and subgroups for mathematics and other subjects. Motivation hugs engagement and keep student going when the concepts get abstract to make sure they are successful."

- Middle School Math Teacher, New York

CONTEXTS INFLUENCING MEP

"Students from families that encourage mistakes, because we can learn from our mistakes, can be more motivated and engaged. However, I have witnessed students from varying backgrounds who are persistent and willing to work because they love learning and thrive on the challenge."

-Elementary School Teacher, Idaho
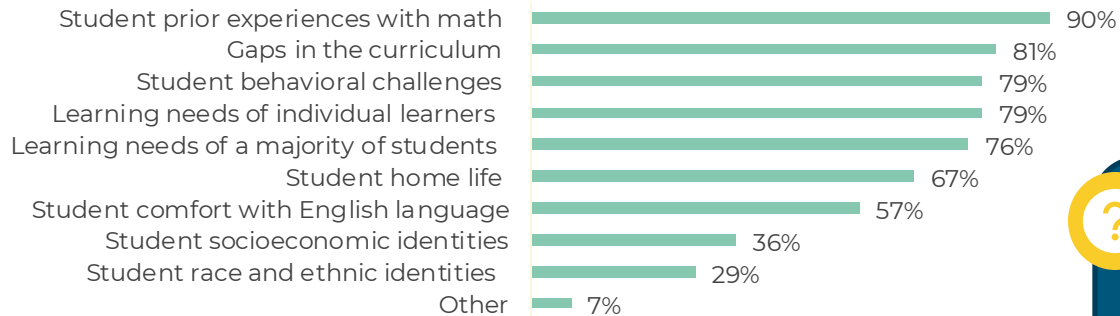
This next section looks at the contexts and, specifically, barriers students experience that practitioners believe may influence a student's motivation, engagement, and persistence.

By better understanding these contexts and barriers, organizations can explore what it might look like to develop and/or modify products and services to address these contexts in support of better MEP outcomes.

Practitioners cited that it is most important to consider a student's prior experiences with math, the limitations of a curriculum, and student behavior challenges when working to cultivate motivation, engagement, and persistence in the math classroom.

Most Important Contexts to Understanding when Fostering MEP in the Math Classroom (n=42)

Context	Percentage
Student prior experiences with math	90%
Gaps in the curriculum	81%
Student behavioral challenges	79%
Learning needs of individual learners	79%
Learning needs of a majority of students	76%
Student home life	67%
Student comfort with English language	57%
Student socioeconomic identities	36%
Student race and ethnic identities	29%
Other	7%

Other Context Important for MEP: Inclusive of best practices to show how to do the math step by step; Consideration of overall impressions of education by students and their families; How comfortable the teacher is with the subject.

"Personal connections and safety are the keys to getting students to want to work with you and persevere.."

-Middle School Math Teacher, Arizona

Practitioners saw student socioeconomic and racial/ethnic identities as *less important contexts* for fostering MEP, which contrasts findings in previous studies where culturally relevant and relatable content was identified as crucial for facilitating positive math learning environments. Deeper exploration of the role culturally relevant and relatable content plays in fostering MEP may be explored in Phase II of this study.

Most commonly cited barriers to student MEP include challenges with comprehension, a student's home life, and math mindsets.

Primary Barriers to Student MEP + Look Fors

Difficulties with academic comprehension, missing key skills they should already know, and struggling to engage

- ELL students struggling to keep up; Students lacking the reading skills necessary to engage with content; Students lacking prerequisite skills or appropriate math vocabulary

"Lack of skills lack of prior knowledge and understanding of pre-requisite math skills."

- Elementary School Teacher, Wisconsin

Home life contexts that make engaging challenging for students

- Personal needs not being met; Student is distracted by home life; Struggles to keep up due chronic absenteeism or lack of sleep at home

Low self-esteem, lack of self-confidence, and fear of failure make students not want to engage with content

- Negative self talk, learned helplessness, struggles with grit, not wanting to look like a nerd in front of peers

"Hunger/trauma and years of failing because of the lack of skills lack of prior knowledge and understanding of pre-requisite math skills."

- Middle School Math Coach, New York

*Themes are presented in descending order of frequency.

Other frequently mentioned barriers to student MEP include a lack of interest in math or behavior issues, lack of caregiver support, learning contexts, and practitioner negative math talk.

