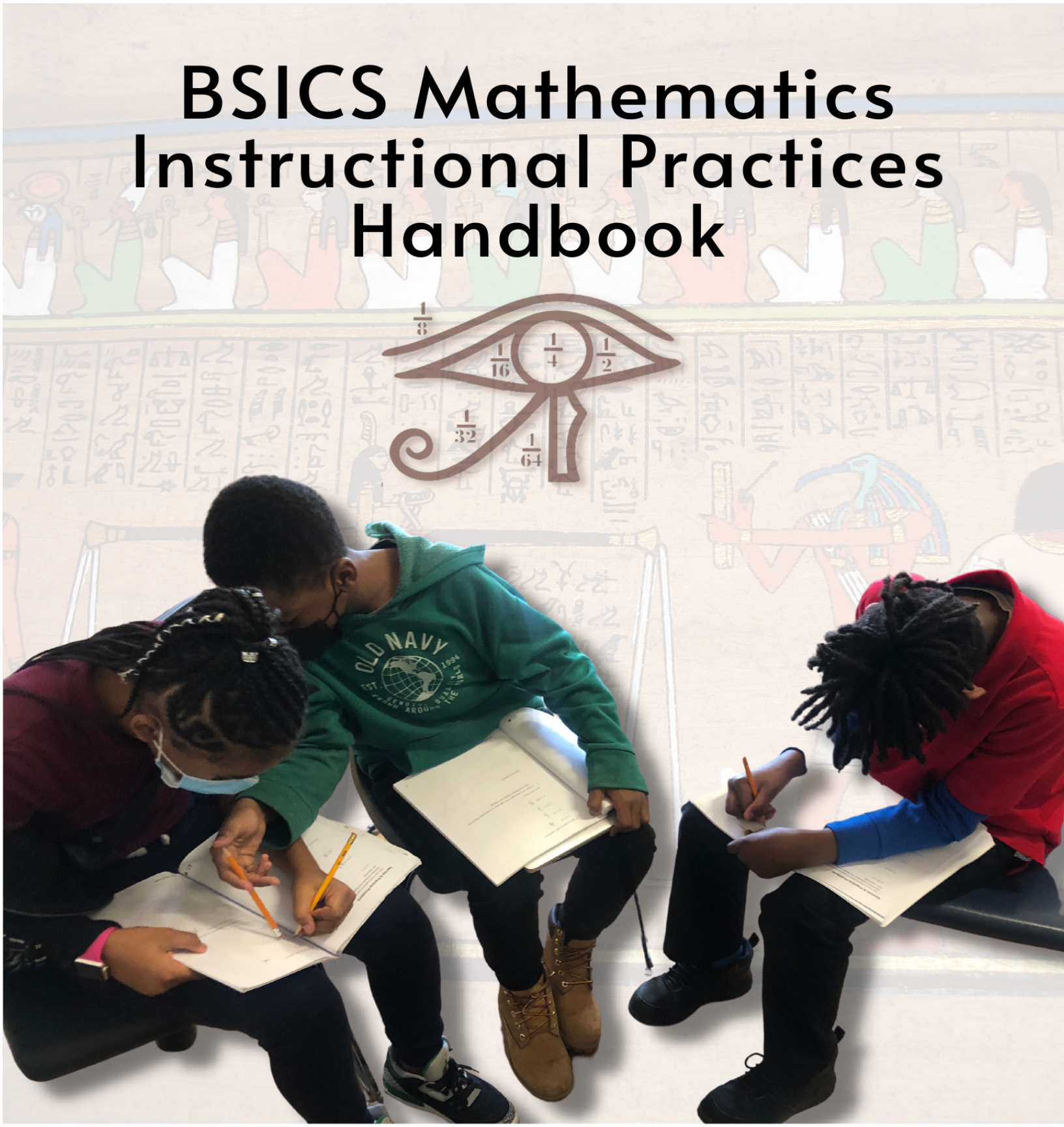
BSICS Mathematics Instructional Practices Handbook



Betty Shabazz
International Charter Schools

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Welcome and Introduction

Welcome to the Mathematics Handbook of Betty Shabazz International Charter School! This comprehensive guide has been meticulously crafted to serve as a valuable reference and a trusted companion for the mathematics department. It is designed to provide a clear understanding of the fundamental concepts, principles, and techniques that form the backbone of mathematics education at our esteemed institution.

Mathematics is not merely a subject to be studied; it is a language, a powerful tool for understanding and describing the world around us. It permeates every aspect of our lives, from the structure of the universe to the intricate patterns found in nature, from the algorithms that power our digital age to the logic that underpins critical thinking. At Betty Shabazz International Charter School, we recognize the vital importance of mathematics in equipping our students with the skills they need to thrive in an ever-changing global landscape.

This handbook serves as a manifesto, embodying our commitment to excellence in mathematics education. It encapsulates the collective wisdom, expertise, and pedagogical approaches of our dedicated leaders and educators, who have drawn upon years of experience to create a resource that empowers learners at all levels. Whether you are a beginner navigating the exciting terrain of teaching numbers, an intermediate learner seeking to deepen your understanding of mathematical pedagogy, or an advanced educator aiming to master the teaching of complex mathematical concepts, this handbook is here to guide you every step of the way. Within these pages, you will find a wealth of knowledge presented in a clear, concise manner.

As a reference tool, this handbook will serve as your compass as a mathematics educator at BSICS. Whether you are preparing lessons for a class, a challenging assessment, or simply seeking to deepen your mathematical prowess, the Mathematics Handbook will be your reliable companion.

We encourage you to embrace this handbook as an invaluable resource, one that complements the rigorous curriculum we offer at Betty Shabazz International Charter Schools. Let it be your guide to unlocking the beauty and power of mathematics instruction, empowering you to think critically about your lesson delivery, solve problems creatively with your students, and assist them in developing the analytical skills necessary for success in academia, the workplace, and life beyond the classroom.

May this Mathematics Handbook be the compass that guides you through the exciting world of mathematics, shaping your students' journey and inspiring a lifelong love for this remarkable discipline. Let it be the manifesto that reflects our commitment to excellence, empowering each and every student to reach their full mathematical potential.

Best wishes on your mathematical journey!

Mathematics Department, Betty Shabazz International Charter Schools

Vision Statement for BSICS Mathematics Instruction

BSICS' goal is to provide mathematics education that supports the learning of all students at the highest possible level. We seek to educate each child to develop his/her will and range of intelligences to become critical, conscious and productive citizens of the local and world community. To achieve this goal, we have adopted the CCSS which presents an opportunity for systematic improvement. The Common Core State Standards for Mathematics build on the best of existing standards and reflect the skills and knowledge students will need to succeed in college, career, and life.

BSICS embraces the *Principles to Action* set forth by the NCTM, which state that an excellent mathematics program have the following Guiding Principles:

- Provides **effective teaching** that engages students in meaningful learning through individual and collaborative experiences that promote their ability to make sense of mathematical ideas and reason mathematically.
- Requires that all students have **access** to a high-quality curriculum, effective teaching and learning, high expectations, and the support and resources needed to maximize their learning potential.
- Includes a **curriculum** that develops important mathematics along coherent learning progressions and develops connections among areas of mathematical study and between mathematics and the real world.
- Integrates the use of **mathematical tools and technology** as essential resources to help students learn and make sense of mathematical ideas, reason mathematically, and communicate their mathematical thinking.
- Ensures that **assessment** is an integral part of instruction, provides evidence of proficiency with important mathematics content and practices, includes a variety of data sources, and informs feedback to students, instructional decisions, and program improvement.
- Educators hold themselves and their colleagues accountable for the mathematics success of every student and for their personal and collective **professional** growth towards effective teaching and learning of mathematics.

Math School Improvement Plan

Math Goals and Strategies

The math program at Betty Shabazz International Charter School is a crucial component of our students' academic success. We have developed a set of goals and strategies to ensure that our teachers are prepared with deep conceptual understanding and instructional pedagogy to provide rigorous and challenging instruction in math.

Adult Culture:

- 100% of teachers will embody and promote a culture that encourages a growth mindset, African-centered applications to STEM, open learning, research-based best practices, and collaboration to develop instructional pedagogy and content knowledge.

Student Culture:

- 100% of students will be immersed in an African-centered STEM focused supportive learning environment that develops a growth and mathematical mindset;
- 90% of students are expected to practice mathematics at home, take mathematical risks, embrace challenges, learn from mistakes, and work collaboratively to solve problems while working productively through challenging problems.

