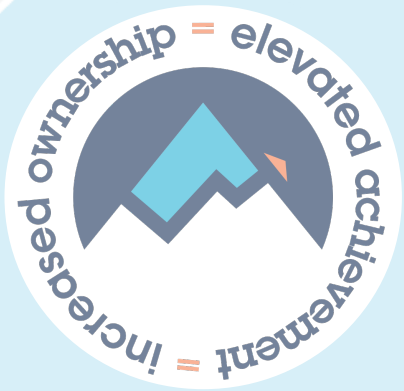
Elevated Achievement Group presents…

Solving the Math Conundrum: How to Develop Students' Skills While Expanding Their Metacognition

July 20, 2022



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Solving the Math Conundrum: How to Develop Students' Skills While Expanding Their Metacognition

July 20, 2022

Presenters

Elevated Achievement Group

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Session Outcomes

Participants will:

- Examine and utilize instructional strategies that integrate mathematical practices and skills with equal focus, coherence, and rigor for all students.
- Analyze and apply the learning process, examples, and tools for developing metacognition with each mathematical practice.
- Create an action plan that ensures all students receive instruction that fosters their mathematics knowledge and metacognition.

The Math Wars

"The new standards grew out of a long and heated debate about mathematics learning…known as the 'math wars,' pitting conceptual understanding and sense-making against procedures, rules, and memorization. The new math standards grew out of the decades-long attempts to acknowledge that both were important aspects of the math curriculum. By incorporating both…, they brought together both sides of the math wars, building on 'the best of previous state standards plus a large body of evidence from international comparisons and domestic reports and recommendations to define a sturdy staircase to college and career readiness.' (National Governors Association, 2013)"

— The Practices in Action, 2021, page 2

Two Types of Standards

STANDARDS FOR MATHEMATICAL CONTENT	STANDARDS FOR MATHEMATICAL PRACTICE
A list of things students should understand and be able to do by the end of each grade	**A list of ways that proficient students engage with mathematics, including thinking skills and habits of mind**
• Specific mathematical knowledge and skills that follow a step-by-step learning progression across grade levels and courses	• More general processes and proficiencies that evolve over time, influenced by cognitive development and the sophistication of the content
• K–8 organized by grade level; high school organized by conceptual theme	• Standards are the same across all grade levels
• Familiar to most teachers	• Not as familiar to teachers
• Easily and frequently tested, and therefore the focus of the typical math curriculum	• Not as easily or frequently tested, and therefore often neglected in the math curriculum

— The Practices in Action, 2021, page 5

Building Math Muscle Memory

"One hallmark of mathematical understanding is the ability to justify, in a way appropriate to the student's mathematical maturity, why a particular mathematical statement is true or where a mathematical rule comes from. There is a world of difference between a student who can summon a mnemonic device to expand a product such as $(a + b)(x + y)$ and a student who can explain where the mnemonic comes from. The student who can explain the rule understands the mathematics and may have a better chance to succeed at a less familiar task such as expanding $(a + b)(x + y)$."

— The Practices in Action, 2021, page 4

Owning the Mathematical Practices

The Standards	Student Ownership Statements
 Make sense of problems and persevere in solving them.	*I can determine what the problem is asking me to do and not give up until I've solved it.*
 Reason abstractly and quantitatively.	*I can make sense of quantities and use math symbols, numbers, or words to represent and solve problems.*
 Construct viable arguments and critique the reasoning of others.	*I can justify my conclusions with evidence from my work, and I can listen to or read others' arguments and decide if they make sense.*
 Model with mathematics.	*I can use what I know about math symbols, words, pictures, tools, and diagrams to solve everyday problems.*
 Use appropriate tools strategically.	*I can determine which tools are the right ones to use when solving problems.*
 Attend to precision.	*I can communicate precisely what I'm doing and explain my thinking using mathematical language.*
 Look for and make use of structure.	*I can determine overall structures and patterns to help me solve problems.*
 Look for and express regularity in repeated reasoning.	*I can use what I already know about problem solving strategies, patterns, and other shortcuts to solve problems.*

— The Practices in Action, 2021, pages 20–21

The Standard for Mathematical Practice 1

Make sense of problems and persevere in solving them.

I can determine what the problem is asking me to do and not give up until I've solved it.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

In short, mathematically proficient students:

- Interpret and make meaning of the problem to find a starting point.
- Analyze what is given in order to explain to themselves the meaning of the problem.
- Plan a solution pathway instead of jumping to a solution.
- Monitor their own progress and change the approach if necessary.
- See relationships between various representations.
- Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another.
- Continually ask themselves, "Does this make sense?"
- Can understand various approaches to solutions.

— The Practices in Action, 2021, pages 22–23

The Learning Progression

Practice 1 Make sense of problems and persevere in solving them.

