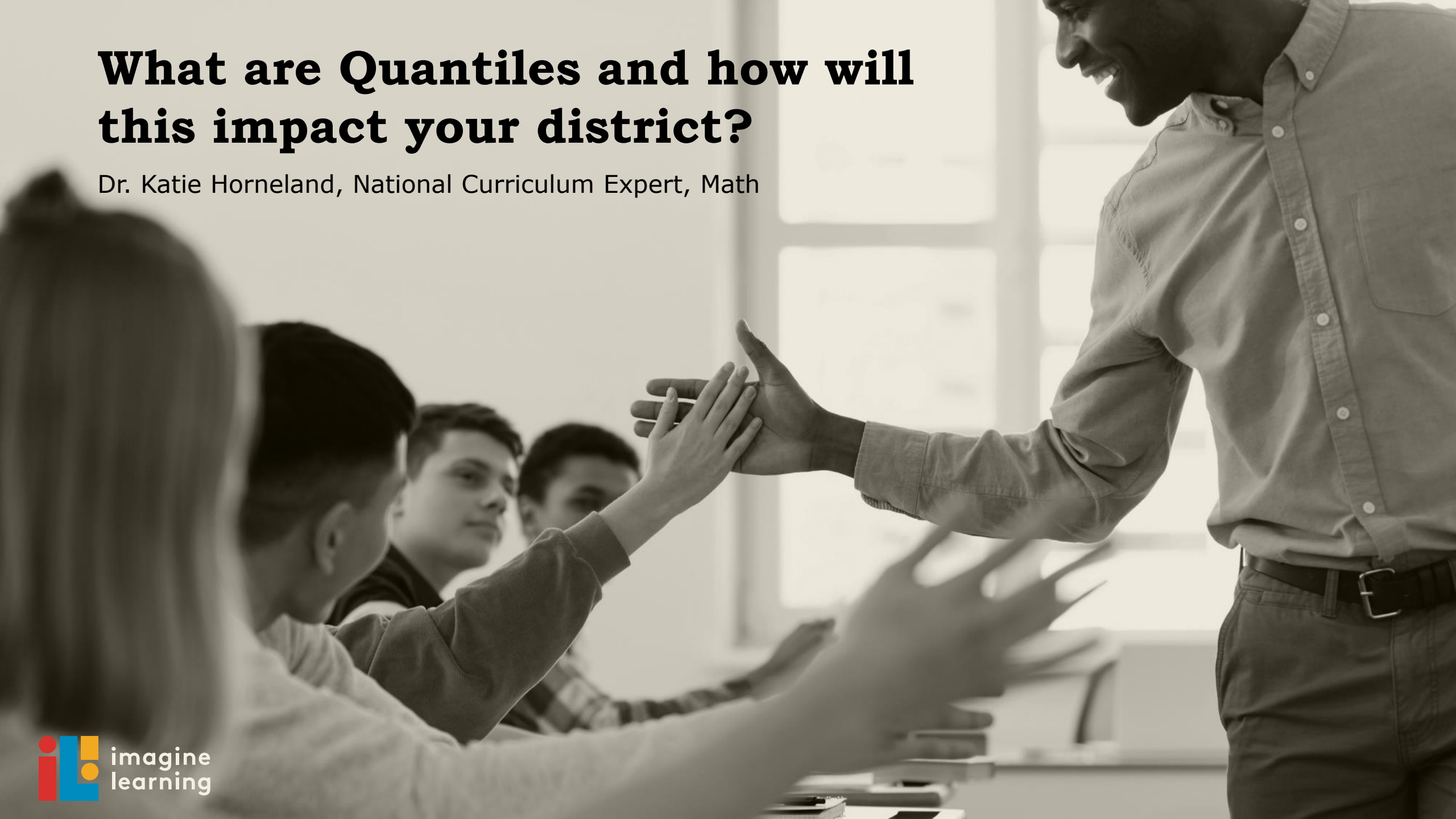
What are Quantiles and how will this impact your district?

Dr. Katie Horneland, National Curriculum Expert, Math



imagine learning

Agenda

- What is the Quantile framework?
- What can be done with Quantile measures?
- Monitor Quantile growth with Imagine Math

How many of you have used the Quantile Framework?

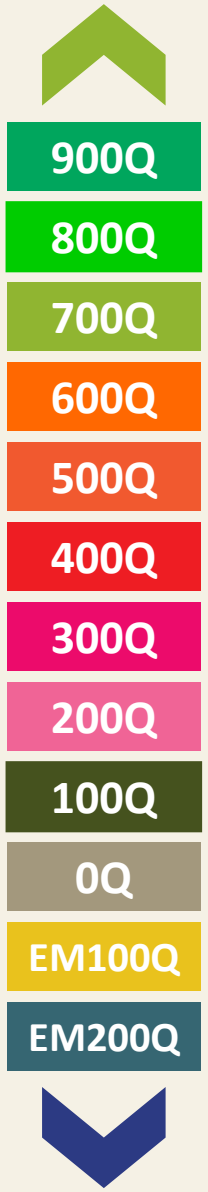
Wh tile

Scale Score

What is the Quantile framework?

Student Math Ability

- Student **readiness** to learn new mathematics
- Describe students' mathematical ability
- How a student is **growing** in math
- Each grade level includes a range of Quantile measures
- College & Career Readiness=1350Q



Math Skills & Concepts

- Range from below 0Q to above 1600Q
- Over 500 skills & concepts K-High School
- Higher the Quantile, the more difficult the material

700Q

- 1000Q *
- 900Q
- 800Q
- 700Q
- 600Q
- 500Q *
- 400Q
- 300Q
- 200Q
- 100Q
- 0Q
- EM100Q
- EM200Q

650-750

Quantile Skills and Concepts

Use scale factors to reduce and enlarge drawings on grids. 990Q

Use dimensional analysis to rename quantities or rates. 950Q

Convert measures of length, area, capacity, weight and time expressed in a given unit to other units in the same measurement system. 820Q

QSC233
Calculate unit rates to make comparisons.
830Q

Describe the probability of an event using a fraction or ratio. 440Q

Determine the ratio or rate of change of a relation given a table or graph. 810Q

Identify equivalent decimals and fractions at the symbolic level, including simplifying fractions. Explain the equivalence. 710Q

Write a ratio to compare two quantities. 390Q

Use proportional reasoning to solve problems. 530Q

Quantile Skills and Concepts

5.MD.C.4: Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.

Quantile Framework

Measurement

QSC630 Model the concept of the volume of a solid figure using cubic units.

480Q

What can be done with Quantile measures?