Academic Achievement:

- Year 1: 26% of students will meet grade level attainment on the IAR (where state is; up from ~8.0% currently)
- Year 2: 30% of students will meet grade level attainment on the IAR
- Year 3: 40% of students will meet grade level attainment on the IAR

Department Priorities:

- Deliver Rigorous & Engaging Lessons and Tasks; Incorporate a balanced & effective instructional model that is both a Teacher-Facilitated & Student-Directed Learning Environment.
- Develop a School Community Where All Students Have Access to High Quality Instruction.
- Collect and Use Precise Data and Student Work to Drive Instruction and Coaching.
- Implement with fidelity the BSICS's Integrated Mathematics curriculum and resources to emphasize problem-solving, critical thinking, and real-world applications of mathematics.

Math Scope of the Year

Phase 1, Strong Start: Strong Student Community, Thoughtful Systems, and High-Level Intellectual Preparation 8 weeks (August 28 - October 20):					
Student Outcomes	Teacher Actions	Leader Actions	Special Education	Assessments	Training
90% of students turning in homework 90% of students engaged in lessons/learning	100% of teachers assigning homework at least 3x per week and entering grades in Powerschool; 100% of teachers sending home weekly math guide	Checking gradebook weekly	Making sure homework is modified to fit IEPs	Curriculum based bi-weekly assessments, iReady individualized plans; student work samples	Imagine Learning/Homework differentiation/modifications
Phase 2, Leveraging Data to Drive Instruction: Data Analysis, Action Planning, and Rigorous Math 9 weeks (October 30 - January 12)					
Student Outcomes	Teacher Actions	Leader Actions	Special Education	Assessments	Training
100% of students meeting typical growth goal on iReady	100% of teachers incorporating RTI M/T/Th/F and iReady on Weds	Checking iReady platform weekly; observing RTI & iReady times	Checking to make sure all students have access to RTI, iReady instructional plans and rigorous instruction	iReady and IAR practice problems during RTI	RTI, iReady, IL Digital Library
Phase 3, Targeted Teaching Time: Building Independence Through Strategic, Transferable Coaching 8 weeks (January 22 - March 15)					
Student Outcomes	Teacher Actions	Leader Actions	Special Education	Assessments	Training

80% of students passing grade level assignments from curriculum	100% of teachers planning in advance with coaches/teachers; delivering high quality instruction; maintaining gradebooks; following the BSICS Math protocols	Checking lesson plans weekly with meaningful feedback; weekly observations; evaluations	Checking to make sure 100% of IEPs are being followed	Mid unit, end of unit assessments	Delivering high quality lessons when 80% of students are not on grade level
Phase 4, Putting All the Pieces Together: Demonstrating Mastery on End-of-Year Exams and Mastering Student-Led Discourse 8 weeks (March 25 - May 24)					
Student Outcomes	Teacher Actions	Leader Actions	Special Education	Assessments	Training
26% of students grade level proficient	100% of teachers following professional expectations; delivering high quality instruction	Develop a written protocol around math practices and protocol; Monitoring of the coach/teacher protocols and all mathematics systems and schedule	Checking to make sure 100% of IEPs are being followed	IAR	

Professional Development and Conferences

At our school, it is mandatory for all teachers to attend Professional Development sessions held every Wednesday from 2:00 PM to 4:00 PM. Locations are to be determined. These sessions are vital for professional growth, as they offer opportunities to enhance instructional practices, stay updated with educational trends, and collaborate with colleagues. By ensuring everyone's attendance, we promote continuous improvement, consistent implementation of best practices,

alignment with school goals, and regulatory compliance, all of which contribute to a supportive and effective learning environment for our students.

Along with Professional Development, educators will have opportunities to participate in conferences and gain valuable insights, instructional strategies, and resources that ultimately enhance their teaching effectiveness and contribute to improved student outcomes. We have the following annual conferences. If you have any conferences you think we should attend, please contact your Math Coach.

Coaching Summit:
Nicole S. Turner
Dates: July 10-12, 2023
Location: Virtual
Info: "Empower Instructional Coaches and Instructional Leaders to gain the "How To" in the best Instructional Coaching Practices. The Speakers and Presenters of this conference will equip you with the tools needed and give you exclusive insight into the world of instructional coaching to increase student achievement by supporting classroom teachers across the world."

Illinois Council for Exceptional Children Conference
Pre-registration: Jul 1, 2023
Location: Chicago Marriott Naperville
Dates: November 2nd - 4th
Info: Topics related to: "academics; autism; behavior; community engagement; diversity; dyslexia; early childhood; elementary; family partnership; high school; home/hospital; legal; mental health; social-emotional learning; student engagement; transition; and more".

Info: Topics related to: "academics; autism; behavior; community engagement; diversity; dyslexia; early childhood; elementary; family partnership; high school; home/hospital; legal; mental health; social-emotional learning; student engagement; transition; and more".

NCTM: National Council of Teachers of Mathematics
Dates: February 7-9, 2024
Location: Seattle, WA
Info: "Networking and learning opportunities for mathematics educators across the nation Advocates for high-quality mathematics teaching and learning for each and every student"

According to their site:

- **Framework:**

- **Teaching and Learning:** NCTM provides guidance and resources for the implementation of research-informed and high-quality teaching that supports the learning of each and every student in equitable environments.
- **Access, Equity and Empowerment:** NCTM advances a culture of equity where each and every person has access to high-quality teaching empowered by the opportunities mathematics affords.
- **Building Member Value:** NCTM provides community and resources to engage and listen to members in order to improve the teaching and learning of mathematics.
- **Advocacy:** NCTM engages in advocacy to focus, raise awareness, and influence decision makers and the public on issues concerning high-quality mathematics teaching and learning.

Instructional Strategies Focus from Coaches

- Q1 Manipulatives then fade into discourse and transition Q2
- Q2 Discourse
- Q3 Meaningful tasks practice discourse, manipulatives, to get to tasks

Standards for Math Practice & Questions for Developing Mathematical Thinking

To help students become college and career ready, there are 8 Standards for Math Practice that BSICS integrates into our daily instruction followed by questions to stimulate mathematical thinking:

Standards for Mathematical Practice Video (12mins.)

Standards for Mathematical Practice	Questions to Develop Mathematical Thinking

1. Make sense of problems and persevere in solving them. **CCSS.Math.Practice.MP1** • Interpret and make meaning of the problem looking for starting points. Analyze what is given to explain to themselves the meaning of the problem. • Plan a solution pathway instead of jumping to a solution. • Can monitor their 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. • Can understand various approaches to solutions. • Continually ask themselves; "Does this make sense?"	• How would you describe the problem in your own words? • How would you describe what you are trying to find? • What do you notice? • What information is given in the problem? • Describe the relationship between the quantities. • Describe what you have already tried. • What might you change? • Talk me through the steps you've used to this point. • What steps in the process are you most confident about? • What are some other strategies you might try? • What are some other problems that are similar to this one? • How might you use one of your previous problems to help you begin? • How else might you organize, represent, and show?
2. Reason abstractly and quantitatively. **CCSS.Math.Practice.MP2** • Make sense of quantities and their relationships. • Are able to decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make meaning of the symbols in a problem) quantitative relationships. • Understand the meaning of quantities and are flexible in the use of operations and their properties. • Create a logical representation of the problem. • Attends to the meaning of quantities, not just how to compute them.	• What do the numbers used in the problem represent? • What is the relationship of the quantities? • How is_____related to_____? • What is the relationship between and _____? • What does_____mean to you? (e.g. symbol, quantity, diagram) • What properties might we use to find a solution? • How did you decide on this task that you needed to use? • Could we have used another operation or property to solve this task? Why or why not?

3. Construct viable arguments and critique the reasoning of others. **CCSS.Math.Practice.MP3** ● Analyze problems and use stated mathematical assumptions, definitions, and established results in constructing arguments. ● Justify conclusions with mathematical ideas. ● Listen to the arguments of others and ask useful questions to determine if an argument makes sense. ● Ask clarifying questions or suggest ideas to improve/revise the argument. ● Compare two arguments and determine correct or flawed logic.	● What mathematical evidence would support your solution? How can we be sure that__? / How could you prove that _____? Will it still work if__? ● What were you considering when ? ● How did you decide to try that strategy? ● How did you test whether your approach worked? ● How did you decide what the problem was asking you to find? (What was unknown?) ● Did you try a method that did not work? Why didn't it work? Would it ever work? Why or why not? ● What is the same and what is different about__? ● How could you demonstrate a counter-example?
4. Model with mathematics. **CCSS.Math.Practice.MP4** ● Understand that this is a way to reason quantitatively and abstractly (able to decontextualize and contextualize). ● Apply the math they know to solve problems in everyday life. ● Are able to simplify a complex problem and identify important quantities to look at relationships. ● Represent mathematics to describe a situation either with an equation or a diagram and interpret the results of a mathematical situation. ● Reflect on whether the results make sense, possibly improving or revising the model. ● Ask themselves, "How can I represent this mathematically?"	● What number model could you construct to represent the problem? ● Modeling One-Step Equations ● What are some ways to represent the quantities? ● What's an equation or expression that matches the diagram, number line, chart, table? ● Dependent & Independent Variables ● Where did you see one of the quantities in the task in your equation or expression? ● Would it help to create a diagram, graph, table? ● What are some ways to visually represent? ● What formula might apply in this situation?