PRE-K	In Pre–K, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. With prompting and support from adults, students explain the meaning of a problem and look for ways to solve it. Students use concrete objects to help them conceptualize and solve problems. They may check their thinking by asking, "Does this make sense?" or they may try another strategy.
KINDERGARTEN	In Kindergarten, students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" or they may try another strategy.
FIRST GRADE	In first grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Younger students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They are willing to try other approaches.
SECOND GRADE	In second grade, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They make conjectures about the solution and plan out a problem-solving approach.

The Learning Progression

Practice 1 Make sense of problems and persevere in solving them.

THIRD GRADE	In third grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.
FOURTH GRADE	In fourth grade, students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Fourth graders may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They listen to the strategies of others and will try different approaches. They often will use another method to check their answers.
FIFTH GRADE	In fifth grade, students solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"
SIXTH GRADE	In grade 6, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

The Learning Progression

Practice 1 Make sense of problems and persevere in solving them.

SEVENTH GRADE	In grade 7, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"
EIGHTH GRADE	In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"
HIGH SCHOOL	High school students start to examine problems by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. By high school, students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. They check their answers to problems using different methods and continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

— The Practices in Action, 2021, pages 24–25

A Process to Teach the Practice

Practice 1

Make sense of problems and persevere in solving them.

"I can determine what the problem is asking me to do and not give up until I've solved it."

Process

Process to make sense of problems

1. Read the problem out loud.
2. Identify and clarify each word that tells you what to do mathematically.
3. Explain the problem in your own words.
4. Explain how you will know you have solved the problem correctly.

Process to persevere in solving them

1. Make a plan for solving the problem.
2. Begin to solve the problem.
3. Each time you get stuck, identify where you got stuck.
4. Ask for help, as needed.
5. Keep working until you've solved the problem correctly.

— The Practices in Action, 2021, page 26

A Reflection Guide for the Practice

Practice **1**

Make sense of problems and persevere in solving them.

"I can determine what the problem is asking me to do and not give up until I've solved it."

Reflection

To what degree can you determine what the problem is asking you to do and not give up until you've solved it?

1	2	3	4	5
never		sometimes		always

- What does "make sense of problems" mean?
- What does "persevere in solving them" mean?
- How do you determine what the problem is asking you to do?
- How do you not give up until you've solved the problem?
- How does "making sense of problems and persevering in solving them" help you?

— The Practices in Action, 2021, page 27

From Process to Practice to Metacognition

Practice 1

Make sense of problems and persevere in solving them.

Seventh Grade

The Practice in Action: When presented with a problem that asks students to analyze proportional relationships and use them to solve real-world and mathematical problems, seventh graders utilizing this practice use their understanding of ratios to discuss how they solved the problem.

The ratio of time that Leo spends on math homework to science homework is 5 to 4. If he spends 40 minutes on math homework, how much time does Leo spend on science homework?

TEACHER: What is the problem asking you to do?

STUDENT: *The problem is asking me to find out how much time Leo spends on science homework.*

TEACHER: What is your plan to solve the problem?

STUDENT: *I can solve this problem by using my understanding that a ratio compares two numbers. This problem gives me the ratio of time spent on math and science homework and the exact amount for math. I can take that information to set up the ratios in fraction form and efficiently cross multiply to find the amount of time for the science homework.*

TEACHER: Does this make sense?

STUDENT: *Yes, because I planned my solution pathway instead of jumping to the solution. This helps me make sure I don't miss a critical piece of information in the problem.*

TEACHER: How did making sense of the problem and persevering in solving it help you?

STUDENT: *It helped me to understand what the problem is really asking me to do. Then, I could figure out how to solve it and then work on it until it was finished.*

— The Practices in Action, 2021, page 216

Tools for Developing Mathematical Thinkers and Speakers

Practice 1

Make sense of problems and persevere in solving them.

Seventh Grade

Questions to Foster Metacognition

What is the problem asking you to do?

What is your plan for solving the problem?

How would you explain the problem in your own words?

How could you go about solving the problem?

Are there any other ways you could approach the problem?

How does looking for the most efficient way to solve the problem help you?

What are some other strategies you might try?

Does this make sense? What can you do if you are struggling?

Why is it important to be able to identify when you are struggling?

How do you know when you have solved the problem?

Why does explaining the problem in your own words help you?

How does making sense of problems and persevering in solving them help you?

— The Practices in Action, 2021, page 217

Tools for Developing Mathematical Thinkers and Speakers

Practice 1

Make sense of problems and persevere in solving them.

Seventh Grade

Ownership Statements

Being able to explain the problem is important because _____.

Planning a solution pathway instead of jumping to a solution is important because _____.

I can solve the problem by _____.

Another way to solve this problem is _____.

Looking for efficient ways to represent and solve the problem helps me because _____.

Understanding that there might be other ways to find the solution helps me because _____.