Secondary Barriers to Student MEP + Look Fors

Lack of interest and engagement, SEL and regulation challenges, and other behavior issues	· Students are not willing to engage with the content and struggle with the emotional intelligence to self-regulate and maintain sense of grit; Instant gratification culture reduces willingness to keep trying; Ongoing behavior issues following Covid-19
Lack of caregiver support and encouragement in the math context	· Parent bias towards math is translated to the student; Lack of encouraging language around math at home
Learning context isn't engaging and supports are lacking	· Curriculum or classroom lacks fun, real-world learning; Classes are too big for teachers to offer adequate support; Classrooms don't have the necessary technology and digital learning supports
Practitioner use of negative talk and lack of quality of teachers	· Teachers use negative math talk or limit student belief in their own abilities; Teachers lack math knowledge to effectively scaffold and teach students

"Students do not seem motivated to learn. Students lose focus easily and become frustrated when work is challenging. Students will often give up and "pretend" to work in the hopes that they will look busy and not be call on to answer questions.

- Elementary School Teacher, Florida

? When considering the barriers student motivation, engagement, and persistence, it is necessary to consider the implications of equity on learning experiences and challenges. Phase II may further explore how tools and approaches can help improve student MEP with an equity-centered lens of inquiry.

*Themes are presented in descending order of frequency.
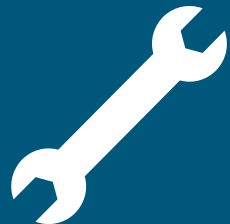
TOOLS AND APPROACHES FOR FACILITATING MEP

"Some programs give instant feedback, which helps with motivation, engagement, and persistence. Some programs allow students to engage in ways when they would normally stay silent. Some programs keep the fun level up, which increases motivation and engagement. There are also so many programs that can help students see things in new ways, learn on their own, and look up help on things they don't understand which creates persistence."

- Middle School Math Teacher, Arizona

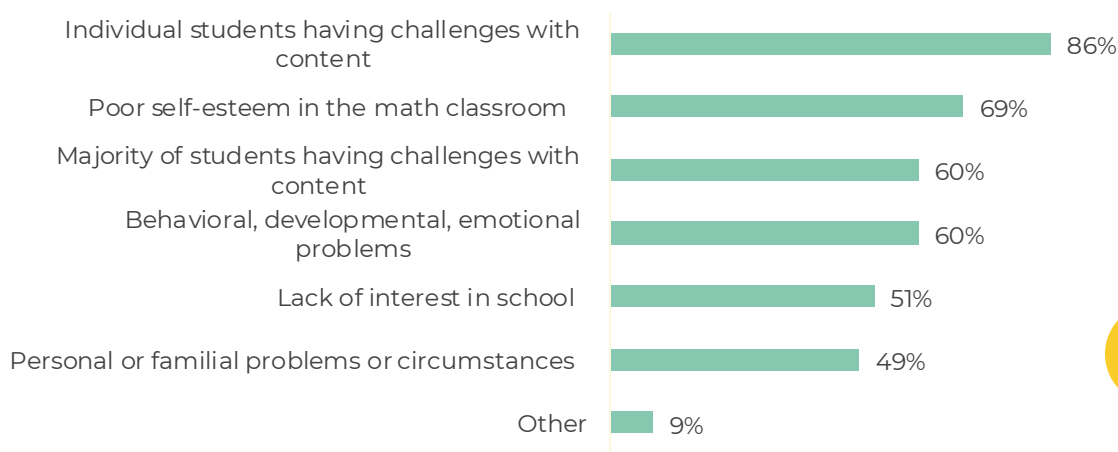**This section considers how teachers might use tools, specifically Digital Learning Products (DLPs), to support student motivation, engagement, and persistence.**

Findings in this section uncover strengths and opportunities among the current tools and approaches practitioners have available. This data can help inform how future tools and approaches can be designed effective in supporting MEP outcomes.

Practitioners most often look to tools and approaches to facilitate MEP when individual students are struggling with content or have lower self-esteem in the math classroom.

Contexts Where Practitioners Use Tools and Approaches to Meet Unique Learner Needs (n=35)

Context	Percentage
Individual students having challenges with content	86%
Poor self-esteem in the math classroom	69%
Majority of students having challenges with content	60%
Behavioral, developmental, emotional problems	60%
Lack of interest in school	51%
Personal or familial problems or circumstances	49%
Other	9%

"I am always showing my students other strategies that I know and was taught to me when I was in school. I also try to find fun and engaging sites/apps to get students excited about learning."

- Elementary School Teacher, Idaho

? As practitioners identified contexts for tool use to support MEP in a multi-select format in this phase of the study, Phase II will aim to explore contexts from an equity angle such as how tools can help improve MEP for underserved students.