5. Use appropriate tools strategically. **CCSS.Math.Practice.MP5** ● Use available tools recognizing the strengths and limitations of each. ● Use estimation and other mathematical knowledge to detect possible errors. ● Identify relevant external mathematical resources to pose and solve problems. ● Use technological tools to deepen their understanding of mathematics.	● What mathematical tools could we use to visualize and represent the situation? ● What information do you have? ● What do you know that is not stated in the problem? ● What approach are you considering trying first? ● What estimate did you make for the solution? ● In this situation would it be helpful to use: a graph, number line, ruler, diagram, calculator, manipulative? ● Why was it helpful to use_____? ● What can using a_____show us, that _____may not? ● In what situations might it be more informative or helpful to use _____?
6. Attend to precision. **CCSS.Math.Practice.MP6** ● Communicate precisely with others and try to use clear mathematical language when discussing their reasoning. ● Understand 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.	● What mathematical terms apply in this situation? ● How did you know your solution was reasonable? ● Explain how you might show that your solution answers the problem. ● Is there a more efficient strategy? ● How are you showing the meaning of the quantities? ● What symbols or mathematical notations are important in this problem? ● What mathematical language, definitions, properties can you use to explain_____? ● How could you test your solution to see if it answers the problem?

7. Look for and make use of structure. **CCSS.Math.Practice.MP7** • Apply general mathematical rules to specific situations. • Look for the overall structure and patterns in mathematics. • See complicated things as single objects or as being composed of several objects.	• What observations do you make about__? • What do you notice when____? • What parts of the problem might you eliminate, simplify? • What patterns do you find in_____? • How do you know if something is a pattern? • What ideas that we have learned before were useful in solving this problem? • What are some other problems that are similar to this one? • How does this relate to_____? • In what ways does this problem connect to other mathematical concepts?
8. Look for and express regularity in repeated reasoning. **CCSS.Math.Practice.MP8** • See repeated calculations and look for generalizations and shortcuts. • See the overall process of the problem and still attend to the details. • Understand the broader application of patterns and see the structure in similar situations. • Continually evaluate the reasonableness of their intermediate results.	• Will the same strategy work in other situations? • Is this always true, sometimes true or never true? • How would we prove that_____? • What do you notice about_____? • What is happening in this situation? • What would happen if_____? • Is there a mathematical rule for ? • What predictions or generalizations can this pattern support? • What mathematical consistencies do you notice?

Magdalene Lampert's Approach to Math Problem-Solving

Magdalene Lampert is a renowned education scholar known for her contributions to the field of mathematics education. Her approach to math problem-solving encourages a deep understanding of mathematical concepts, rather than just rote memorization of procedures. Here's a summary of her key insights:

1. **The role of discourse in problem-solving:** Lampert's work emphasizes the importance of student discourse in the math classroom. She encourages students to explain their thinking process and reasoning behind solutions. This kind of discourse helps students articulate their understanding and learn from one another, leading to a deeper conceptual grasp of mathematical ideas.

2. **The importance of conceptual understanding:** Lampert advocates for a shift from procedural teaching (simply teaching the steps to solve a problem) to a more conceptual understanding of mathematics. Her work emphasizes the need for students to understand the 'why' behind mathematical principles and procedures.

3. **Teaching through problem-solving:** Lampert suggests that teaching through problem-solving can help students build mathematical reasoning skills. In this approach, students learn new mathematical concepts by solving problems that necessitate the use of these concepts, rather than being taught the concepts first and then practicing them through problems.

4. **Progressively complex problem-solving:** Starting with problems that involve smaller numbers to simplify problem-solving and progressively increasing complexity is a pedagogical strategy Lampert suggests. This allows students to grasp the underlying concepts and procedures without getting overwhelmed by complex arithmetic.

5. **The use of models in reasoning:** Lampert highlights the importance of working with students to create models of their reasoning processes that entail the conceptual foundations of the problem area. This helps make abstract concepts more tangible and promotes a deeper understanding.

These insights are drawn from a range of Lampert's work, including her book "Teaching Problems and the Problems of Teaching," where she provides a detailed narrative of her teaching experience and her innovative approaches to mathematics education.

Key Shifts in Teaching Mathematics

 Introduction to Math Shifts Video (12 mins)

Shifts in Mathematics		
Shift 1	Focus	Teachers significantly narrow and deepen the scope of how time and energy is spent in the math classroom. They do so in order to focus deeply on only the concepts that are prioritized in the standards.
Shift 2	Coherence	Principals and teachers carefully connect the learning within and across grades so that students can build new understanding onto foundations built in previous years.
Shift 3	Fluency	Students are expected to have speed and accuracy with simple calculations; teachers structure class time and/or homework time for students to memorize, through repetition, core functions.
Shift 4	Deep Understanding	Students deeply understand and can operate easily within a math concept before moving on. They learn more than the trick to get the answer right; they learn the math.
Shift 5	Application	Students are expected to use math and choose the appropriate concept for application even when they are not prompted to do so.
Shift 6	Dual Intensity	Students are practicing and understanding. There is more than a balance between these two things in the classroom – both are occurring with intensity.

BSICS Mathematics Instructional Minutes

	Grades 6-8		Grades 3-5		Grades K-2	
	Full Day	Half Day	Full Day	Half Day	Full Day	Half Day
Math	75+	36+	~100	~50	~110	~75

BSICS Core Mathematics Curriculum

BSICS uses the Imagine Learning Online Curriculum for instruction and iReady for assessments and homework.

> *WASHINGTON, DC – Today, the LearnZillion Illustrative Mathematics 6-8 Math curriculum received the top rating on EdReports for middle school math. LearnZillion is Illustrative Mathematics' only Certified Partner.*

Each lesson includes ready-to-present, student-facing visuals accompanied by teaching notes. The teaching notes highlight practical teaching moves that keep the lesson on track and provide advice on how to meet students at different levels. As a result, Imagine Learning eliminates the need for additional teacher prep work, ensuring that teachers have time to address the most important components of Illustrative Mathematics' problem-based high school curriculum.

In addition, Imagine Learning has integrated digitized Illustrative Mathematics assessments and practice items so that teachers can receive auto-scored formative feedback on student mastery, and students can practice answering tech-enabled questions.

- K - 5th Grades Overview
- 6 - 8th Grades Overview
- Curriculum Access (Login Required)

Suggested Online Educational Resources

Open, creative lessons from Jo Boaler: Youcubed

National Council for Teaching Mathematics: NCTM

Khan Academy: Khad Academy

African-Centered Mathematics

BSICS provides an education that is culturally rooted in excellence. Each subject area teacher is responsible for teaching from an African-centered pedagogy. In mathematics, it is the expectation that each unit opener includes contributions from people of African descent. Here are some resources to help:

- Content and instructional practices. Heshima To Hotep - Ten Steps to Educational Excellence

- The Baseline Essays provide information about the history, culture, and contributions of Africans and African-Americans in the disciplines of Art, Language Arts, Mathematics, Science, Social Studies, and Music and should be used by teachers and other District staff as a reference and resource just as adopted textbooks and other resources are used. Portland Baseline Essays

- Dr. Scott W. Williams, Professor of Mathematics at The State University of New York at Buffalo created a site dedicated to Mathematics of the African Diaspora. A Modern History of Blacks in Mathematics

- Beatrice Lumpkin is a long time labor activist with laundry workers, steelworkers, and teachers. As a math professor at Malcolm X College in Chicago, she fought to restore the contributions of people of color to the educational curriculum. She has served as a multicultural consultant to textbook publishers and to public schools in Chicago, Detroit, Milwaukee, and Portland, Ore. Her works include:
    - Mathematics in Egypt: Egyptian Mathematics and African PredecessorsMathematics used in Egyptian construction and bookkeeping
    - African and African-American Contributions to Mathematics
    - Algebra Activities from Many Cultures
    - Multicultural Science and Math Connections: Middle School Projects and Activities

- Black Math Genius offers a video series on historical contributions to mathematics.