Monitoring my progress and changing the approach, if needed, is important because _____.

Making sense of problems and persevering in solving them helps me because _____.

— The Practices in Action, 2021, page 217

The Standard for Mathematical Practice 6

Attend to precision.

I can communicate precisely what I'm doing and explain my thinking using mathematical language.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

In short, mathematically proficient students:

- Communicate precisely with others and try to use clear mathematical language when discussing their reasoning.
- Understand the meanings of symbols used in mathematics and can label quantities appropriately.
- Express numerical answers with a degree of precision appropriate for the problem context.
- Calculate efficiently and accurately.

— The Practices in Action, 2021, pages 52–53

The Learning Progression

Attend to precision.

PRE-K	As pre–k students begin to develop their mathematical communication skills, teachers model clear and precise language and encourage students to try and use it in their discussions with others and in their own reasoning.
KINDERGARTEN	As kindergarteners begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning.
FIRST GRADE	As young children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning.
SECOND GRADE	As children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning.
THIRD GRADE	As third graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units .
FOURTH GRADE	As fourth graders develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, they use appropriate labels when creating a line plot.
FIFTH GRADE	Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.

The Learning Progression

Attend to precision.

SIXTH GRADE	In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations or inequalities.
SEVENTH GRADE	In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations or inequalities.
EIGHTH GRADE	In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.
HIGH SCHOOL	High school students try to communicate precisely to others by using clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

— The Practices in Action, 2021, pages 54–55

A Process to Teach the Practice

Practice 6

Attend to precision.

"I can communicate precisely what I'm doing and explain my thinking using mathematical language."

Process

Process to attend to precision

1. Explain the problem using specific mathematical language for words and symbols.
2. Explain the problem using specific units of measure.
3. Explain how you will solve the problem using specific mathematical language and units of measure.
4. As you are solving the problem, explain what you are doing using specific mathematical language and units of measure.
5. Explain your thinking in both writing and speaking.

— The Practices in Action, 2021, page 56

A Reflection Guide for the Practice

Practice 6

Attend to precision.

"I can communicate precisely what I'm doing and explain my thinking using mathematical language."

Reflection

To what degree can you communicate precisely what you are doing and explain your thinking using mathematical language ?

1	2	3	4	5
never		sometimes		always

- What does "attend to precision" mean?

- How do you communicate precisely what you are doing and explain your thinking using mathematical language?

- How does attending to precision help you?

— The Practices in Action, 2021, page 57

From Process to Practice to Metacognition

Practice 6

Attend to Precision.

Algebra I

The Practice in Action: When presented with solving systems of equations in a problem, Algebra I students utilizing this practice graph the equations to verify the solution of the system.

Solve the following system of equations using substitution and graph the equations:

$$6x - 5y = 34$$
$$3x + 2y = 8$$

TEACHER: What is the problem asking you to do?

STUDENT: The problem is asking me to solve a system of equations using substitution and then to graph the equations.

TEACHER: What mathematical terms apply in this situation?

STUDENT: *The terms that apply are "system of equations" and "substitution."*

TEACHER: What symbols or mathematical notations are important in this problem?

STUDENT: *The positive and negative numbers are important because I have to pay attention to them when solving correctly.*

TEACHER: How will you solve the system of equations and graph each equation?

STUDENT: *I start by rearranging the second equation to isolate the y variable: y equals 4 minus 1.5 times x. Then I substitute the expression 4 minus 1.5 times x for y in the first equation and solve for x. I need to check to make sure the solution I get makes both equations in the system true. If my answer is yes, I can graph the equations to verify the solution of the system. If my answer is no, then I need to check my work.*

TEACHER: How could you test your solution?

STUDENT: *I could substitute the values for x or for y into the original equations to determine if the result is true. If it is, my original answer is correct .*

TEACHER: How does attending to precision help you?

STUDENT: *It helps me be clear about the mathematical symbols and language needed to solve the problem.*

— The Practices in Action (High School Edition), 2021, page 64

Tools for Developing Mathematical Thinkers and Speakers

Practice 6

Attend to precision.

Algebra I

Questions to Foster Metacognition

What is the problem asking you to do?

What mathematical terms apply in this situation?

How you might show that your solution answers this problem?

How could you test your solution to see if it answers the problem?

Is there a more efficient strategy for solving the problem?

How are you showing the meaning of the quantities?

What symbols or mathematical notations are important in this problem?

What mathematical language, definitions, or properties can you use to explain _____?

How does being able to communicate precisely with others help you?

Why is using clear mathematical language when discussing your reasoning important?

How does understanding the meaning of symbols used in mathematics help you?

Why is being able to label quantities appropriately important?

Why is being able to express numerical answers with a degree of precision appropriate for the problem context important?

Why is being able to calculate efficiently and accurately important?

How does attending to precision help you solve the problem?