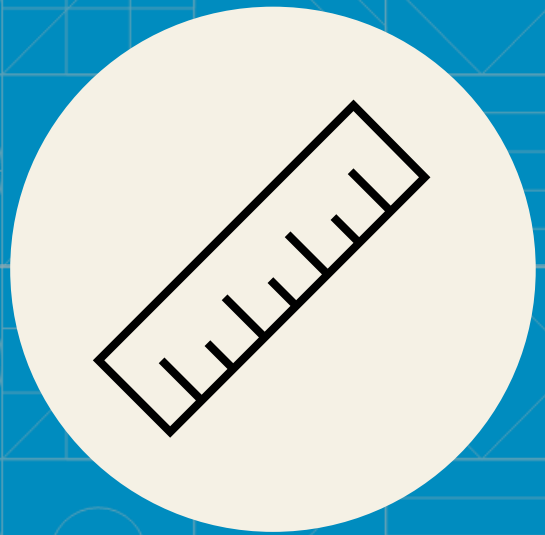
- Monitor and forecast growth toward college and career readiness: Where students are, where they are going and steps to get there
  - *Demonstrate the value of state assessments to stakeholders throughout their states*
  - *Differentiate math instruction*
  - *Match learners with math resources at their ability level*
  - *Identify math demands needed for entry into college and career*

1045Q

Algebra 2

Measurement & Instrumentation

How many instruments can be used to measure inches and centimeters?

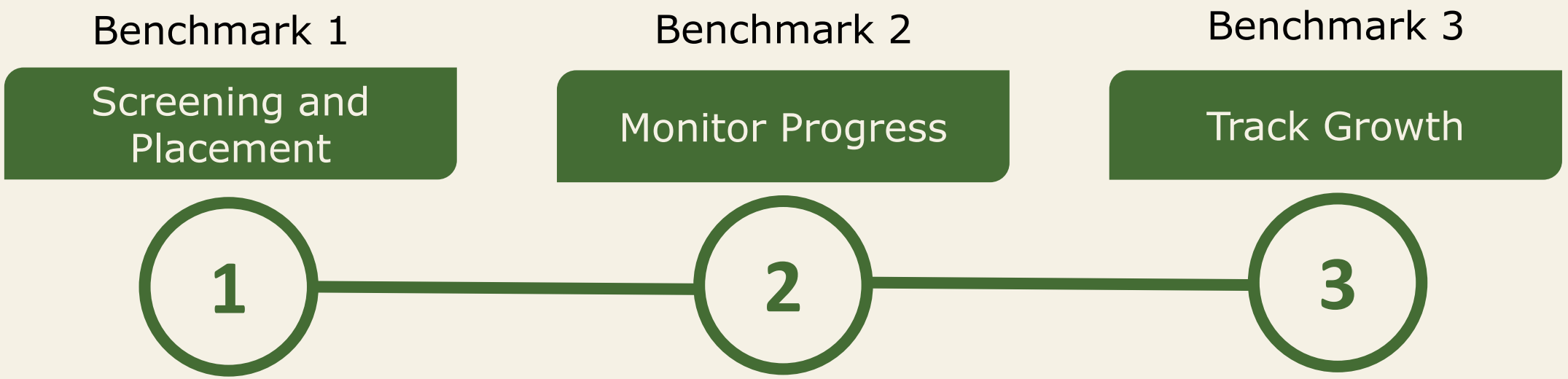


Quantile Measure Instruments

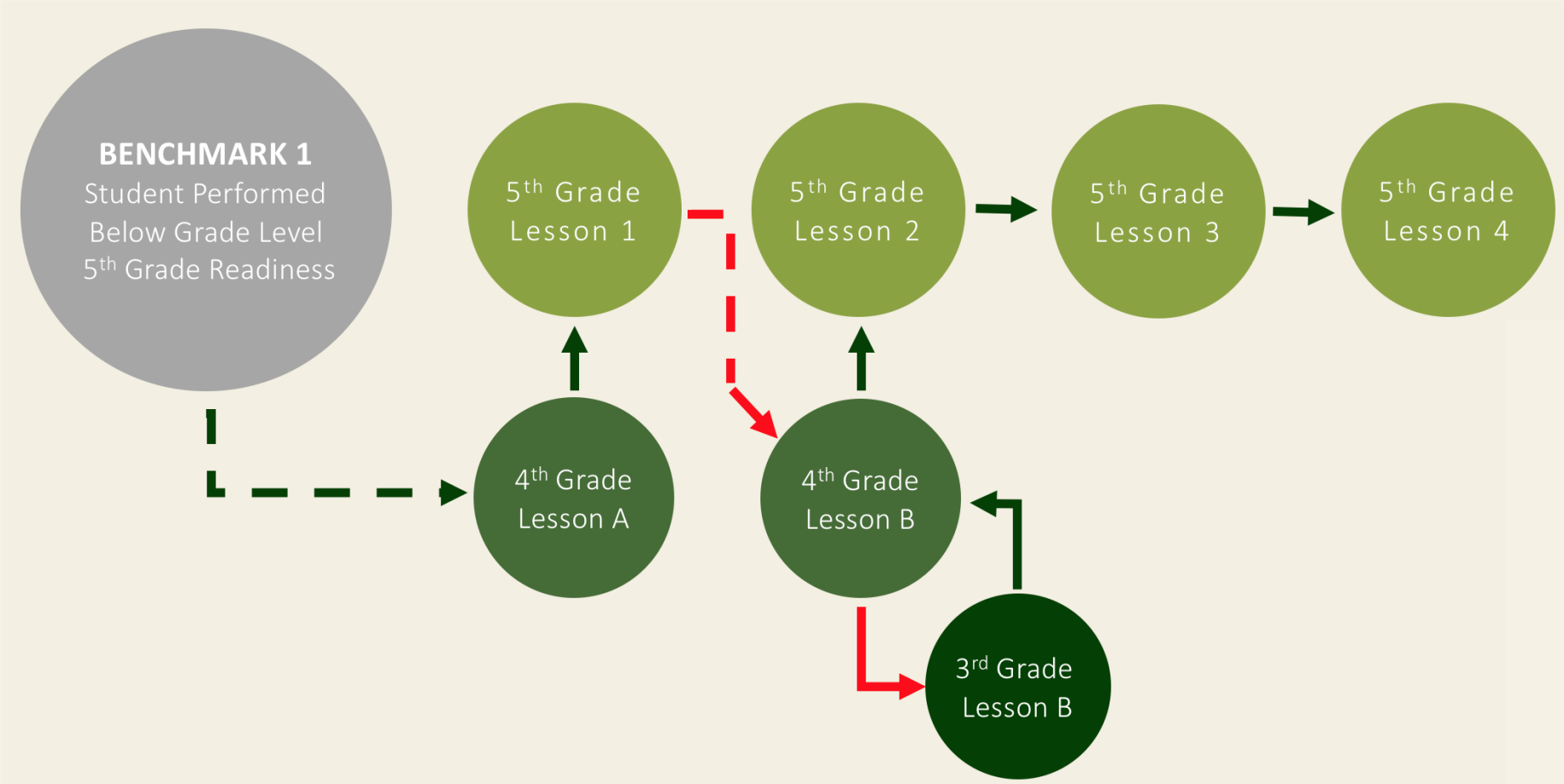
- High stakes state-wide assessments
- Classroom or local assessments
- Imagine Math benchmarks