BSICS Teaching Practices & Instructional Delivery

At Betty Shabazz International Charter School, we are committed to providing high-quality mathematics education that nurtures deep conceptual understanding, critical thinking, and problem-solving skills in our students. To achieve this goal, we align our instructional practices with the widely recognized framework outlined in the National Council of Teachers of Mathematics (NCTM) publication, "Principles to Actions." This framework consists of eight Mathematics Teaching Practices, which serve as guiding principles for effective mathematics instruction. In this section, we present the BSICS Mathematics Practices and their corresponding instructional strategies, highlighting how they contribute to our students' mathematical growth.

- **Establishing mathematics goals to focus learning:** As educators, we begin each lesson with clearly defined learning goals. These goals guide our instruction and enable students to understand the purpose and relevance of their mathematical studies. By setting explicit objectives, we create a meaningful context for learning and provide students with a sense of direction.
    - *Instructional Strategy:* Clearly state the learning objectives at the beginning of each lesson and engage students in discussions about their significance. Encourage students to reflect on their progress and set personal goals to foster a sense of ownership in their mathematical journey.

- **Implementing tasks that promote reasoning and problem-solving:** We believe in providing students with rich, challenging mathematical tasks that require them to think critically, reason logically, and apply problem-solving strategies. Such tasks promote deep understanding and allow students to develop mathematical proficiency in real-world contexts.
    - *Instructional Strategy:* Incorporate open-ended, thought-provoking tasks that encourage students to explore multiple solution strategies. Foster a classroom culture that values perseverance, collaboration, and the opportunity to learn from mistakes.

- **Using and connecting mathematical representations:** Effective instruction involves leveraging various mathematical representations, such as visual models, graphs, tables, and equations, to help students make connections between mathematical ideas and develop a robust understanding of concepts.
    - *Instructional Strategy:* Provide opportunities for students to visualize and represent mathematical ideas using different tools and representations. Encourage students to discuss and compare different representations to deepen their understanding of mathematical concepts.

- **Facilitating meaningful mathematical discourse:** We believe in creating a classroom environment that encourages student-to-student discourse, where students construct and share mathematical arguments, communicate their reasoning, and engage in respectful debate. Such discourse promotes mathematical thinking and fosters a deeper understanding of concepts.
    - *Instructional Strategy:* Implement strategies such as turn-and-talk, think-pair-share, and whole-class discussions to promote active

participation and collaboration. Emphasize the importance of justifying and critiquing mathematical ideas using evidence and logical reasoning.

- **Posing purposeful questions:** Skillful questioning plays a pivotal role in guiding student thinking and promoting mathematical sense-making. Thoughtfully crafted questions encourage students to explain their reasoning, make connections between concepts, and delve deeper into mathematical ideas.
    - *Instructional Strategy:* Pose open-ended questions that challenge students' thinking and provoke productive discussions. Use probing questions to elicit students' thinking processes and guide them toward deeper mathematical understanding.

- **Building procedural fluency from conceptual understanding:** We recognize that procedural fluency is essential for mathematical proficiency. However, we also emphasize the importance of developing a deep conceptual understanding as the foundation for procedural skills. By connecting procedures to underlying concepts, we empower students to make sense of mathematical operations.
    - *Instructional Strategy:* Provide opportunities for students to explore mathematical concepts concretely, visually, and contextually before introducing procedural algorithms. Foster a balance between conceptual understanding and procedural fluency through explicit connections and ongoing practice.

- **Supporting productive struggle in learning mathematics:** We believe that productive struggle is a vital component of learning mathematics. By allowing students to grapple with challenging problems, we foster perseverance, resilience, and problem-solving skills. We support students as they make sense of mathematics, rather than offering immediate solutions.
    - *Instructional Strategy:* Present tasks that require intellectual effort and encourage students to persevere through challenges. Provide scaffolding and support when necessary, allowing students to engage in productive struggle while maintaining a supportive learning environment.

- **Eliciting and using evidence of student thinking:** To inform our instructional decisions and provide targeted feedback, we continually seek evidence of student understanding and thinking processes. By assessing students' mathematical thinking, we can tailor instruction to address individual needs and facilitate their mathematical growth.

- *Instructional Strategy:* Use a variety of formative assessment strategies, such as observation, student work samples, and questioning techniques, to gauge student understanding. Provide timely and specific feedback that supports students' mathematical progress and guides their future learning.

By incorporating the BSICS Mathematics Practices into our instructional delivery, we strive to create a dynamic and engaging learning environment that empowers students to develop deep mathematical understanding, critical thinking skills, and a passion for mathematics. Together, let us embrace these practices and unlock the limitless potential of mathematics for our students.

Math Accountability Talks

The National Council of Teachers of Mathematics (NCTM) defines math talk as “the ways of representing, thinking, talking, and agreeing and disagreeing that teachers and students use to engage in [mathematical] tasks” (NCTM, 1991). Effective communication about mathematics is essential to help students develop the thinking, self-questioning, and explanation skills needed to master required skills and concepts. In addition to NCTM’s standards, most state standards include competencies related to communicating effectively through mathematical language, justifying solutions, and evaluating the mathematical thinking of others. In order for math talk to be successful, students must understand how to collaborate fairly and hold a respectful exchange of ideas. Before implementing math talk in the classroom, brainstorm a list of classroom norms for how community members will participate and behave during the discussion.

Before the Discussion

- **Define your goal:** What do you hope to accomplish? Goals for math talk include wanting students to: listen and compare methods used to solve a problem, look for the most efficient way to solve a problem, generate explanations for why a particular solution works, or examine why one solution is correct and why another is not.
- **Choose a Problem:** This depends on your goal. If you want to highlight a variety of strategies that can be used to solve a problem, then choose a problem with multiple solution strategies. If you are examining why one solution is correct over another, then choose a problem where students frequently make missteps in their solution strategy.

- **Anticipate Student Responses:** In order to create the best discussion opportunities, think about how students may respond to a particular problem, and create a plan to address any misconceptions that may develop. In addition, if there is an obscure solution that you think may be missed, then plant the seed with a student group or be prepared to introduce the strategy yourself. For example, you can say, "When I looked at this problem, I thought that I could solve the problem like this (show the strategy). How does this strategy compare to the others we used today?"

During the Discussion

- **Monitor Student Responses:** During this time observe the interactions of the groups and make notes about their solution strategies. Also, note any observed areas of concern to address at a later time.
- **Select Students to Present:** Based on your observations, determine which solution strategies to highlight that will best help you accomplish your goal. For example, if you want to emphasize a variety of strategies to solve a particular problem, select solutions that vary from one another.
- **Sequence Student Responses:** Order the presentation of the solution strategies in a manner that will allow you to maximize the students' learning experience. For example, beginning with the most widely used strategy and then moving to the more abstract strategies may draw students' attention to new methods. Similarly, beginning with the more concrete strategies will give students the opportunity to move from a more concrete to an abstract understanding.
- **Connect Student Responses:** The most important aspect of using math talk in the classroom is the connections between solutions that you and the students make. In the beginning students will need your support to make these connections. For example, if you sequence the presentations from less sophisticated to more sophisticated, you can have students discuss the similarities and differences between the solutions. You can also discuss efficiency. Which process is more efficient?
- The "Open-Ended Questions" link has a great list of questions both you and the students can use during math talk to make connections and analyze solution strategies.
- Use the "Math Talk Moves" poster below to teach students how to make connections and respond to others during math talk. The poster describes moves made by the student. The teacher should teach these moves and encourage their use during discussion. You may even want to have a "Move of the Day/Week" to highlight ways to connect student ideas. Additionally, you may want to include these in the students' math notebooks or tape a copy to their desks to refer to during the discussion. **Please note:** Several resources describe "Turn and Talk" as a math talk move. Because I chose to focus my poster on student moves, I did not include it; however, it is a useful move to use during math talk so that students have another participant to share ideas with during large class discussions. From that point, they can choose a student move to keep the conversation going or choose one move for a class-wide share-out. To get your own copy of my Math Talk Moves poster, please visit my TpT store.