— The Practices in Action, 2021, page 263

Tools for Developing Mathematical Thinkers and Speakers

Practice 6

Attend to precision.

Algebra I

Ownership Statements

Being able to communicate precisely with others helps me because _____.

Using clear mathematical language when discussing my reasoning is important because _____.

Understanding the meaning of symbols used in mathematics helps me because _____.

Being able to label quantities appropriately is important because _____.

Being able to express numerical answers with a degree of precision appropriate for the problem context is important because _____.

Being able to calculate efficiently and accurately is important because _____.

Attending to precision helps me _____.

— The Practices in Action, 2021, page 264

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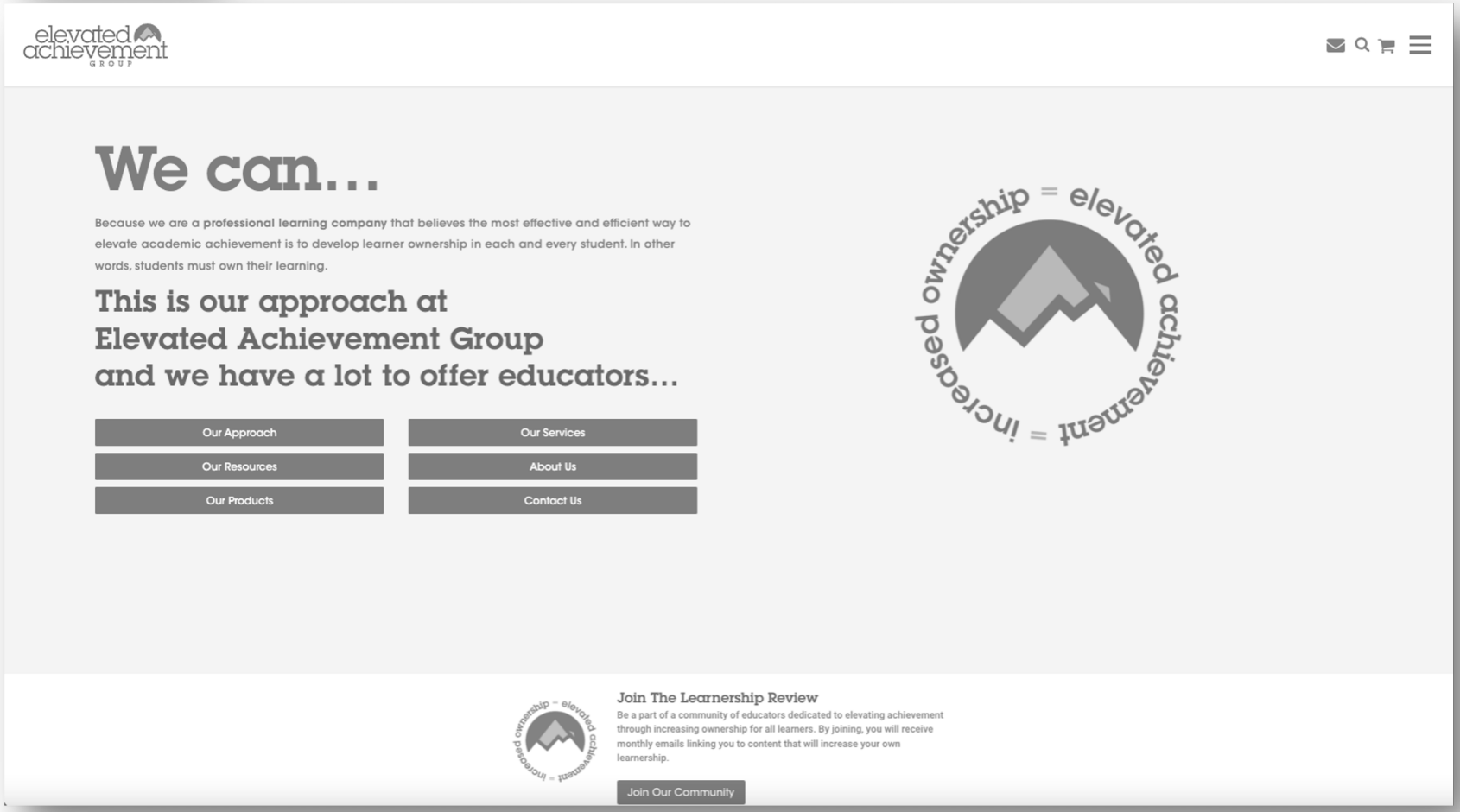

Why does Elevated Achievement Group exist?

We exist because we believe that in order for each and every learner to achieve at higher levels they must own their learning.

- We believe that we can support you in developing learner ownership and elevating achievement—of students, teachers, and administrators.