Math

IMAGINE MATH: VALID & RELIABLE QUANTILE MEASURES



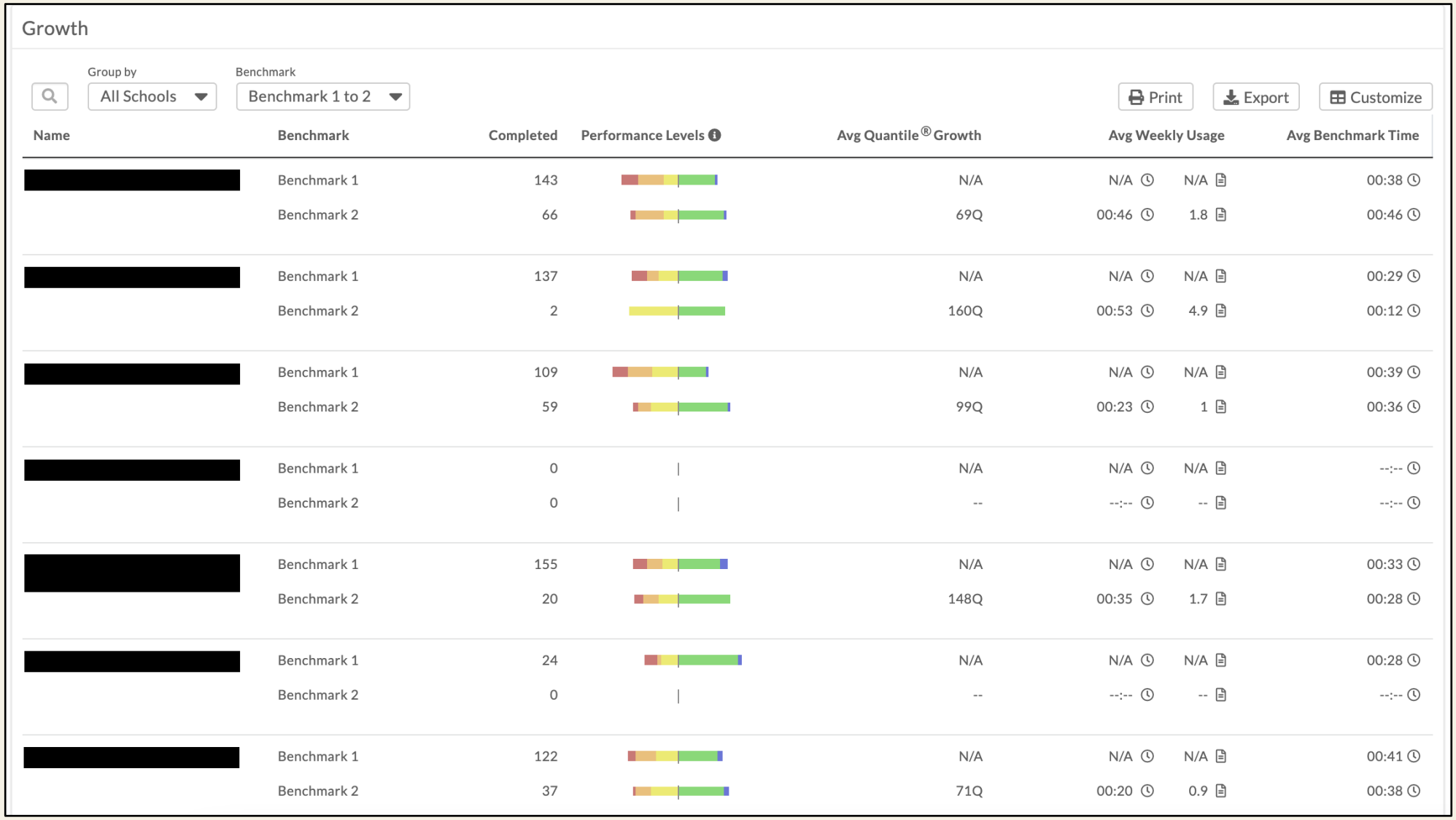
IMAGINE MATH: INDIVIDUALIZED LEARNING PATHWAYS



QUANTILE®

The Quantile® Framework for Mathematics
Linking assessment with mathematics instruction

IMAGINE MATH: HOW WE USE QUANTILE MEASURES



Growth

Group by: All Schools | Benchmark: Benchmark 1 to 2 | Print | Export | Customize

Name	Benchmark	Completed	Performance Levels	Avg Quantile® Growth	Avg Weekly Usage		Avg Benchmark Time
[redacted]	Benchmark 1	143		N/A	N/A	N/A	00:38
	Benchmark 2	66		69Q	00:46	1.8	00:46
[redacted]	Benchmark 1	137		N/A	N/A	N/A	00:29
	Benchmark 2	2		160Q	00:53	4.9	00:12
[redacted]	Benchmark 1	109		N/A	N/A	N/A	00:39
	Benchmark 2	59		99Q	00:23	1	00:36
[redacted]	Benchmark 1	0		N/A	N/A	N/A	--:--
	Benchmark 2	0		--	--:--	--	--:--
[redacted]	Benchmark 1	155		N/A	N/A	N/A	00:33
	Benchmark 2	20		148Q	00:35	1.7	00:28
[redacted]	Benchmark 1	24		N/A	N/A	N/A	00:28
	Benchmark 2	0		--	--:--	--	--:--
[redacted]	Benchmark 1	122		N/A	N/A	N/A	00:41
	Benchmark 2	37		71Q	00:20	0.9	00:38