- Participation is key! Sometimes it's hard to get all students to participate because they're afraid to take risks. One of the ways you can get your more reluctant students to take part in the conversation is through the use of hand signals, such as teaching students to use the American Sign Language symbol for Y (see picture below) to indicate that they agree with someone else's thinking. Once reluctant students see that they're not alone, they may be willing to participate more.

After the Discussion

After reviewing the students' solutions and listening to their presentations, use the information that you gathered to determine the next steps. The following activities will help extend and deepen the students' understanding of the intended content and skills.

- **Look for Areas of Concern:** Reviewing the solutions for common errors or misconceptions may provide material for a mini-lesson or content for an additional problem solving task at a later date.
- **Check for Reasonableness:** It is essential that students develop the ability to verify their solutions and check them for reasonableness. After the discussion you can ask each group to develop a method to check their strategy for reasonableness or choose a specific solution and ask students to determine a method to check for reasonableness. Be sure to have students share and compare their strategies.
- **Justify the Solution:** In addition to being able to make sense of a solution, students should be able to explain why a specific solution strategy leads to the correct answer. For this activity, students use pictures, numbers, and words to make sense of the solution and explain why it works.
- **Look for What Went Wrong:** One of the most powerful activities for students is to examine their mistakes. Use one of the solution strategies that did not lead to the correct answer (if available) and explore where the solution went wrong. After determining the misstep, allow students an opportunity to complete the remainder of the solution strategy. If you don't have an incorrect solution strategy to use, create one yourself and say, "What if someone had done (show the strategy)?" Then, allow the students to discuss the error(s).

Implementing and planning regular math talk sessions will support the development of strong communication skills and deepen the students' ability to reason and think critically about the intended math content and skills.

Upside Down Teaching Model

Meaningful Math Tasks(25 mins)

Teaching upside down involves choosing to first present to students a problem they are expected to mess around with for a while, without having first taught them the particular rules or procedures they could use to solve the problem. Engaging students in this way helps them interact with the mathematics and sets them up to learn the mathematical content the teacher intends.

Rather than the Gradual Release Model (*I Do-We Do -You Do*) structure used in many mathematics classrooms today, this model could be characterized as ***You Do-, You Do Together-, We Do-, and then I Do***: ***You*** (students) will mess around with a task for a while, ideally engaging in some thinking, trying things out, and generally wrestling with or constructively struggling with mathematics arising from the problem; ***You Do Together*** (students working together) collaboratively sharing their ideas, then *We* (students and teacher) will discuss the different approaches students tried (*using the*

Growth Mindset), with students explaining, questioning, clarifying, and further grappling with the mathematics; finally, ***I*** (the teacher) will connect this work and the class's productive discourse around the problem and related mathematical ideas, facilitating the whole process and ensuring that students come away with the intended mathematics learning. Sometimes, students' learning may emerge naturally from their engagement with the task. Other times, it may involve the teacher directly telling students a key point or working through an explicit example. Even when such direct instruction may be called for, students' engagement with the task and participation in the resulting discourse sets them up to also take in what the teacher presents.

The way that I learned to teach—clear explanations, shared practice, application of what was just learned—represented a very teacher-centered approach. The **upside-down model** I'm advocating here is more difficult to implement well, calling for considerable time and teacher skill in orchestrating and managing the classroom—a teacher-*structured* approach focused on student engagement, rather than a teacher-*centered* approach with students playing a more passive role. ***Teaching in this way allows students the opportunity to push their thinking as they constructively struggle with problems that may go beyond more predictable one- or two-step word problems typically found at the end of a lesson or chapter in a textbook. And by drawing students into thinking about the problem, students are more likely to attend to the intended mathematics than they would be if listening more passively to a teacher's explanation.***

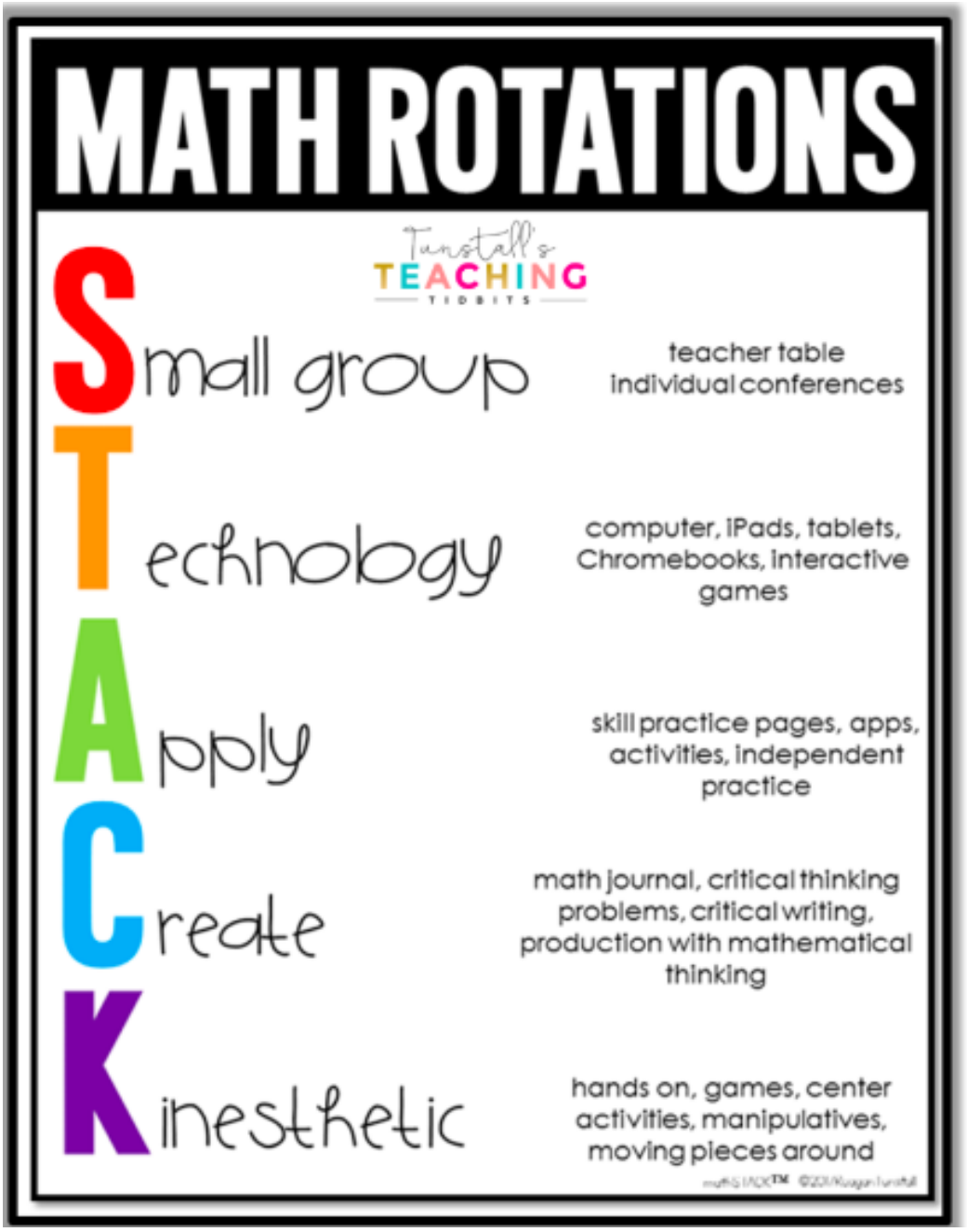
Learning Stations Teaching Model

One helpful tactic to employ **differentiated instruction strategies** is called **Learning Stations**—a way to supply your class with multiple ways to learn and understand concepts. Much like a menu offers patrons a variety of options to satisfy their appetite, learning stations expose students to a variety of strategies and choices that address many learners' needs.

Learning Stations are fluid and can span multiple levels. This gives both students and teachers insight as to how a particular individual learns best.

Workstations using the STACK Mode I - 5 groups of 6 students:

- **Small Group**- Intensive Homogenous Support Group for differentiation
- **Technology Center** - Khan Academy, Imagine Learning, You Tube, Many Online Games (Jo Boaler recommendations)
- **Application Center** - Collaboration on Leveled Mathematics Performance Tasks for Differentiation
- **Computation Center** - For fluency drills or computation practice using algorithms - iReady
- **Kinesthetic Center**- Using Appropriate tools or Manipulatives



Effective Lesson Internalization, Delivery Techniques, and Classroom Management Suggestions

Good unit and lesson internalizations are essential to the process of teaching and learning. A teacher who is prepared is well on his/her way to a successful instructional experience. The development of interesting lessons takes a great deal of time and effort. To be an effective teacher, you must be committed to spending the necessary time in this endeavor.