- We provide professional learning experiences that…
  - Promote a growth mindset.
  - Actively engage you in the learning rather than just participating.
  - Exemplify respect, cooperation, collaboration, and risk-taking
  - Ensure that developing ownership is at the center of all decision-making.

- We believe that increased ownership leads to elevated achievement to such a degree that we put it in our name. We want to be part of a professional group of educators that elevates student achievement—for each and every student—at your school or district.

Your kids are our kids. Your success is our success.

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References

Alberti, S. (2013). Making the shifts. *Education Leadership*, 70.

Beck, I.L., McKeown, M.G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction* (second edition). New York: The Guildford Press.

Boucher, D. (2018). Encouraging student self-reflection. Retrieved from https://www.mathcoachscorner.com/2016/10/student-self-reflection/.

California Department of Education. (2013a). *California common core state standards for English language arts and literacy in history/social studies, science, and technical subjects.* Sacramento, CA.

California Department of Education. (2013b). *California common core state standards for mathematics.* Sacramento, CA.

California Department of Education. (2013c). *Overview of the standards chapters of the mathematics framework for California public schools: Kindergarten through grade twelve.* Sacramento, CA. Retrieved from https://www.cde.ca.gov/Ci/ma/cf/documents/mathfwoverview.pdf.

Chan, P. et al. (2014). Beyond involvement: Promoting student ownership of learning in classrooms. *Intervention in School and Clinic*. 50(2), 105–113.

Chick, Nancy. (2017). Metacognition. *CFT Teaching Guides.* Retrieved from https://cft.vanderbilt. edu/guides-sub-pages/metacognition/.

Cohen, E.G. (1986). *Designing groupwork: Strategies for heterogeneous classrooms.* New York: Teachers College Press.

Cohen, E.G. & Chatfield, M. (1991). *Complex instruction implementation manual.* Palo Alto, CA: Stanford University.

Cohen, E.G., et al. (1995). Complex instruction: Higher order thinking in heterogeneous classrooms. In Stahl, R.J. (Ed.). *Handbook of Cooperative Learning*. Westport, CT: Greenwood Publishing Company.

Cohen, E.G., & Lotan, R.A. (1997). *Working for equity in heterogeneous classrooms: Sociological theory in practice.* New York: Teachers College Press.

Cohen, E.G., Lotan, R.A., & Leechor, C. (1989). Can classrooms learn? *Sociology of Education*, 62.

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, 77(1), 113–143.

Crowe, R. & Kennedy, J. (2018). *Developing student ownership: Supporting students to own their learning through the use of strategic learning practices.* West Palm Beach, FL: Learning Sciences International.

Datta, D.K. & Narayanan, V.K. (1989). A meta-analytic review of the concentration-performance relationship: Aggregating findings in strategic management. *Journal of Management*, 15(3), 469–483.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2013). *High school flip book: Common core state standards for mathematics.* Retrieved from http://www.katm.org/flipbooks/HS%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014a). *Common core state standards for mathematics flip book: Kindergarten*. Retrieved from http://www.katm.org/flipbooks/K%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014b). *Common core state standards for mathematics flip book: Grade 1*. Retrieved from http://www.katm.org/flipbooks/1%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014c). *Common core state standards for mathematics flip book: Grade 2*. Retrieved from http://www.katm.org/flipbooks/2%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014d). *Common core state standards for mathematics flip book: Grade 3*. Retrieved from https://alex.state.al.us/ccrs/sites/alex.state.al.us.ccrs/files/3rd%20Grade%20Updated.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014e). *Common core state standards for mathematics flip book: Grade 4*. Retrieved from http://www.katm.org/flipbooks/4%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014f). *Common core state standards for mathematics flip book: Grade 5*. Retrieved from http://www.katm.org/flipbooks/5%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014g). *Common core state standards for mathematics flip book: Grade 6.* Retrieved from http://www.katm.org/flipbooks/6%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014h). *Common core state standards for mathematics flip book: Grade 7.* Retrieved from http://www.katm.org/flipbooks/7%20FlipBook%20Final%20CCSS%202014.pdf.

Departments of Education in Ohio, North Carolina, Georgia., EngageNY, NCTM, & *Tools for the Common Core Standards.* (2014i). *Common core state standards for mathematics flip book: Grade 8.* Retrieved from https://www.cesa2.org/STEM/Flip%20book_CCSS_8th%20grade.pdf.

Digital Chalkboard. (2019). California's common core state standards for mathematics: Organization and structure. Retrieved from https://www.mydigitalchalkboard.org/portal/default/Content/Viewer/Content.

Dunn, R., Griggs, S.A., Olson, J., Beasley, M., & Gorman, B.S. (1995). A meta-analytic validation of the Dunn and Dunn model of learning-style preferences. *Journal of Educational Research*, 88(6), 353–362.