IMAGINE MATH: HOW WE USE QUANTILE MEASURES

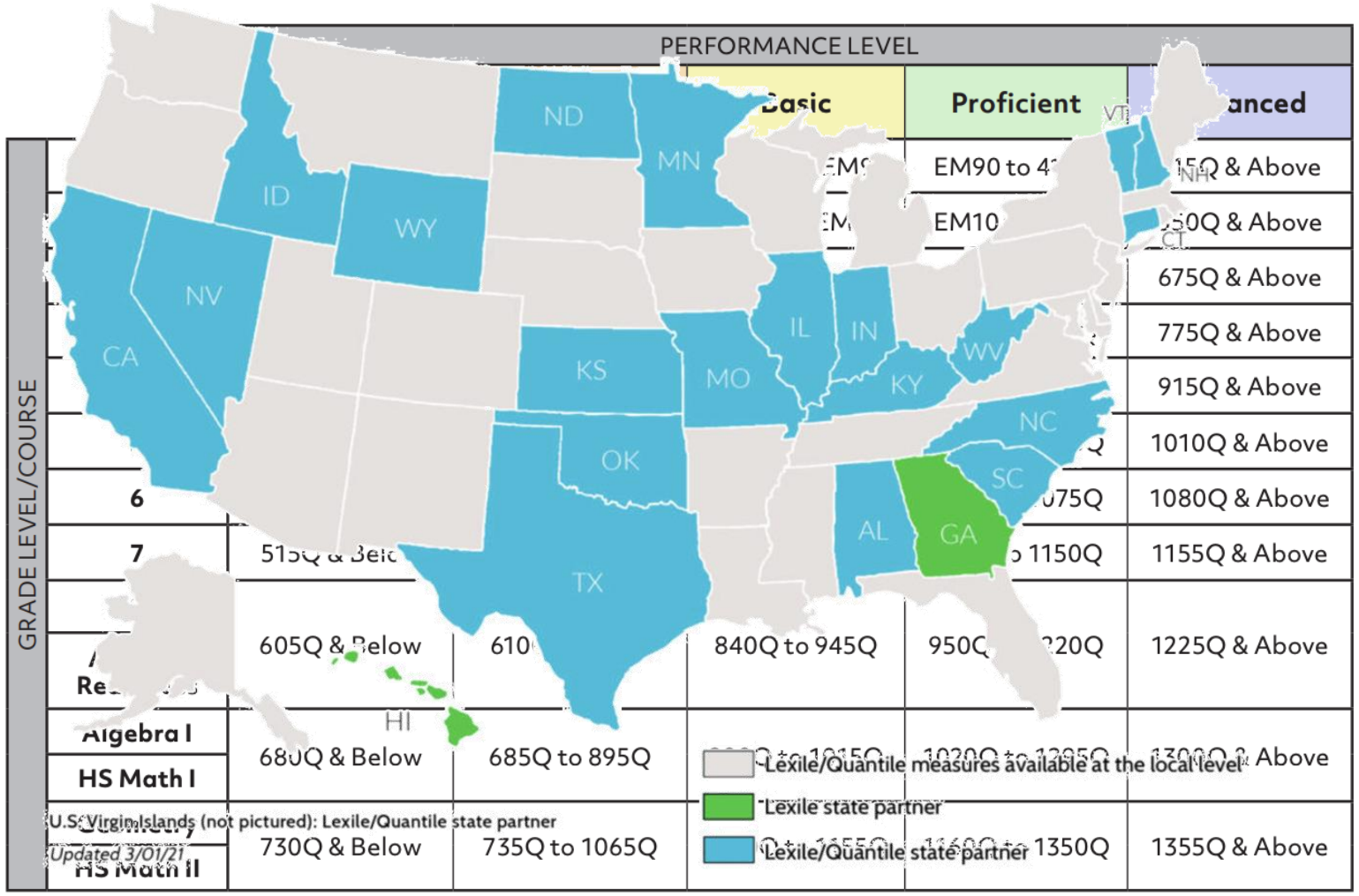
Growth

Group by: All Students | Benchmark: Benchmark 1 to 2 | Print | Export | Customize

Last Name	First Name	Benchmark	Grade Level	Instructional Grade Level	Date Completed	Performance Level	Quantile® Measure	Quantile® Growth	Benchmark Time
[redacted]		Benchmark 1	Grade 6	Grade 6	08/27/2020	Basic	725Q	N/A	00:26
		Benchmark 2	Grade 6	Grade 6	12/10/2020	Proficient	815Q	90Q	00:21
[redacted]		Benchmark 1	Grade 6	Grade 6	09/04/2020	Below Basic	630Q	N/A	00:14
		Benchmark 2	Grade 6	Grade 6	12/09/2020	Basic	720Q	90Q	00:42
[redacted]		Benchmark 1	Grade 2	Grade 2	11/06/2020	Proficient	485Q	N/A	00:23
		Benchmark 2	Grade 2	Grade 2	01/26/2021	Proficient	585Q	100Q	00:26
[redacted]		Benchmark 1	Grade 6	Grade 6	08/27/2020	Basic	725Q	N/A	00:30
		Benchmark 2	Grade 6	Grade 6	12/09/2020	Proficient	850Q	125Q	00:36
[redacted]		Benchmark 1	Grade 2	Grade 2	10/29/2020	Proficient	585Q	N/A	00:37
		Benchmark 2	Grade 2	Grade 2	02/04/2021	Advanced	725Q	140Q	00:33

IMAGINE MATH: HOW WE USE QUANTILE MEASURES

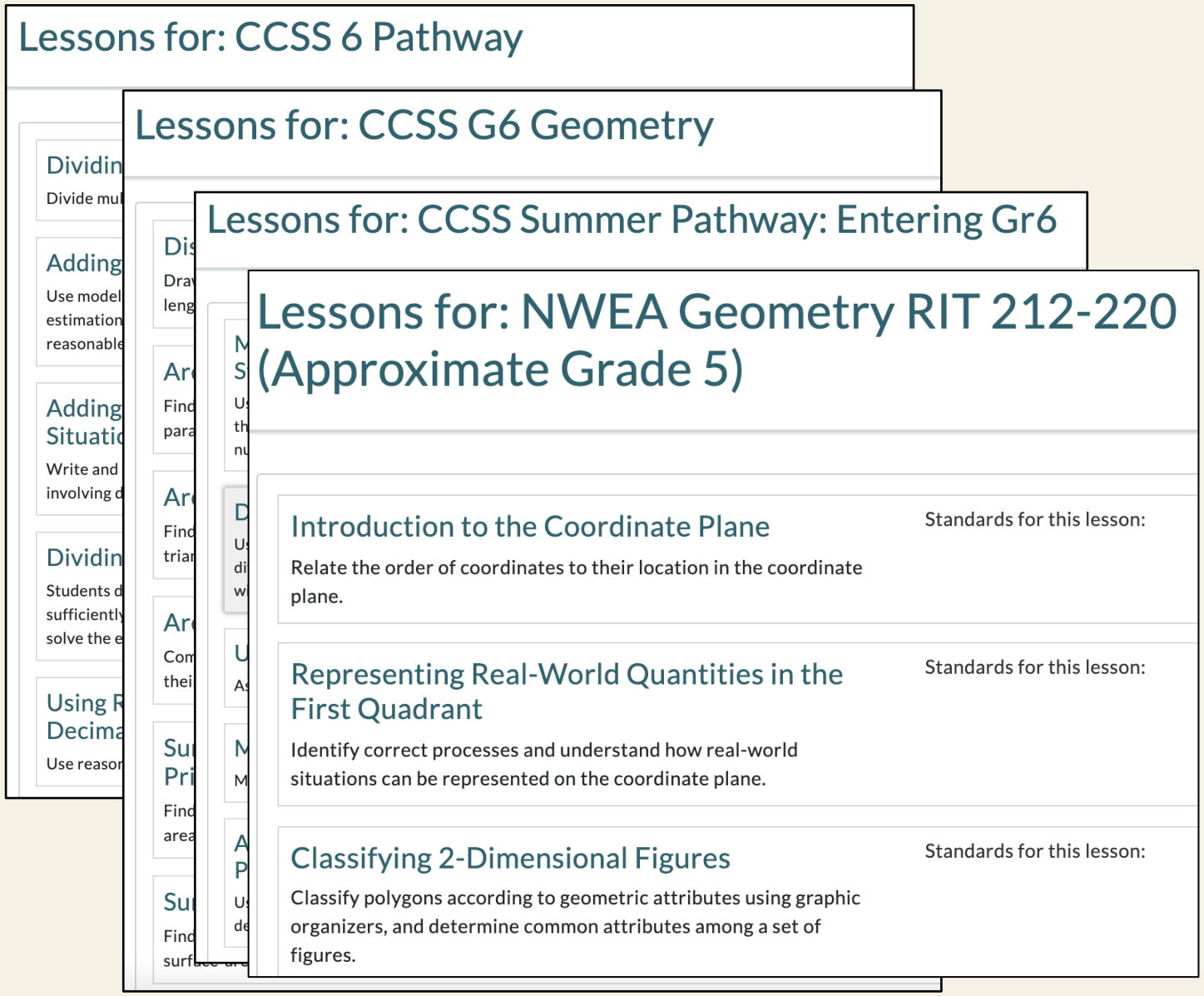
Imagine Math National Performance Levels