It is also important to realize that the best planned lesson is worthless if interesting delivery procedures, along with good classroom management techniques, are not in evidence. There is a large body of research available pertaining to lesson development and delivery and the significance of classroom management. They are skills that must be researched, structured to your individual style, implemented in a teacher/learning situation, and constantly evaluated and revamped when necessary. Consistency is of the utmost importance in the implementation of a classroom management plan.

All teachers should understand that they are not an island unto themselves. The educational philosophy of the district and the uniqueness of their schools should be the guiding force behind what takes place in the classroom. The school's code of discipline, which should be fair, responsible and meaningful, must be reflected in every teacher's classroom management efforts.

Required Plans for Teachers

All teachers are REQUIRED to submit the following:

1. Scope and Sequence Plans are to be completed annually, by grade level one week before the start of each school year. Here is a copy of the 2022-23 plans: 2023-24 Math Planning
2. Unit internalizations are to be completed approximately every 4 - 5 weeks for each unit. **Forms can be found in SchoolMint Grow.**
3. Lesson internalization plans are to be completed weekly for each of the instructional days. **Forms can be found in SchoolMint Grow.**

Math Unit Internalization Process

1. Read the summary of the unit/module, if provided by your curriculum.	• Identify the main goals of the unit. • Consider how this unit builds on skills/concepts from prior units.

2. Gain expertise about each standard in the unit.*	• Refer to the ISBE Math Standards. Do a close read of each standard, noting questions you have and looking at items to learn more:
	  ○ Identify if each standard is major, supporting or additional,
	  ○ Make connections between additional/supporting and major standards,
	  ○ Consider the aspect(s) of rigor being targeted, and
	  ○ Review the Standards for Mathematical Practice present in the unit
	• Preview ISBE test samples that correlate to the lesson. **USE THESE PROBLEMS AS PRACTICE, HOMEWORK, DISCUSSION,ETC.** The Digital Item Library provides access to items previously administered on an Illinois English language arts or mathematics assessment. The library categorizes items by Evidence Statements or Common Core State Standards and contains searchable fields to help find specific items.

3. Complete the unit/module assessment.	• Answer and show student work for each item. • Then, identify which standard(s) it is assessing. • Review standards, answer key and/or unit overview and lessons to ensure you have solved items using the strategies, models and language that students would use to demonstrate mastery.
4.Consider potential challenges in this unit/module.	Based on the assessment and standards, annotate the unit/module to illuminate the following: • What content is going to be challenging for students? • What misconceptions might they have? • How will you address these misunderstandings and struggles in your plans?
5. Skim lesson activities and/or daily assessments for the unit.	• Review the lessons in the unit to identify how they fit together to support mastery of topics. • Make sure to review the previous grade level standards this unit/module is building on to anticipate where students may struggle and where you may need to adapt/spend more time.

Math Lesson Internalization Process

1. **Articulate the rigor of the lesson:**

   Review the standards and objectives for the lesson. Do the standards, or parts thereof, for this lesson demand work towards conceptual understanding, procedural skill and fluency, application of learning, or a combination? How does this influence your approach and connect to lesson activities?

   What this could look like:

   - Annotate the aspect of rigor next to the objectives
   - Underline words that highlight the rigor
   - Note if the whole standard or part is addressed in this lesson

2. **Do the Math: Complete Lesson Performance Tasks & Practice**

   Complete the exit ticket and lesson tasks with the standard(s) and objective(s) in mind. What understanding will be elicited from the exit ticket? How do the lesson tasks build this understanding? Are there multiple pathways to the answer?

   What this could look like:

   - All tasks and exit tickets are completed with exemplar explanations, considering multiple solution methods, when appropriate.

3. **Read the Lesson & Connect to the Standards**

   How does this objective connect to the focus standard(s) and fit in the sequence of learning? **How does it prepare students for the mid/end of module assessments? Articulate the most important new learning for students**, and how the lesson and tasks help students make sense of the standard(s). **Why specific SMPs are called out and what does that mean for your instruction?**

   What this could look like:

   - Highlight or star key standards
   - Annotate why the SMP is highlighted and what it means for your instruction.

4. **Prioritize**

   What are the crucial activities/instructional strategies that build the lesson's key knowledge or skill in students? How do the strategies you are choosing align with the aspect of rigor?

   What this could look like:

- Star the problems, tasks, questions, etc. in the lesson that must be asked in order to fully address the day's learning.
- Annotate exemplar student responses. (I.e *What do you need to hear in order to know that students understand the mathematics?*)

5. **Adapt**

   Does anything need to be cut or changed due to time constraints? What scaffolds might you need to provide for your students? Note: While we may need to add in scaffolds (fewer/shorter problems, adjusting structures, pairing students) we need to ensure our supports don't take away students' opportunity to engage in cognitive work.

   What this could look like:

   - *Cross out problems/parts, tasks, questions, that will be cut.*
   - *Write in additional questions, problems that will be added as scaffolds*

6. **Anticipate Misconceptions**

   Review the lesson and the exit ticket. What misconceptions do you anticipate your students might have and how will you address them? Ensure you have time for students to explore and dig into their misconceptions, as well as critique the reasoning that resulted in them.

   What this could look like:

   - Write anticipated misconceptions next to the problems you expect them and the questions/support you will provide.

7. **Build Knowledge**

   Turn to the subsequent lesson and examine the exit ticket. How does this exit ticket build on the last? What level of mastery of the first lesson's objective is necessary in preparation for the following lesson(s)?

Lesson Internalization Plan – Instructional Plan

Subject: _____ **Grade:** _____ **Date:** _____

Unit/Lesson:	**Materials Needed:**	**Detailed Lesson Structure / Activity (DO NOT COPY AND PASTE FROM CURRICULUM):**	**Vocabulary:**
Standard(s) code & in your own words:			**African Centered Connections:**
Questioning:			**Assessment(s):**
Misconceptions:	**Enrichment:**		**Homework:**

Intervention Plan: **please be specific and clear on the activities that will be completed.**

- I-Ready:
- Small Group with Teacher:
- Game Challenge:
- IAR Test Prep:

Group 1: List students' names here	**Group 2:** List students' names here	**Group 3:** List students' names here	**Group 4:** List students' names here

Due Thursdays at 6PM

Suggested Practices

- **Establish a positive classroom environment**
  - Make the classroom a pleasant, friendly place
  - Accept individual differences
  - Learning activities should be cooperative and supportive
  - Create a non-threatening learning environment
  - Organize physical space; eliminate situations that may be dangerous or disruptive
  - Establish classroom rules and procedures and consistently reinforce them

- **Begin lessons by giving clear instructions**
  - State desired quality of work
  - Have students paraphrase directions
  - Ensure that everyone is paying attention
  - Ensure that all distractions have been removed
  - Describe expectations, activities and evaluation procedures
  - Start with a highly motivating activity
  - Build lesson upon prior student knowledge

- **Maintain student attention**
  - Use random selection in calling upon students
  - Vary who you call on and how you call on them
  - Ask questions before calling on a student; wait at least five seconds for a response
  - Be animated; show enthusiasm and interest
  - Reinforce student efforts with praise
  - Vary instructional methods
  - Provide work of appropriate difficulty
  - Demonstrate and model the types of responses or tasks you want students to perform
  - Provide guided practice for students; monitor responses and deliver immediate corrective feedback

- **Use appropriate pacing**
  - Be aware of your teaching tempo
  - Watch for cues that children are becoming confused, bored or restless; sometimes lesson have to be shortened

- **Provide suitable seatwork**
    - Seatwork should be diagnostic and prescriptive
    - Develop procedures for seeking assistance; have a “help” signal
    - Develop procedures for what to do when finished
    - Move around to monitor seatwork
    - Vary methods of practice

- **Evaluate what has taken place in your lesson**
    - Summarize the lesson and focus on positive gains made by students; use surprise reinforcers as a direct result of their good behavior
    - Determine if the lesson was successful; were goals accomplished?