Dusek, J.B. & Joseph, G. (1985). The bases of teacher expectancies. In J. B. Dusek (Ed.), *Teacher Expectancies*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Duzinski, G. A. (1987). *The educational utility of cognitive behavior modification strategies with children: A quantitative synthesis*. Unpublished Ph.D., University of Illinois at Chicago, IL.

Education.com. (2019). Common core state standards: Math, kindergarten through fifth grade. Retrieved from https://www.education.com/common-core/.

Elmore, R.F. (1992). Why restructuring alone won't improve teaching. *Educational Leadership*, 49(7), 44–48.

Emeny, W. (2013). Metacognition...thoughts on teaching mathematical problem solving skills. Retrieved from http://www.greatmathsteachingideas.com/2013/07/23/metacognition-thoughts-on-teaching-mathematical-problem-solving-skills/; dated 7/23/2013.

Engage NY. (2015). *Regents examination in algebra II (common core); Sample questions, fall 2015.* Retrieved from https://www.engageny.org/resource/regents-exams-mathematics-algebra-ii-sample-questions.

Fendick, F. (1990). *The correlation between teacher clarity of communication and student achievement gain: A meta-analysis*. Unpublished Ph.D., University of Florida, FL.

Friesen, S. (2008). *Effective teaching practices—A practice.* Toronto: Canadian Education Association.

Fuchs, L.S. & Fuchs, D. (1986a). Curriculum-based assessment of progress toward long-term and short-term goals. *Journal of Special Education*, 20(1), 69–82.

Fuchs, L.S. & Fuchs, D. (1986b). Effects of systematic formative evaluation: A meta-analysis. *Exceptional Children*, 53(3), 199–208.

Guskey, T.R. (2003). How classroom assessments improve learning. *Educational Leadership*, 60(5), 6–11.

Haertel, G.D., Walberg, H.J., & Haertel, E.H. (1980). Classroom socio-psychological environments and learning: A quantitative synthesis. *British Educational Research Journal*, 7(1), 27–36.

Hammond, Z. (2015). *Culturally responsive teaching & the brain: Promoting authentic engagement and rigor among culturally and linguistically diverse students.* Thousand Oaks, CA: Corwin, A Sage Company.

Hanover Research. (2014). *The impact of formative assessment and learning interventions on student achievement* [White paper]. Retrieved February 4, 2019 from Hanover Research District Administration Practice: https://www.hanoverresearch.com/media/The-Impact-of-Formative-Assessment-and-Learning-Intentions-on-Student-Achievement.pdf.

Hart, B. & Risley, T.R. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore: Brookes Publishing Co.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Hattie, J. (2011). *Visible learning for teachers*. New York, NY: Routledge.

Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112.

Huang, Z. (1991). *A meta-analysis of self-questioning strategies*. Unpublished Ph.D., Hofstra University, NY.

Hunter, M. (1967). *Teach more-faster!* Thousand Oaks, CA: Corwin Press.

Hunter, M. (1982). *Mastery teaching*. El Segundo, CA: TIP Publications.

Kluger, A.N. & DeNisis, A. (1996). The effects of feedback interventions on performance: A historical review, meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, 119(2), 254.

Knowles, M.S. (1984). *The modern practice of adult education: From pedagogy to andragogy.* Wilton, CT: Association Press.

Kulhavy, R.W. (1997). Feedback in written instruction. *Review of Educational Research*, 47(2), 211–232.

Kumar, D.D. (1991). A meta-analysis of the relationship between science instruction and student engagement. *Educational Review*, 43(1), 49–61.

Lane, H.B. & Allen, S. (2010). The vocabulary-rich classroom: Modeling sophisticated word use to promote word consciousness and vocabulary growth. *The Reading Teacher,* 63(5), 362–370.

Larson, M. R., & Kanold, T. D. (2016). *Balancing the equation: A guide to school mathematics for educators and parents*. Bloomington, IN: Solution Tree.

Locke, E.A. & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.

Marzano, R. J. (1998). *A theory-based meta-analysis of research on instruction*. Aurora, CO: Mid-Continent Regional Education Lab.

Marzano, R.J. (2000). *A new era of school reform: Going where the research takes us*. Aurora, CO: Mid-Continent Regional Education Lab.

McTighe, J. & Wiggins, G. (2012). *Understanding by design® framework* [White paper]. Retrieved February 4, 2019 from ASCD: https://www.ascd.org/ASCD/pdf/siteASCD/publications/UbD_WhitePaper0312.pdf.

Morrison, J. (2008/2009). Why teachers must be data experts. *Educational Leadership*, 66(4).

Nagy, W.E. (1988). *Teaching vocabulary to improve reading comprehension*. Urbana, IL: NCTE.

NAEYC. (2009). Developmentally appropriate practice in early childhood programs serving children from birth through age 8. Washington, DC: The National Association for the Education of Young Children.