imagine Math 3+

FLEXIBLE PATHWAYS

- CCSS and State specific grade-level pathways
- Content Pathways
- Summer Bridge Pathways
- NWEA RIT Band Pathways
- Customize Pathways
  - Enrichment
  - Intervention
  - Alignment to District Curriculum
  - Focus Standards



Quantile Skills and Concepts

4.MD.A.3: Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Quantile Framework

Measurement

QSC192	Determine the area of rectangles, squares, and composite figures using grids, and standard units in number and word problems.
QSC1018	Use models to develop the relationship between the total distance around a figure and the formula for perimeter; find perimeter using the formula in number and word problems.

450Q

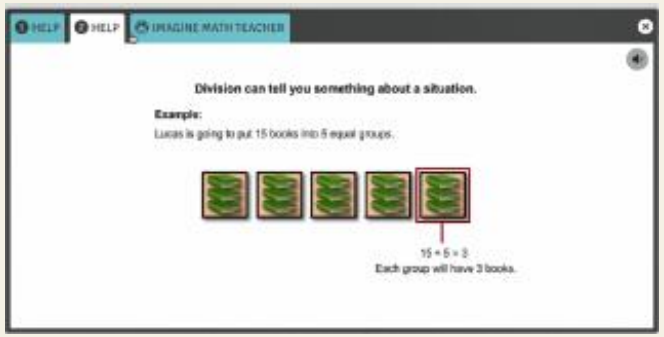
780Q

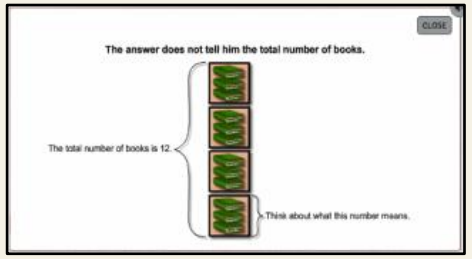
imagine Math 3+

LIVE TEACHERS AND TIERED SUPPORT

LEVEL 1

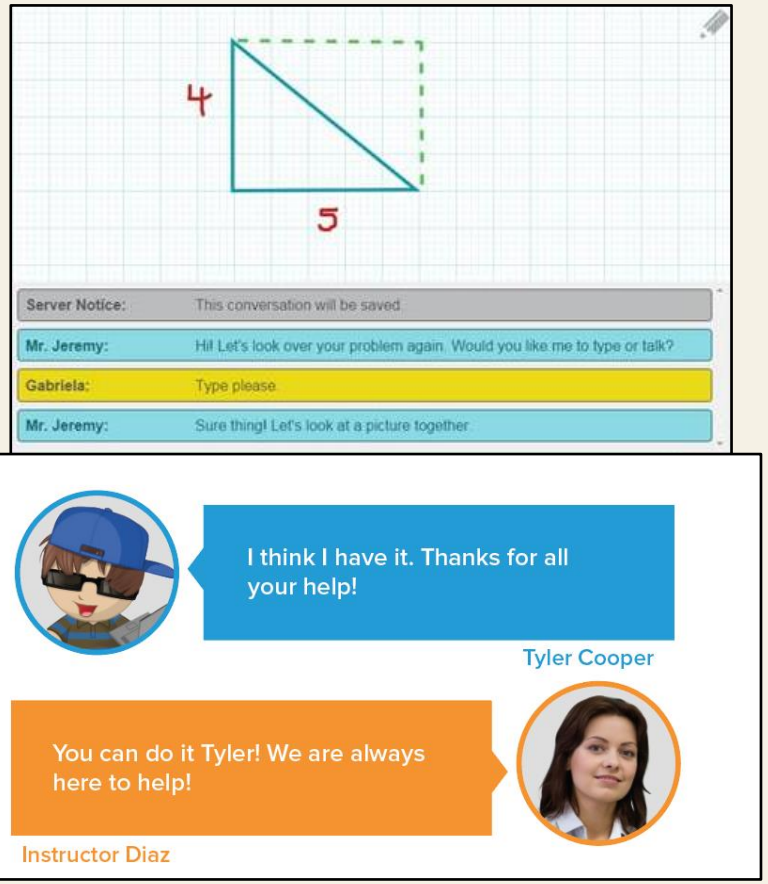
Automated, customized corrective feedback