Teachers know that their tools and approaches are helping to improve student MEP because of observable changes in students' academic performance and of change in students' mindsets towards math.

Evidence that Tools and Approaches Improve MEP in a Math Context + Look Fors in Action

Academic performance	Math mindsets and action	Relationships and interactions	Feedback and student demeanor	Interactions with tools/approaches
• Mastery of a lesson or content area • Improved data from exit tickets and tests • Completing work • Formative and summative data	• Less apprehension towards math learning • A willingness to correct mistakes and possessing the knowledge to do so • A comfort with asking questions • Needing less assistance because they understand the content • Excitement and improved confidence	• More conversations with peers where they ask questions and offer advice • Classroom culture is one where students cheer each other on	• Students share that they enjoy coming to class or using a specific tool or approach • Student voice surveys • Staying on task	• Students ask to use the tools on their own time or ask to do certain activities again • Students express a desire to spend more time on sites/with tools

Quotes below demonstrate ways that teachers and coaches know that tools and approaches improve student MEP.

Evidence that Tools and Approaches Improve MEP in a Math Context + Look Fors in Action

"I am accustomed to a small classroom where students sometimes work on individual and whole-group concepts. With this population, I am able to see different results from tools and approaches. Some students may provide feedback and be eager to demonstrate math concepts outside of math class. I am able to tell that a method has worked and see outcomes in motivation, engagement, and persistence. Within the class, when students are able to complete tasks without scaffolding or minimal assistance, I can see that approaches have been working.

- Elementary School Teacher, Maryland

"Students are able to explain their learning, solve problems independently. Students asking for certain activities. Students advancing in their skills, their math thinking and academic discourse. Students asking deeper questions. Asking why? Students working all class period long and surprised when time is up. Seeing student having pride in their work, realizing when learning is hard, and they are doing complex thinking."
- Middle School Math Coach, Kentucky

"I know the approaches I use are helping because I see an improvement in student work and less apprehension to math."

- Elementary School Teacher Georgia

Math teachers and coaches cited that digital learning products are most useful for supporting MEP due to their ability to support learning differentiation, make learning fun, and offer timely feedback to students.

Digital Learning Products (DLPs) help practitioners support MEP by:

1 Offering different entry points depending on learner proficiencies and allowing students to engage with content at their level and thus stay motivated rather than feel stigmatized for falling behind

2 Meeting students where they are and embracing technology as a tool; Making learning fun, stimulating, relatable, and engaging by incorporating interactivity, gamified learning, or animated visuals.

3 Enabling timely feedback for students and providing real-time data for teachers to indicate when a student or group of students may need redirecting or reteaching, which is empowering for learners.

4 Letting students learn at their own pace, which allows teachers more availability to offer 1:1 support to students who are struggling

5 Enabling students to have more repetition of a problem type if they are struggling in comparison to textbooks, which have more limited number of practice problems

6 Increasing equitable access to support that may not otherwise be available due to classroom sizes or individualized support necessary for students who are behind due to content challenges, home-life contexts, or more

*Themes are presented in descending order of frequency.

Quotes below demonstrate ways that digital tools help support student MEP.

Digital Learning Products (DLPs) help practitioners support MEP by …

> *"Easily leveling to my student's needs and levels of understanding, self-pacing, and creating a fun and safe environment for learning!."*
>
> - Elementary School Teacher, Idaho

> *"Differentiating the tasks to varying levels of complexity for all students to feel successful without them knowing."*
>
> - High School Math Teacher, Florida

> *"Creating fun ways for the students to learn and work at their own pace while I am able to see what they are doing and give instant or quick feedback, reteaching, or redirection."*
> - Middle School Math Teacher, Arizona

> *"Providing individual instruction time, immediate feedback, self-pacing, opportunities for custom learning paths, opportunities for video, more examples. Allow me time to work more one on one with students that need me and keep other students engaged."*
>
> - Middle School Math Coach, Kentucky

*Themes are presented in descending order of frequency.

Math practitioners cite using DLPs such as Desmos, Blooket, and Kahoot to facilitate student MEP but more insights are needed to understand what draws teachers specific to these tools.

Online journal participants were asked to share up to five tools or approaches that they use to increase MEP in the math classroom. Qualitative coding and data cleaning revealed a list of digital tools that math teachers and coaches use in the classroom to encourage MEP.

