8. Differentiation

Why?

All math teachers struggle with two big concerns:

1. Meeting the needs of ALL learners
2. Supporting students who are continuously struggling, or coming in years behind their grade level standards and skills.

Most commonly, teachers attempt to remedy this through two methods:

1. All Homogenous Groupings (i.e. tracking)	
Every school gets a wide range of mathematics learners - this will never end. It is understandable that most schools address this with homogenous groupings (i.e. grouping the “best” math students together, etc.). However, research shows us that this is ineffective. There is no subject that is more homogeneously grouped than math. The reality is that kids come into every grade with widely different abilities (on both the low end and the high end) in mathematics. Most schools react to this by placing students into different tracks. The research shows, however, that this has negative gains for students on all ends.	*Why does the research say that homogenous groupings are ineffective?*
2. Thinking of math as a linear ladder of growth:	
How do you deal with kids who are in 9th grade and can’t solve basic multiplication? Kids struggle for many reasons (language, language processing, emotional struggles, cognitive struggles). A mistake we make is thinking of math in each grade level year as a ladder of growth. Rather we should	*Why is the ladder myth a mistake? Isn’t math linear?*

be examining curriculum within domains, and differentiating within those domains as well. This does not mean the 9th grader who can't multiply shouldn't be made aware and supported in that domain, but it also shouldn't stop this 9th grader from thinking deeply about other areas of mathematics as well.	

These two mistakes and the constant chorus of teachers and students feeling frustrated with mathematics differentiation make this a crucial area for all schools to explore more deeply.

The cycle of "I'm not a math person" is perpetuating as we struggle to support all learners (See Recommendation #1) so this work is crucial to tackle as a full school team.

What?

EL Education's Core Practice 19 lays out the detailed vision for differentiation within EL Education schools.

School-wide structures for differentiation are essential in order to ensure equity for students and clarity and support in planning for teachers. See the table below for a big picture summary of some whole school and classroom-based differentiation structures (with associated resources from within EL Education) that are particularly salient to mathematics systems. These tools are meant to define the what and why of differentiation practices. Read on below this chart for the nuances of *how* to implement these systems for mathematics.

Structure	Further Unpacking / Research / Tools:	Implications for Math
School-Wide Structures: ● Heterogeneous Classrooms: School leaders ensure that students with disabilities and advanced learners are taught in general education classrooms to the greatest extent possible. ● Structures Within School in Place for Interventions: School leaders ensure that the continuum of services is available based on the needs of the student population.	● See here for the Terrain of Differentiation as defined commonly by the three tiers of intervention: ○ All Students: Whole Group Instruction ○ Most Students: Intervention and reteach based on need, often in small group	The most commonly tracked subject in any school is mathematics. Our goal is more intentional planning for all learners in context of their heterogeneous classroom, not tracking.

These services should be provided via push-in as much as possible.	○ Very Few Students: Small Group, at times modified curriculum	
Whole Class Instruction: ● Heterogeneous teaching (same learning targets, same curriculum, same classroom, same-age peers to the greatest extent possible) ● Employing flexible grouping ● Provide small group (most students) support when needed through flexible groups ● Providing multiple pathways for meeting the learning targets based on student readiness	● Nine Principles of Differentiated Instruction Definitions ● Tiering Tasks ● Compacting (for advanced exceptional learners) ● The Who, What, Why of Differentiating Instruction, excerpt from Learning that Lasts Chapter 6 ● Differentiated Instruction Diagram ● Continuum of Interventions	Planning for math instruction must include identifying priority goals and learning targets for concepts and fluency goals. It must allow for focused supports through intervention and push-in/pull-out supports.

How?

In order to achieve the necessary whole-school and in-classroom differentiation structures for mathematics, teachers must have moved through the other stages of recommendations.

- They must have their own growth mindset about mathematics & planned for it in their classroom (Recommendation #2)
- They must have plans for instruction that allow for schoolwide visions for instruction (Recommendations #3 and #4)
- They must have the content and pedagogical knowledge to tier tasks, adjust complexity, create powerful anchor models, facilitate different ranges of discussion, create flexible grouping, etc. (Recommendations #5, #6, and #7)

Now that they and/or the school school is ready to begin to work on differentiation within mathematics, see the table below, adapted from Chapter 6 of Learning that Lasts for the pieces that must be considered:

General Differentiation

Leaders of their own Learning, examines deeply

What do Teachers Do? (*taken from LTL)*	What does this Mean For Math?

Build a culture of differentiation within the classroom.	• Differentiation of **content** (the mathematical models students unpack and own, the number size they work with, the complexity of a task) as well as **process** (the context of a problem, the models used in solving, the anchor charts available, the discussion or entry points to a lesson) must be considered the norm. (*See here for further unpacking of this idea with examples and tools for doing this work.)*
	"No one is good at everything, but everyone is good at some things."
	• The culture of the room must support the development of a growth mindset and a collaborative solving space.
	• For more on how to do this, see Jo Boaler's definition of a complex instruction classroom, which includes:
	  ○ Student Roles
	  ○ Assigning Competence
	  ○ Multi-Dimensionality
	  ○ Student Responsibility
	And find more in her book Mathematical Mindsets in Chapter 7

Gather detailed information about students' learning backgrounds, strengths, challenges, readiness, and interests, collaborating with other school professionals to do so.	• It is crucial to understand where students are currently engaging with mathematical concepts, fluency skills, and problem solving skills. • Benchmark or other forms of data collection (observation, work analysis, etc) must be employed to understand students capacities of all 3 areas of mathematics instruction such that respectful tasks and flexible grouping can be employed. • In order to do this schools must define their methods for this information collection, and the calendar (included in Recommendation #4) for this collection.
Develop standards-based student-friendly learning targets that all students work toward.	• With a large number of standards at all grade levels, teachers must be supported to prioritize, group standards, and craft clear, student friendly, and grade level appropriate targets. • This work can often happen in recommendation #4, however is one that needs constant maintenance. • Creating year long supports to track fluency and problem solving is one idea that has proven successful. See examples of this in sections C, and D of this document. • Creating unit overviews that clearly map long term targets with weekly check-ins can help drive tier 2 intervention grouping.
Develop appropriate scaffolding or extensions	• Choose from multiple supplemental resources (see Supplemental Resources) if choose additional scaffolds or extensions

to challenge, engage, and empower students. These might include technology that enhances differentiation.	
Form flexible learning groups to maximize the level of challenge and engagement.	• Use benchmark data and weekly check-ins to create flexible responsive groups to both long term problem solving and fluency goals as well as current unit content work
Embed student-engaged assessment at all points of the learning process.	• Provide regular feedback and support students to do so as well • Allow students to monitor their understanding of all aspects of mathematics instruction

Tier assignments
&
Offer students a choice of tasks based on their readiness
and/or interests.
	• As defined in the tool Tiering Tasks, create multiple entry points of tasks that allow for mastery on the same target.
	  ○ BOA example from MELS on Staten Island
	  ○ For resources see tasks from CPM, Robert Kaplinsky, Mapshell, Illustrative Mathematics, to name a few.
	• Additionally - and especially with middle elementary and lower elementary grades - the use of central math games (played with cards, game boards, or on technology devices) is a great way to support tiered experiences around a central concept for all and still provided a cohesive discourse.
	• See Graphic

Differentiate classroom management and socio-emotional learning.	• Crucial in mathematics classrooms as students may enter with past fixed mindset baggage or beliefs.