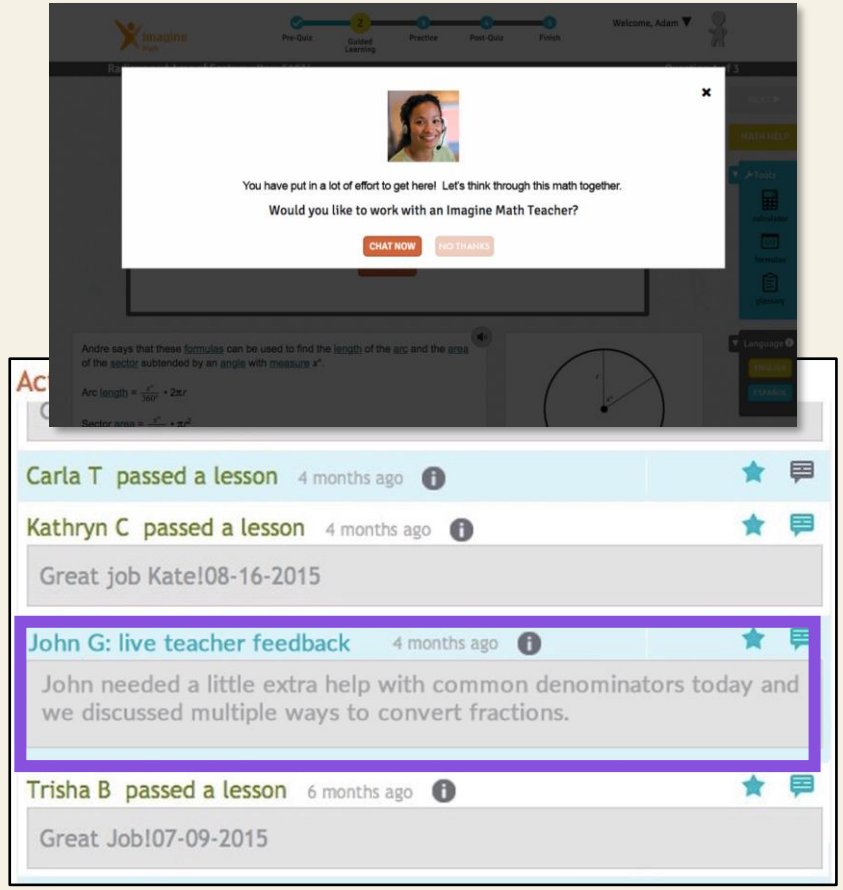
LEVEL 2

Type or talk to Imagine Math teacher.



LEVEL 3

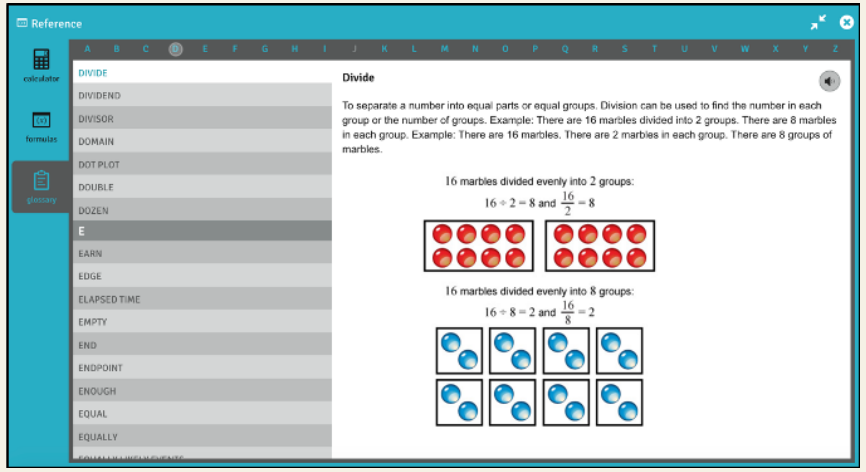
Proactive intervention and communication

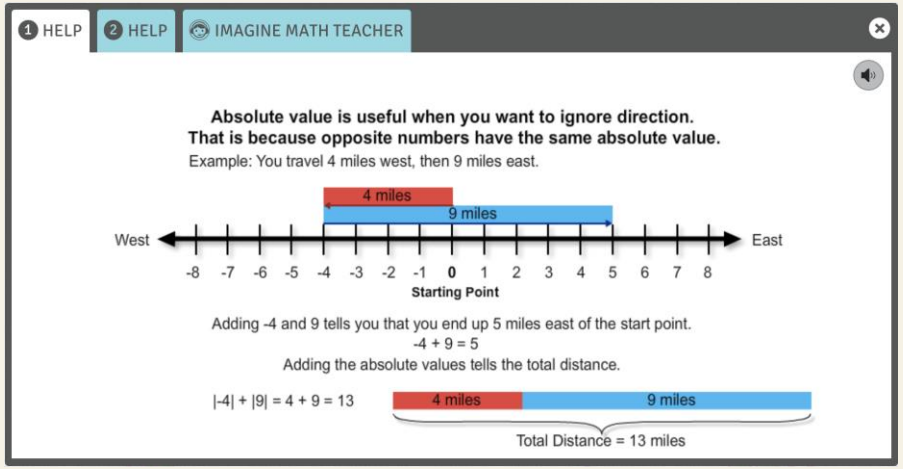


imagine Math 3+

8TH GRADE STUDENT: *reteaching process*

Grade Level		Lesson Title	Pre-Quiz Score (* Tested Out)	Post-Quiz Score (* Tested Out)	Time on Lesson (HH:MM)
8	✗	Interpreting Slope	36%	21%	00:28
7	✗	Making Sense of Slope	67%	54%	00:33
7	✓	Interpreting Unit Rates on Graphs	36%	100%	00:18
7	△	Making Sense of Slope	76%	54%	00:18
8	✓	Interpreting Slope	14%	79%	00:18





Total Intervention:

- 4 days
- 1 hr 58 minutes intervention instruction
- 30 mins of teacher interaction

imagine Math 3+

APPLICATION TASKS

Functions

Create a Roller Coaster Ride

Grade 8 | 45 Min. | or

LESSON OBJECTIVE Students will use nonlinear functions to model a roller coaster ride

LANGUAGE OBJECTIVES Using mathematical language and linking words and phrases to connect ideas, students will describe the use of nonlinear functions in modeling real-world situations.

PREREQUISITE SKILLS Students graph functions and describe translations in the coordinate plane.

Teachers can use the Imagine Math Standards Report and the Benchmark Performance Level Report to evaluate student readiness to complete this task.

COLLEGE AND CAREER READINESS STANDARDS FOR MATHEMATICS 8.F.B.5

CCSS MATH 8.F.B.5	TEKS MATH 8.5.H	QSC 209

Teacher Preparation

MATERIALS
- Graphing Paper
- Drawing Paper
- Vocabulary Knowledge Rating Sheet

LESSON OVERVIEW Students develop plans for sections of a roller coaster in the coordinate plane using sections of the graphs of different nonlinear functions. They write equations for the translations of the graphs and tell where the height of the roller coaster is increasing or decreasing. They solve equations to check their answers.

Understand Science Background

The concept of roller coasters can be traced back to the Russian "ice hills" of the 1400s, when people paid to climb stairs to the tops of hills built from snow and ice to ride down the hills in sleds. In the 1700s, wheels were added to the sleds, so people could ride the ice hills year-round. The craze for these rides, known as "Russian Mountains," spread throughout Europe until the mid-1800s, when increasing injuries caused most to be shut down.

The roller coaster concept reappeared in the United States in 1874, when an inclined railway at a Pennsylvania coal mine was repurposed as an amusement ride. Mules pulled railway cars up the hill, and gravity brought cars and riders, including mules, back down. The basic principle of all roller coasters, from the early ice hills to the high-tech roller coaster rides at today's theme parks, is that an initial height must be reached to build momentum, and then gravity does the rest.