When responses were broken down by grade band, Desmos, Digital Boards, iReady, and videos were the most popular tools for middle-grade math practitioners
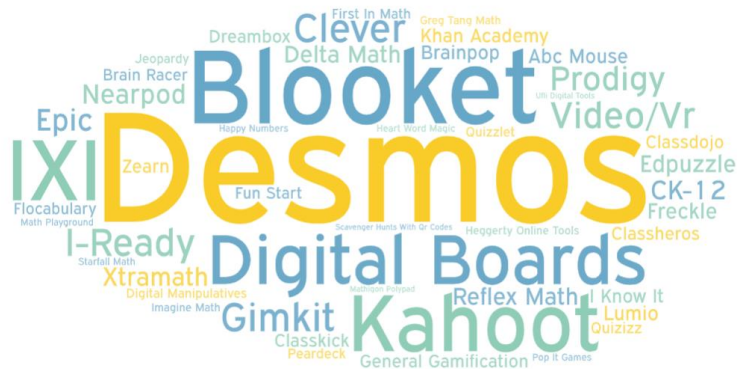
"Desmos helps create academic safety with their anonymous names and snapshot tools. Students are more motivated to participate because they know their peers won't see their name. GimKit has many different modes of gamified practice to engage students. Delta Math provides feedback quickly, as well as examples, videos, and detailed solutions. Students can also shoot for a goal of getting 5 problems correct, regardless of whether they need 5 tries or 15."

- High School Math Teacher, Kentucky

? Phase II will aim to uncover further insights around why teachers and coaches select different digital tools and experiences of MEP from caregivers and student perspectives.

CONSIDERATIONS FOR MEP TOOLS & APPROACHES

"Motivation, engagement and persistence are all connected and can only be remedied when we tap into students' social emotional needs and provide them with the skills or tools to make them successful. Also providing a pathway for all by tapping into their talents and using it to move forward so they can experience joy that will motivate them to be engaged and persist to alleviate the deficits."

-Middle School Math Coach, Texas

This final section examines some of the barriers that bar practitioners from using DLPs and identifies some of the ingredients that make a tool or approach successful in supporting student MEP.

By being aware of the barriers and ingredients teachers see as essential for a strong tool or approach, organizations can develop more effective and equitable products and services.

Approaches to increase MEP are <u>most effective</u> when students and teachers are bought into the approach and content meets students where they are.

When MEP approaches are <u>most effective</u>, they:

Build on student buy-in for a particular approach	**Are grounded in a teacher's own buy-in for an approach or a method**	**Consider ways to meet students where they are in their abilities and lived experiences**
· Students appearing excited, curious, and like they want to see what will come next	· A teacher having a positive teacher attitude and an energy that transfers to the students	· Content that relates to students' lives and experiences and is presented at an appropriate level for the students' abilities
Encourage collaboration between student and teacher and between peers as well as participatory learning	**Have a foundation of mutual trust and strong rapport between teacher and students**	**Provide a balance between consistent routine with novelty so students know what to expect but don't lose interest**
· A teacher who gives students choice in the math classroom and input in their learning context along with opportunities to support and learn with fellow students	· Clear communication between teacher and students and ongoing efforts to get to know students and their needs as well as student comfort in sharing these needs	· Students knowing what expectations are in the math classroom, have a typical routine, but experience some variation in instruction approach and day-to-day activities

*Themes are presented in descending order of frequency.

Approaches to increase MEP are <u>least effective</u> when they are not tailored to meet the needs of students and when the learning context is too consistent.

When MEP approaches are <u>least effective</u>, they:

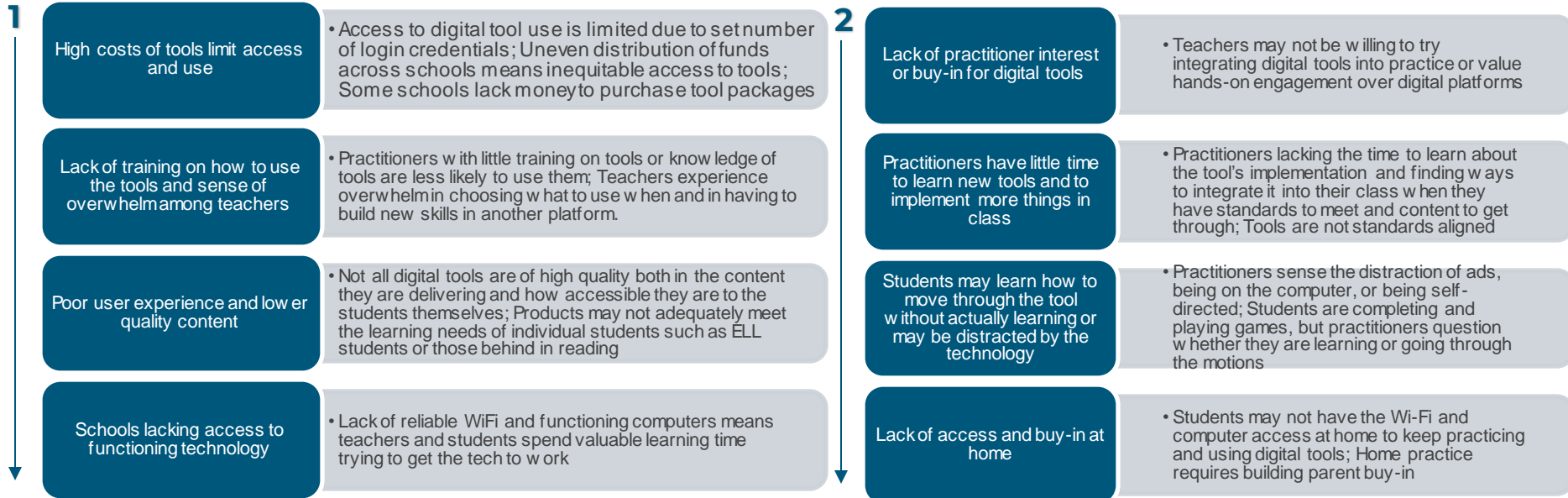|		
Are prescribed without adjustments and where students are not offered choice in how to engage or adequate instructions	**Are overused and stale or when the tools are used inconsistently and students don't have the opportunity to get the hang of them**	**Don't acknowledge student math identities and bad prior experiences with the subject, a tool, or a specific approach**
· Teachers using tactics from a textbook without adjusting them to student contexts, abilities, or learning needs or not providing students enough choice in the classroom; Students getting lost or being disinterested	· A lack of balance between students' need for consistency and their desire for novelty; Repetitive use of tools and approaches; Constantly switching tools and approaches	· Students experiencing low expectations in other classrooms, them seeing an approach as a waste of time, or not having experience with productive struggle and shutting down
Are up against disruptions to instruction	**Don't facilitate student buy-in and a learning context that is meaningful to students**	**Lack a teacher's enthusiasm for the approach or content**
· Student behavior issues, technology interruptions, or chronic absenteeism	· Students struggling to find meaning or relevance in the approach or are not experiencing interactive learning and check-out	· Teacher struggling to elicit engagement from students or an interest in trying an approach

*Themes are presented in descending order of frequency.

The biggest barriers to practitioner use of digital learning tools to encourage MEP are the cost of these tools and access challenges as well as the training needed to implement them effectively.

Barriers to Implementing Digital Learning Tools to Facilitate MEP + Classroom "Look Fors"

1

High costs of tools limit access and use	• Access to digital tool use is limited due to set number of login credentials; Uneven distribution of funds across schools means inequitable access to tools; Some schools lack money to purchase tool packages
Lack of training on how to use the tools and sense of overwhelm among teachers	• Practitioners with little training on tools or knowledge of tools are less likely to use them; Teachers experience overwhelm in choosing what to use when and in having to build new skills in another platform.
Poor user experience and lower quality content	• Not all digital tools are of high quality both in the content they are delivering and how accessible they are to the students themselves; Products may not adequately meet the learning needs of individual students such as ELL students or those behind in reading
Schools lacking access to functioning technology	• Lack of reliable WiFi and functioning computers means teachers and students spend valuable learning time trying to get the tech to work

2

Lack of practitioner interest or buy-in for digital tools	• Teachers may not be willing to try integrating digital tools into practice or value hands-on engagement over digital platforms
Practitioners have little time to learn new tools and to implement more things in class	• Practitioners lacking the time to learn about the tool's implementation and finding ways to integrate it into their class when they have standards to meet and content to get through; Tools are not standards aligned
Students may learn how to move through the tool without actually learning or may be distracted by the technology	• Practitioners sense the distraction of ads, being on the computer, or being self-directed; Students are completing and playing games, but practitioners question whether they are learning or going through the motions
Lack of access and buy-in at home	• Students may not have the Wi-Fi and computer access at home to keep practicing and using digital tools; Home practice requires building parent buy-in

*Themes are presented in descending order of frequency.

The quotes below highlight the barriers that teachers and coaches elevated to using digital tools support student MEP.