National Council of Teachers of Mathematics. (2000). Principles and standards for school mathematics. Reston, VA: National Council of Teachers of Mathematics.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010a). *Common core state standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: Authors.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010b). *Common core state standards for English language arts and literacy in history/social studies, science, and technical subjects: Appendix A*. Washington, DC: Authors.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010c). *Common core state standards for mathematics*. Washington, DC: Authors.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2013). *K–8 publishers' criteria for the common core state standards for mathematics.* Washington, D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.

National Mathematics Advisory Panel. (2008). Foundations for success: The final report of the National Mathematics Advisory Panel. Washington, DC: Department of Education.

National Research Council. (2001). Adding it up: Helping children learn mathematics. J. Kilpatrick, J. Swafford, and B. Findell (Eds.). Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

NCSU (National Center on Scaling Up). (2014). Developing student ownership and responsibility in high schools. *Practitioner Brief*.

Niemi, D., Vallone, J., Wang, J., & Griffin, N. (2007). Recommendations for building a valid benchmark assessment system: Interim report to the Jackson public schools. *CRESST Report 723*. National Center for Research on Evaluation, Standards, and Student Testing (CRESST). University of California, Los Angeles, CA.

Nuthall, G. (2005). The cultural myths and realities of classroom teaching and learning: A personal journey. *Teachers College Record*, 107(5), 895–934.

Nuthall, G. (2007). *The hidden lives of learners*. Wellington, New Zealand: NZCER Press.

O'Connell, M. & Vandos, K. (2015). *Partnering with students: Building ownership of learning*. Thousand Oaks, CA: Corwin.

Office of Superintendent of Public Instruction–Washington State. (2010). Standards for mathematical practices progression through grade levels. Retrieved from https://www.masonk12.net/sites/default/files/documents/Buildings/CO/wa%20smp%20unpacked%20k-12.pdf.

Ohio Department of Education. (2017a). Standards for mathematical practices. Retrieved from http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/Standards-for-Mathematical-Practice/Standards-for-Mathematical-Practice.pdf.aspx.

Ohio Department of Education. (2017b). Standards for mathematical practices: High school. Retrieved from http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/Standards-for-Mathematical-Practice/ohio_standards_for_mathematical_practices_in_high_school.pdf.aspx.

RAND Education. (2012). Teachers matter: Understanding teachers' impact on student achievement. Santa Monica, CA: https://www.rand.org/pubs/corporate_pubs/CP693z1-2012-09.html.

Reeves, D. (2018). Engaging every learner (presentation). San Bernardino City Unified School District. Retrieved July 9, 2018 from: University of California, San Bernardino and www.CreativeLeadership.net.

Risko, V.J. & Vogt, M. (2016). *Professional learning in action: An inquiry approach for teachers of literacy.* New York: Teachers College Press.

Rosenshine, B. & Meister, C. (1994). Reciprocal teaching: A review of the research. *Review of Educational Research*, 64(4), 479–530.

Rothman, R. (2011). *Something in common: the common core standards and the next chapter in American education*. Cambridge, MA: Harvard Education Press.

Samson, G.E., Strykowski, B., Weinstein, T., & Walberg, H.J. (1987). The effects of teacher questioning levels on student achievement: A quantitative synthesis. *Journal of Educational Research*, 80(5), 290–295.

Scott, J.A., Skobel, B.J., & Wells, J. (2008). *The word-conscious classroom: Building the vocabulary readers and writers need*. New York: Scholastic Inc.

Seidel, T. & Shavelson, R.J. (2007). Teaching effectiveness research in the past decade: The role of theory and research and research design in disentangling meta-analysis results. *Review of Educational Research*, 77(4), 454–499.

Shanahan, Timothy. (2012.). *Shanahan on literacy* (blog). Retrieved from http://www.shanahanonliteracy.com/2012/06/what-isclose-reading.html.

Stevens, R.J. & Slavin, R.E. (1990). When cooperative learning improves the achievement of students with mild disabilities: A response to Tateyama-Sniezek. *Exceptional Children*, 57(3), 276–280.

Student Achievement Partners. (2013a). The common core shifts at a glance. Retrieved from http://achievethecore.org/page/277/the-common-core-shifts-at-a-glance-detail-pg.

Student Achievement Partners. (2013b). Complete guide to creating text-dependent questions. Retrieved from http://achievethecore.org/page/46/complete-guide-to-creating-text-dependent-questions.

Student Achievement Partners. (2013c). ELA/literacy: Text-dependent questions. Retrieved from http://achievethecore.org/page/710/text-dependent-question-resources#.

Student Achievement Partners. (2013d). Introduction to the ELA/literacy shifts of the common core state standards (PowerPoint). Retrieved from http://achievethecore.org/dashboard/408/search/3/1/0/page/394/introduction-to-ela-literacy-shifts.