As part of the roller coaster ride, there are smaller hills and valleys, as well as twists, turns, and even loops. Because energy is lost due to friction, hill heights must keep decreasing so that the car keeps moving until it reaches the bottom.

Collaborate: Work with science, literacy, and history teachers to explore opportunities to expand cross-curricular experiences for students.

Building a modern-era roller coaster is a major design and engineering project. Initial design is done with scale models on computers, using mathematical models such as quadratic functions to simulate the ride. Benefits of creating scale models include the ability to create new and exciting rides for all ages while ensuring that the roller coaster will work safely for passengers based on principles of physics.

After computer models and prototypes are completed, the entire ride is manufactured and installed on-site. Before a ride is open to the public, it undergoes extensive testing. This testing is continued even after it is operational, with daily inspections. A major goal of modern-era roller coaster designers and engineers is to keep the rides safe, avoiding the fate of the "Russian Mountains."

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Competition

APPLICATION TASK | **Create a Roller Coaster Ride**

Goal
Use nonlinear functions to model a roller coaster ride.

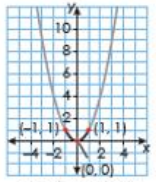
Language Objective
Using mathematical language and linking words and phrases to connect ideas, describe the use of nonlinear functions in modeling real-world situations.

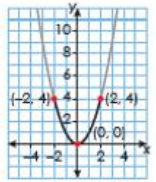
Why Use Nonlinear Functions to Model Real-World Situations?
Sometimes the relationship between two real-world quantities is not linear.

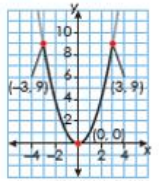
Essential Question **How can you model real-world situations with nonlinear functions?**

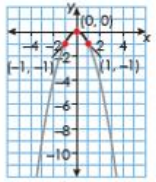
In this task, you are creating a **roller coaster** ride from graph sections of the **nonlinear** functions $y = x^2$ and $y = -x^2$. You will develop two plans for different roller coaster rides.

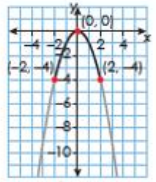
Constraints:
- The roller coaster ride can start at any height, but there must be at least two hills.
- Sections can be shifted up and to the right in whole-number increments.
- The heights of the hills should decrease from left to right.

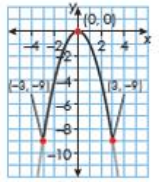

$y = x^2$: $-1 \le x \le 1$


$y = x^2$: $-2 \le x \le 2$


$y = x^2$: $-3 \le x \le 3$

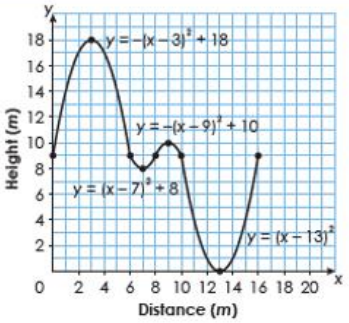

$y = -x^2$: $-1 \le x \le 1$


$y = -x^2$: $-2 \le x \le 2$


$y = -x^2$: $-3 \le x \le 3$

Name: _____

SAMPLE PLAN

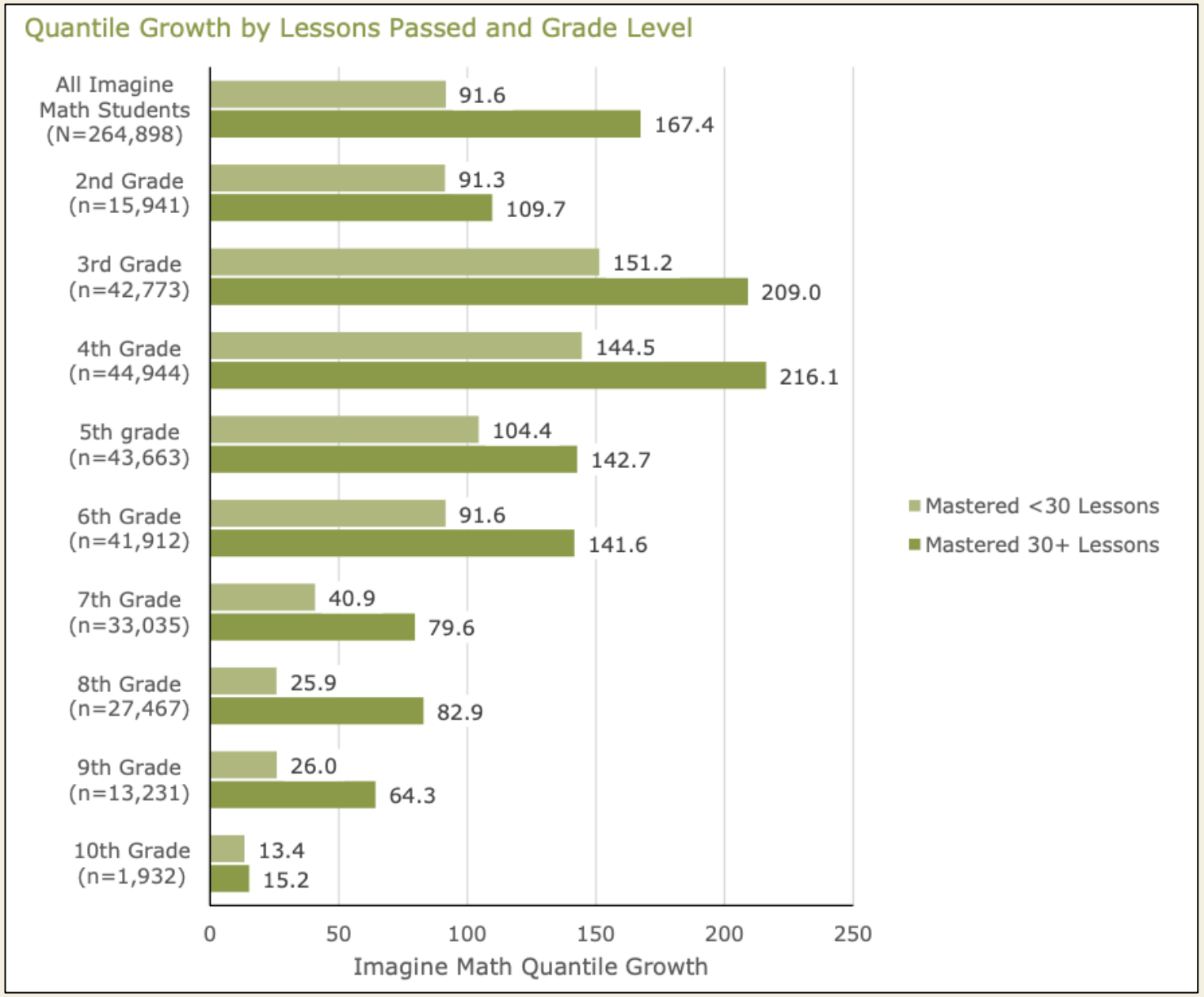


Increasing Height Intervals	Decreasing Height Intervals
$0 < x < 3$ $7 < x < 9$ $0 < x < 3$	$3 < x < 7$ $9 < x < 13$