Barriers to Implementing Digital Learning Tools to Facilitate MEP + Indicators

"Acquiring the right program for student diversity or scheduling issues, and how to differentiate using the online tools."

- Middle School Math Coach, New York

"Reading comprehension for students to understand how to use the program on their own."

- High School Math Teacher, South Carolina

"Teachers believing they don't need to continue to learn, they are good enough."

- Middle School Math Coach, Kentucky

"Uneven distribution of funds across schools."

- Elementary School Teacher, Tennessee

"Students outsmart whatever app/system instead of actually learning material."

- Elementary School Teacher, Florida

*Themes are presented in descending order of frequency.

Many practitioners expressed wariness of a blanket acceptance of digital tools as useful for encouraging MEP and cite that tools require training and should be considered as an option among approaches but not always the best solution.

Almost half of practitioners said digital tools need to be used with caution or felt that they don't help teachers foster MEP. To these practitioners, tools are only as good as their users and need to be implemented intentionally. While tools may help with persistence, they don't inherently ensure student engagement, motivation or learning.

Digital tools are one option among many and the value of physical games and manipulatives, songs and real-life examples to solidify learning, and group work to facilitate MEP should not be overlooked.

? Findings may indicate a need for further exploration in Phase I around the support that practitioners need in selecting digital tools for fostering MEP and knowing the circumstances when they will best benefit underserved students.

"Digital products are simply a vehicle of content. Motivation, engagement, and persistence are fostered through human interaction and relationships. They are the result of teachers carefully planning activities, tasks and moments in a lesson where students get to build relationships with each other while overcoming challenges in the math classroom. It is one of the most challenging and beautiful aspects of teaching, and it can take years to become really good at the nuances of how to approach different children with diverse needs when it comes to their motivation and engagement."
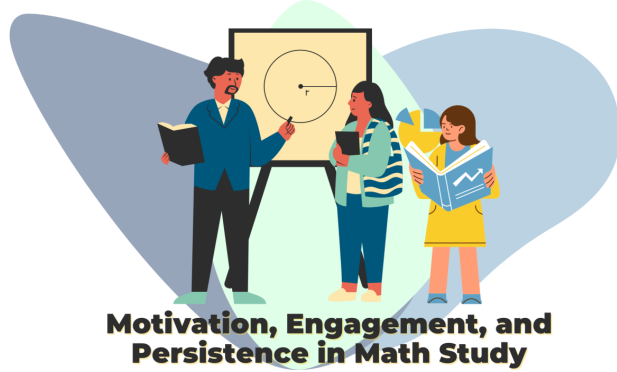
- High School Math Teacher, Washington

Digital Learning Products (DLPs) are a promising means to supplement supporting student MEP outcomes but must be implemented in a way that considers equitable access and support for practitioners to know when to put them in action.

Digital Learning Products (DLPs) have great potential to support student MEP outcomes as they can address barriers such as lack of interest or feelings of shame in being behind.

For a teacher to leverage DLPs to support MEP, the tools must be financially accessible, there must be trainings to onboard teachers to the tools and show them how to use it and when, the school must have the technological and internet capabilities in place.

Through scaffolded structures so that students can learn at different paces or an ability to deliver real-time feedback, DLPs are a positive way to meet student learning needs in a way that also embraces technology that is such a significant part of their lives. Practitioners express that while they see improved outcomes in MEP, improved academic performance, or application of content as a result of DLP use, they still have some wariness about their implementation. Barriers to DLP to implementation include teacher training, access to technology, and questions of whether students are learning or just playing games.

If DLPs are prioritized as a primary means to cultivate MEP outcomes, it will also be necessary to identify how to support schools in overcoming these barriers of accessibility as they more significantly impact schools with underserved student populations. In a broader context of tension around practitioner agency, DLPs should be considered as one of many ways to facilitate student MEP and math teachers and coaches should be trusted to know when they will best serve the needs of math learners. Finally, it is important to recognize that while DLPs have great promise for improving student MEP and thus learning outcomes, they must be considered along side student needs and barriers to MEP such as home life and math mindsets.

Motivation, Engagement, and Persistence in Math Study

NEXT STEPS

NEXT STEPS | Opportunities

> **Phase II of explorations in spring / summer of 2023. Phase II will build on learnings from Phase I and subsequently the questions and areas of further exploration that emerged.**

In addition to providing further insight into the motivations behind DLP selection and use, there is potential to align learnings around MEP from the practitioners and caregivers of the Community Insights Network, math teachers within the Teacher2Teacher network, and student MEP experiences gathered by BUILD and elevate across these networks what still needs further exploration in the MEP space.