- **Make a smooth transition into next subject**
    - Have materials ready for next lesson
    - Maintain attention of students until you have given clear instructions for the next activity
    - Do not do tasks that can be done by students (i.e. passing out paper or collecting assignments); use monitors
    - Move around and attend to individual needs
    - Provide simple, step-by-step instructions
    - Utilize a freeze and listen signal, when necessary

- **Develop positive teacher/student relationships**
    - Set a good example; be a positive role model
    - Create an exciting learning environment for all students
    - Reward good behavior; create special activities that children will enjoy doing
    - Correct misbehaviors; have consequences of disruptive behavior; communicate them to children
    - Handling disruptions
        - *Keep is short and simple (KISS)*
        - *Use a warning system*
        - *Defer disruptive behavior proactively (eye contact, close space between you and student, use head/hand gestures)*
        - *Help students be successful*
        - *Use planned ignoring (and teach other student to also ignore)*

Targeting the Error: Strategies for Re-teaching

Re-teaching 101: Effective Modeling: Model for students how to think/solve/write

- Give students a clear listening/note taking task that fosters active listening of the model, and then debrief the model.
    - "What did I do in my model?"
    - "What are the key things to remember when you are doing the same in your own work?"
- Model thinking, not just a procedure
    - Narrow the focus to the thinking students are struggling with
    - Model replicable thinking steps that students can follow
    - Model how to activate one's own content knowledge and skills that have been learned in previous lessons

Re-teaching 201: Guided Discourse - let students unpack their own errors and build a solution

- Show-Call: post student work (either an exemplar or incorrect response) and ask students to identify why the displayed answer is correct or incorrect.
- Stamp the understanding: reference the key or conceptual understanding by having students articulate key ideas and concepts:
    - "What are the keys to remember when solving problems like these?"
    - "Can someone explain the rule here?"
- Practice: give students ample opportunity to practice and encode success

Universal Prompts - Push the thinking back onto students through universal prompts that can be asked at any point:

- Provide wait time after posing challenging questions
- Pre-call: let a student who needs more time know you're calling them next
- Roll back answers : repeat the wrong answer back to the student to give them time to understand and fix their mistake (vary tone of voice to highlight error)
- Ask Universal Prompts:
    - "Tell me more."
    - "What makes you think that?"
    - "How do you know?"
    - "Why is that important?"

- Close the loop: after correcting the error, return to students with incorrect answers and have them revise their response.

Habits of Discussion: teach and model for students the habits that strengthen class discussions:

- Manage your tell: don't reveal the right or wrong answer through your reaction to the student response; remain neutral
- Agree/Build: "I agree with _ _ _ and I'd like to add:"
- Disagree Respectfully: "While I agree with [this part of your argument], I disagree with…"

Strategic Prompts: ask strategic questions to target students in response to student error

- Prompt students to access previously learned knowledge:
  - Point students to resources (notes, posted concepts and content)
  - "What do we know about_____ [content learned in previous class]"
- Call on students based on their learning needs
  - Call on lower and middle achieving students to unpack question(s)
  - If they struggle, try higher achieving student
  - Create sequence of students to call on based on rigor of each prompt/questions

Students prompting students: push students to use habits of discussion to critique or push another's answer:

Go Conceptual: get students to do the conceptual thinking

Ask students to verbalize a conceptual understanding of content, not just the answer to a specific question:

- "That's the procedure. Now tell me why that works."
- "Can you generalize the idea and apply to all problems like this one?"
- "Use the following terms when restating your answer." (provide the terms)
- Upgrade Vocabulary: ask students to use technical/academic language when answering questions:
  - "That's the right idea generally. Now state it again using proper mathematical/historical/scientific language."

- "Correct. Now state it again using your Academic Word Wall as a resource."

Stretch It: ask particular students to answer a more difficult extension to a given question:

- "What would the answer be if I changed it to_____?"
- Is there an alternative way to solve this problem?
- "What do you think is the strongest counter argument to yours and how would you refute it?"

Extended Response Criteria for Success Protocol

1. Annotate Problem for Understanding
2. Estimate Solution
3. Model is drawn to represent the unknown and known (drawing, table, graph, etc.)
4. Equation is written
5. All calculations are shown and answer is circled
6. Check your work
7. Explain ***what*** you did and ***why***? (Answer written in complete sentences)

Use problems from the ISBE Digital Library for practice.

Growth Mindset Philosophy in Mathematics

Carol Dweck - Mindsets (5 mins)

The Growth Mindset in Mathematics is an approach to teaching mathematics which believes that mindset is more important than initial ability in determining the progress made by pupils in their mathematical understanding. Pupils with a growth mindset will make better progress than pupils with a fixed mindset. Dr. Angela Lee Duckworth said that "**Grit**" is the best predictor of success in a person's life, including when it comes to goals in education. She goes on to say that the best example of how to develop grit is through achieving a "Growth Mindset."

Jo Boaler Mindset Resources:

- Day 1 Mindset & Practice
- Ask your principal or coach for the books below:
  - Mathematical Mindsets Book
  - Mindset Mathematics by Grade Level

Students with a "Growth Mindset":

- Believe that talents can be developed and
- great abilities can be built
- over time
- View mistakes as an opportunity to develop
- Are resilient
- Believe that effort creates success
- Think about how they learn

Importance of Mathematical Performance Tasks

In the act of learning, students obtain content knowledge, acquire skills, and develop work habits—and practice the application of all three to “real world” situations. Performance-based learning and assessment represent a set of strategies for the acquisition and application of knowledge, skills, and work habits through the performance of tasks that are meaningful and engaging to students. Traditional testing helps answer the question, “Do you know it?” and performance assessment helps answer the question, “How well can you use what you know?”

Performance tasks build on earlier content knowledge, process skills, and work habits and are strategically placed in the lesson or unit to enhance learning as the student “pulls it all together.” Such performance tasks are not “add-ons” at the end of instruction. They are both an *integral part of the learning* and an *opportunity to assess the quality of student performance*. When the goal of teaching and learning is knowing and using, the performance-based classroom emerges. **Mathematics Performance Tasks**

Scaffolding Suggestions for Intensive Learning Support

In our commitment to ensuring that every student receives a quality mathematics education, Betty Shabazz International Charter School recognizes the importance of providing intensive learning support for students who may require additional assistance. This section of the Mathematics Handbook aims to provide educators with practical strategies and techniques to scaffold the learning of students who may need extra guidance and reinforcement in mathematics.

Scaffolding refers to the support and assistance provided to students as they navigate complex mathematical concepts and skills. It involves structuring tasks, breaking them down into manageable steps, and offering targeted support to help students build a solid foundation of understanding. Scaffolding enables students to access the

curriculum, engage with challenging content, and make meaningful progress in their mathematical learning.

Within this section, you will find a collection of effective scaffolding suggestions that have been carefully curated by experienced educators at Betty Shabazz International Charter School. These suggestions are designed to meet the diverse needs of students, ensuring that each learner receives the support necessary to succeed in mathematics.

The scaffolding suggestions encompass a range of strategies, including:

1. **Concrete and Visual Models:** Utilizing concrete manipulatives and visual models to enhance understanding and make abstract concepts more tangible. Provide physical objects or visual aids such as base-ten blocks, fraction strips, or geometric shapes to help students visualize and manipulate mathematical ideas. Use visual aids such as bar models, number lines, or geometric shapes to support students' comprehension.

2. **Graphic Organizers as Visuals:** Using graphic organizers as visual tools to assist students in organizing their thoughts and making connections between mathematical concepts. Utilize graphic organizers such as concept maps, flowcharts, or problem-solving diagrams to guide students' thinking and promote structured problem-solving.

3. **Multimedia to Enhance Understanding:** Incorporating multimedia resources, such as videos, simulations, or interactive online tools, to deepen students' understanding of mathematical concepts. Use digital resources that provide visual representations and interactive experiences to engage students and enhance their comprehension.

4. **Structured Opportunities to Speak with a Partner or Small Group:** Encouraging students to engage in structured discussions with a partner or small group. Provide opportunities for students to explain their thinking, discuss strategies, and solve problems collaboratively. This promotes active engagement and peer-to-peer learning.

5. **Provide Regular, Structured Opportunities to Write:** Incorporating writing activities as a means for students to articulate their mathematical thinking and reflect on their learning. Assign tasks that require students to explain their

reasoning, justify their solutions, or write reflections on problem-solving processes.

6. **Build Background Knowledge:** Prioritizing the development of necessary background knowledge to support students' understanding of new mathematical concepts. Activate prior knowledge through pre-teaching or engaging in activities that bridge the gap between students' existing knowledge and the new content.

7. **Clarifying Key Concepts:** Offering additional support to clarify key mathematical concepts and procedures. Provide explicit explanations, examples, and non-examples to ensure students have a solid understanding of foundational concepts before moving forward.

8. **Teacher Modeling and Explanation:** Demonstrating mathematical processes, strategies, and problem-solving techniques through explicit modeling and explanation. Break down complex procedures into smaller steps, showcasing the thinking process and providing clear guidance.