Did You Know? **The 570-foot-tall Skyscraper in Orlando, Florida, will be the world's tallest roller coaster.**

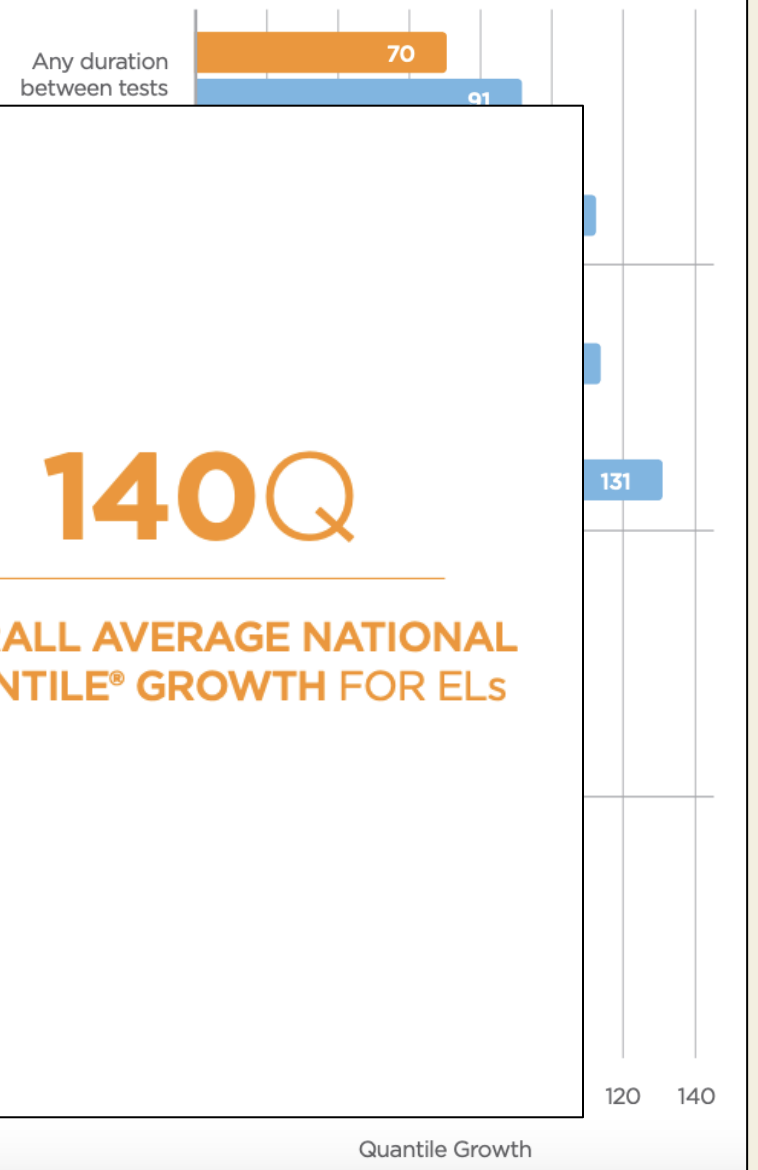
Math

+250,000
students



Math

Quantile Growth by Lessons Passed and Grade-Level

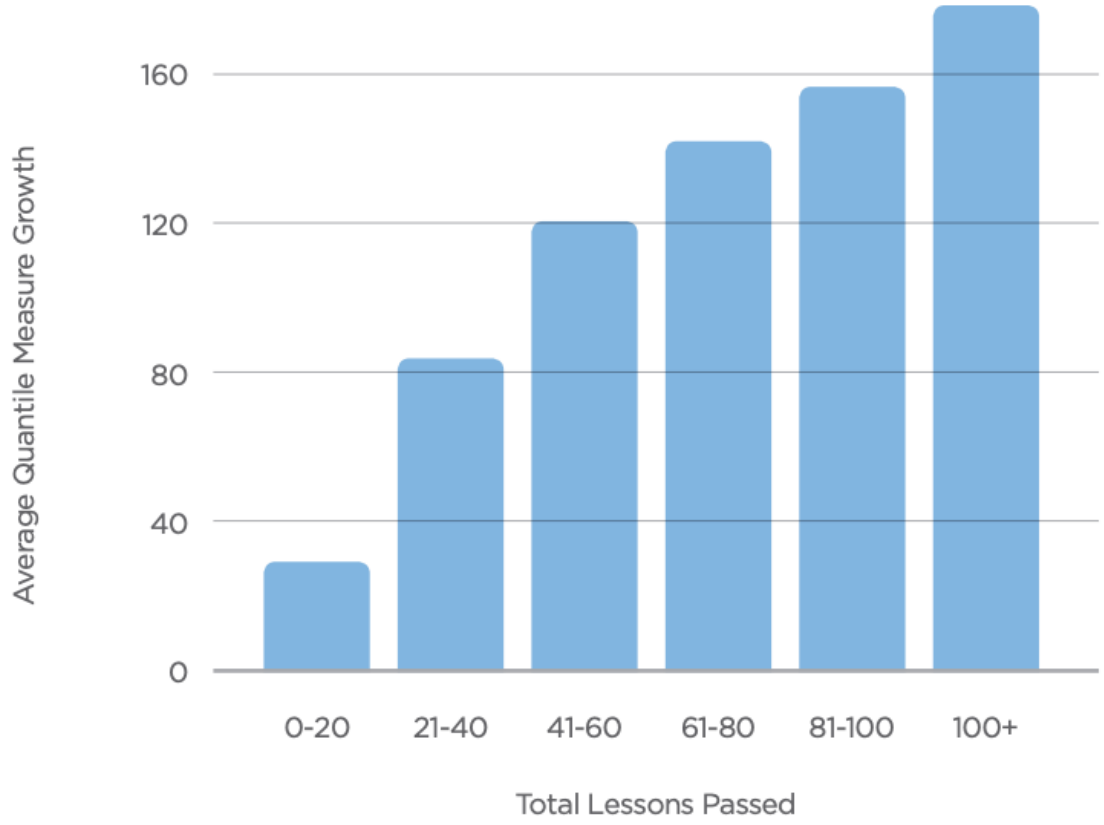


Qua

ENGL

SPAN

Figure 1. Average Quantile® Measure Growth by Average Imagine Math Lessons Passed



140Q

OVERALL AVERAGE NATIONAL QUANTILE® GROWTH FOR ELs

What are your next steps?

Next steps with Quantiles and/or Imagine Math

Share in chat

Questions?


imagine
learning