Possible further areas of exploration may include the following:

- What instructional practices do teachers use to support students' MEP and learning when using digital products?
- Do teachers believe that products that incorporate guideline recommendations for priority quality domains can encourage instruction and classroom experiences that increase students' MEP?
- How, if at all, do principals purchasing DLP access and supplemental materials consider quality domains or contexts that facilitate MEP when making their decisions?

- What might practitioners be able to reveal about the equitable access to DLPs and what might it take to work toward improved access?
- When do teachers and coaches gravitate towards specific DLPs to facilitate MEP and what are the experiences of learners and their families are with these tools?
- To what extent can learnings from ongoing Math Mindsets work be applied to and build upon with further exploration of MEP outcomes and DLPs?
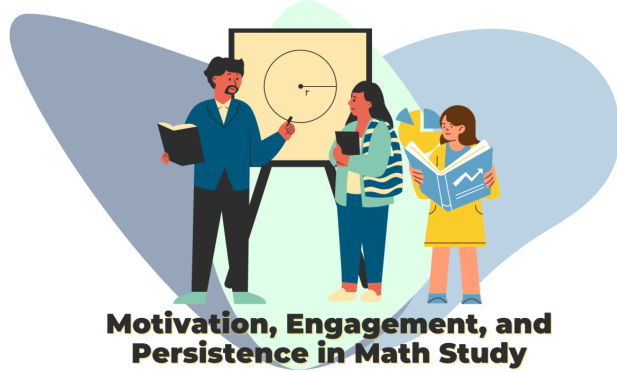
Motivation, Engagement, and Persistence in Math Study

APPENDIX

STUDY APPROACH | Learning Questions
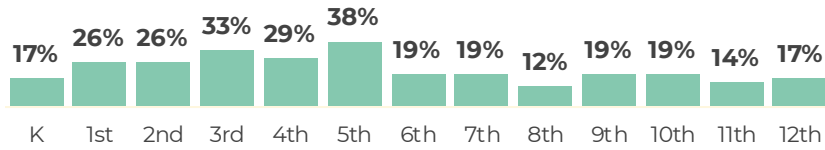
Phase I: Online Journal (COMPLETE)

- What elements of CMEP definitions do teachers see as most important/impactful to students' math experiences and learning?
- What classroom situations do teachers associate with students being motivated/engaged, or demotivated/disengaged?
- What elements of students' personal contexts do teachers think are most important to understand to foster students' MEP? (E.g., identities, experiences outside of school, and/or prior knowledge)
- What do teachers think are the most important learning environment supports/barriers to fostering students' MEP? (E.g., school or district policy, lack of time, limited professional development)
- In what ways do digital learning products help teachers support students' MEP? (E.g., automate repetitive tasks, provide feedback and insights, directly support students' growth mindset, scaffold tasks, provide suggestions of when and how to intervene)

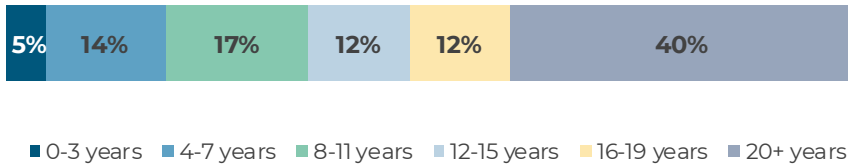**Phase II: In-Depth Interviews or Focus Group Discussions**

- What instructional practices do teachers use to support students' MEP and learning when using digital products?
- Do teachers believe that products that incorporate guideline recommendations for priority quality domains can encourage instruction and classroom experiences that increase students' MEP?
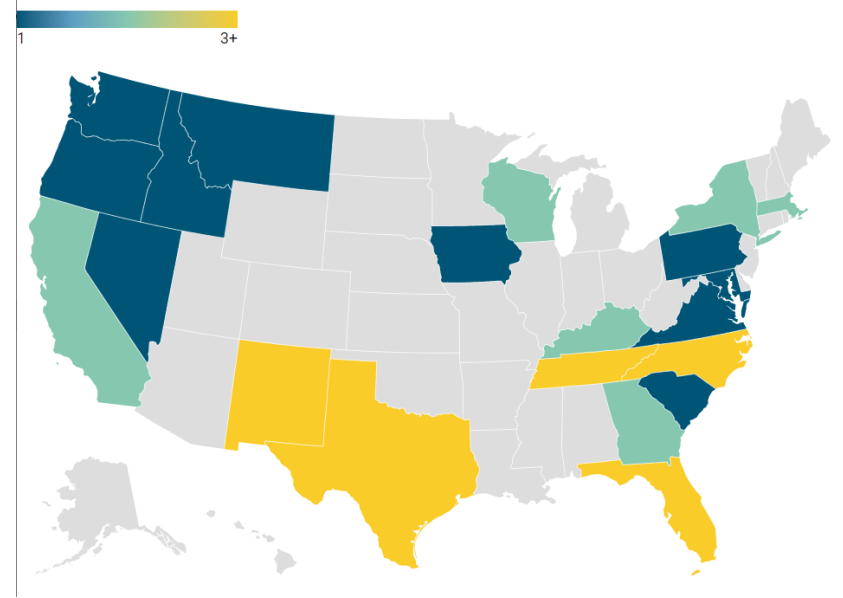
STUDY APPROACH | Participant Demographics