Student Achievement Partners. (2013e). Shifts at a glance: College- and career-ready shifts in English language arts/literacy. Retrieved from https://achievethecore.org/content/upload/ELA%20SAP_ShiftsAtAGlance_02.pdf.

Student Achievement Partners. (2013f). Student writing samples. Retrieved from http://achievethecore.org/page/504/common-core-informative-explanatory-writing-list-pg.

Student Achievement Partners. (2013g). Understanding text-dependent questions (Powerpoint). Retrieved from http://achievethecore.org/dashboard/408/search/3/1/0/page/396/understanding-text-dependent-questions.

Student Achievement Partners. (2014). Vocabulary and the common core. Retrieved from https://achievethecore.org/page/974/vocabulary-and-the-common-core.

Swanson, H.L. & Hoskyn, M. (1998). Experimental intervention research on students with learning disabilities: A metaanalysis of treatment outcomes. *Review of Educational Research*, 68(3), 277–321.

Taylor, L. & Parsons, J. (2011). Improving student engagement. *Current Issues in Education,* 14(1). Retrieved from http://cie.asu.edu/.

Test, J.E., Cunningham, D.D., & Lee, A.C. (2010). Talking with young children: How teachers encourage learning. *Dimensions of Early Childhood,* 38(3), 3–14.

Think Math! (2019). Differences between, and connections between, content and practice standards. Retrieved from http://thinkmath.edc.org/resource/differences-between-and-connections-between-content-and-practice-standards.

Thomas, R. S. (2011). My nine 'truths' of data analysis: Data-driven strategies alone won't boost student achievement. *Education Week Spotlight*, 30(35), 29, 36.

Timperley, H. (2011). *Realizing the power of professional Learning*. New York, NY: Open University Press.

Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development*, 65(2), 606–621.

Weimer, Maryellen. (2012). Deep learning vs. surface learning: Getting students to understand the difference. Retrieved from the Teaching Professor Blog: http://www.facultyfocus.com/articles/teaching-professor-blog/deep-learning-vs-surface-learning-getting-students-to-understand-the-difference/.

Wiggins, G. & McTigher, J. (2005). *Understanding by design.* Alexandria, VA: The Association for Supervision and Curriculum Department.

We want to hear from you…

Please give us your feedback. Include your name and contact info if you want us to reach out to you. Then turn this sheet in as you leave.

1. What resonated with you?

2. Why is student ownership important to you?

3. What questions do you still have?

Name: _____

Position: _____

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School: _____

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District: _____

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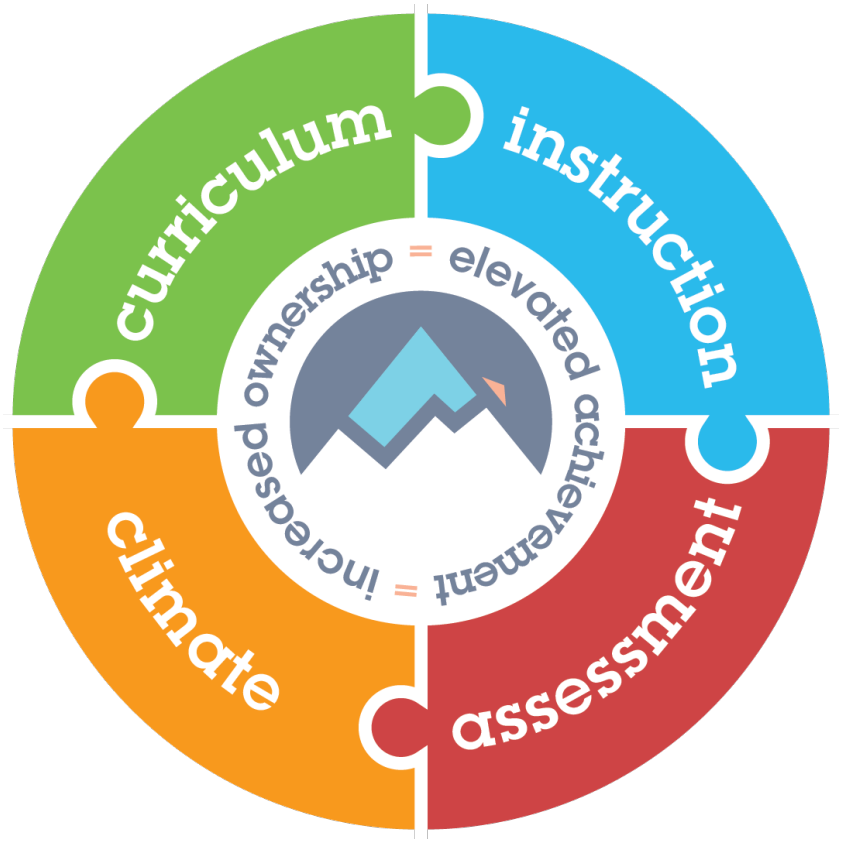

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