Grade Levels of Students Most Frequently Worked With (N = 42)

K	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
17%	26%	26%	33%	29%	38%	19%	19%	12%	19%	19%	14%	17%

Years in Current Role (N = 42)

5%	14%	17%	12%	12%	40%

■ 0-3 years ■ 4-7 years ■ 8-11 years ■ 12-15 years ■ 16-19 years ■ 20+ years
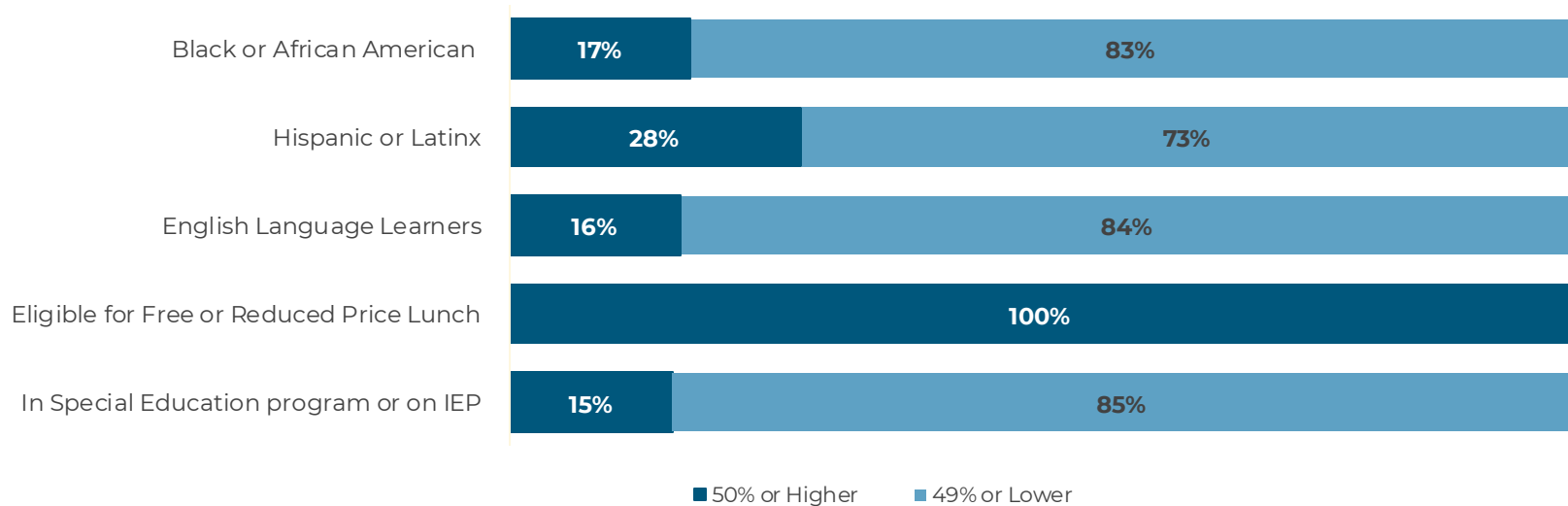
C*MEP Participation by State

1   3+

STUDY APPROACH | Participant Demographics

Percentages of participants working with student populations at or above 50% in the following demographic groups

Demographic Group	50% or Higher	49% or Lower
Black or African American	17%	83%
Hispanic or Latinx	28%	73%
English Language Learners	16%	84%
Eligible for Free or Reduced Price Lunch	100%	
In Special Education program or on IEP	15%	85%

■ 50% or Higher ■ 49% or Lower

THANK YOU!