9. **Cueing:** Using cues and prompts to direct students' attention and guide their thinking during problem-solving. Offer cues such as "What information do you have? What are you trying to find? What strategy can you use?" to help students navigate the problem-solving process effectively.

10. **Differentiated Instruction:** Tailoring instruction to address individual student needs and learning styles. Provide varied instructional materials, assignments, or assessments that align with each student's abilities and interests.

11. **Step-by-Step Guidance:** Breaking down complex procedures and problem-solving tasks into smaller, manageable steps, providing clear instructions and guidance along the way. Present explicit step-by-step instructions, modeling each step and providing opportunities for guided practice.

12. **Peer Collaboration:** Encouraging students to work collaboratively in pairs or small groups, providing opportunities for peer support, discussion, and shared problem-solving. Assign partners or small groups to work together, fostering peer-to-peer learning and encouraging students to explain their thinking to one another.

13. **Verbal and Written Prompts:** Offering prompts and questions that guide students' thinking, encourage deeper reasoning, and prompt reflection on problem-solving strategies. Use prompts such as "Can you explain your reasoning?" or "What other approaches can you try?" to encourage students to think critically and articulate their thought processes.

14. **Mnemonic Devices and Memory Aids:** Introducing memory aids, acronyms, or rhymes to help students recall key information and procedures. Use mnemonic devices or catchy phrases to assist with remembering formulas, mathematical rules, or order of operations.

15. **Formative Assessment:** Employing ongoing assessments to gauge students' understanding and provide timely feedback, allowing for targeted support and adjustment of instructional approaches. Use formative assessment techniques such as exit tickets, quick quizzes, or observations to identify areas of misconception or need for additional support.

By implementing these scaffolding strategies, we can create an inclusive and supportive learning environment where all students have the opportunity to thrive in their mathematical studies. Let us embrace these suggestions and work collaboratively to ensure that every student receives the necessary support to succeed in mathematics.

Questioning Strategies for IAR Proficiency

If we include this in our assessments once a week, the students will have a better understanding of it.

- **Type I: Tasks assessing concepts, skills and procedures**
    - Type I tasks include a balance of conceptual understanding, fluency, and application. These tasks can involve any or all mathematical practice standards.
    - Type I tasks will be machine scorable and will include innovative, computer-based formats.
    - Type I tasks will appear on the End of Year and Performance Based Assessment components and generate evidence for measuring major, additional, and supporting content with connections to the mathematical practices.

- **Type II: Tasks assessing expressing mathematical reasoning**

    - Type II tasks call for written arguments/justifications, critique of reasoning, or precision in mathematical statements (MP. 3, 6). These tasks can also involve other mathematical practice standards.
    - Type II tasks may include a mix of innovative, machine scored and hand scored responses.
    - Type II tasks will be included on the Performance Based Assessment component and generate evidence for measuring mathematical reasoning with connections to content.

- **Type III: Tasks assessing modeling / applications**
    - Type III tasks call for modeling/application in a real-world context or scenario (MP.4) and can also involve other mathematical practice standards.
    - Type III tasks may include a mix of innovative, machine scored and hand scored responses.
    - Type III tasks will be included on the Performance Based Assessment component and generate evidence for measuring mathematical modeling/application with connections to content.

Practice Assessments for Questioning Strategies

- **Illinois Assessment of Readiness Practice Tests**
- **IL Digital Item Library of Test Problems**

Classroom Schedule

Each mathematics class should be structured as follows M/T/Th/F:

- Formative Loop: 5 - 7 Minutes to build fluency
- Lesson: 40 - 50 Minutes
- Small Group Rotations: 20 - 25 Minutes
- On Thursdays to keep up with pacing and keep up with the curriculum, two lessons will need to be taught.
- Regardless of campus, five lessons are to be taught per week.

Wednesdays:

- Each student should receive 20-39 minutes of iReady

Classroom Observations

In the realm of education, continuous professional development plays a crucial role in fostering effective teaching practices and improving student outcomes. For mathematics educators, this development often involves regular classroom observations conducted by experienced math coaches. These observations provide valuable opportunities for teachers to receive feedback, refine their instructional techniques, and enhance their overall pedagogical skills.

Teachers will be observed weekly using the TruMath Framework, a comprehensive rubric designed to guide and evaluate instruction. The TruMath Framework offers a structured approach for math coaches to assess various aspects of teaching, ranging from instructional strategies to classroom management, and enables them to provide constructive feedback to teachers.

The core purpose of regular classroom observations is to facilitate professional growth and improve instructional practices. Through ongoing feedback and collaborative discussions, teachers can refine their teaching methods, address areas of improvement, and leverage their strengths to create engaging and impactful learning experiences for their students. The presence of a math coach during these observations ensures that teachers receive individualized support and tailored guidance based on their unique teaching styles and needs.

The TruMath Framework, which serves as the foundation for our observation and evaluation process, encompasses a set of key indicators and performance levels that assist math coaches in assessing teaching effectiveness. These indicators cover a wide range of elements crucial to successful mathematics instruction, such as lesson design, questioning techniques, student engagement, differentiation, and assessment strategies. By utilizing the TruMath Framework, math coaches can provide objective and comprehensive feedback to guide teachers towards more effective pedagogical practices.

By incorporating regular classroom observations into the professional development journey of mathematics teachers and leveraging the TruMath Framework as an evaluation tool, we aim to create a culture of reflective practice and continuous improvement. This handbook will serve as a valuable resource for math coaches, providing them with the necessary guidance to conduct meaningful observations and facilitate teacher growth. Furthermore, it will empower educators to embrace these

observations as opportunities for self-reflection, refinement, and ultimately, enhanced mathematics instruction that positively impacts their students' learning experiences.

The Tru Framework

This Teaching for Robust Understanding Observation Guide for Mathematics is designed to support teachers, coaches, administrators, and professional learning communities in planning, conducting, and reflecting on observations in mathematics classrooms. It is based on the Teaching for Robust Understanding (TRU) Framework (see, e.g., Schoenfeld, 2013, 2014; Schoenfeld & the Teaching for Robust Understanding Project, 2016). The key idea behind the framework is that the five dimensions of classroom activity described in figure 1 are central in determining the degree to which students will emerge from the classroom being proficient mathematical thinkers and problem solvers.

The Five Dimensions of Powerful Mathematics Classrooms

The Mathematics	Cognitive Demand	Equitable Access to Mathematics	Agency, Ownership, and Identity	Formative Assessment
The extent to which classroom activity structures provide opportunities for students to become knowledgeable, flexible, and resourceful mathematical thinkers. Discussions are focused and coherent, providing opportunities to learn mathematical ideas, techniques, and perspectives, make connections, and develop productive mathematical habits of mind.	*The extent to which students have opportunities to grapple with and make sense of important mathematical ideas and their use. Students learn best when they are challenged in ways that provide room and support for growth, with task difficulty ranging from moderate to demanding. The level of challenge should be conducive to what has been called "productive struggle."*	*The extent to which classroom activity structures invite and support the active engagement of all of the students in the classroom with the core mathematical content being addressed by the class. Classrooms in which a small number of students get most of the "air time" are not equitable, no matter how rich the content: all students need to be involved in meaningful ways.*	*The extent to which students are provided opportunities to "walk the walk and talk the talk" – to contribute to conversations about mathematical ideas, to build on others' ideas and have others build on theirs – in ways that contribute to their development of agency (the willingness to engage), their ownership over the content, and the development of positive identities as thinkers and learners.*	*The extent to which classroom activities elicit student thinking and subsequent interactions respond to those ideas, building on productive beginnings and addressing emerging misunderstandings. Powerful instruction "meets students where they are" and gives them opportunities to deepen their understandings.*

This Observation Guide for Mathematics is part of a support system for collaborative partnerships between teachers and observers. Optimally, each observation is one of a series of classroom visits contributing to teacher growth. There should be ample time to

plan observations, to observe lessons, and to discuss the observations, over the course of a term or a year. Prior to an observation, it is useful for the teacher and observer to discuss the lesson plan and decide on the main points of focus for the observation. The observation might be general; it is possible for a practiced observer to take notes on all dimensions. Alternatively, the teacher and observer might agree to focus on one or two areas the teacher wants to address in detail. Either way, reflecting beforehand on goals for the lesson and for the observation is a good way to make the most of the observation. A useful tool for planning and debriefing is the Teaching for Robust Understanding Conversation Guide (Baldinger, Louie, and the Algebra Teaching Study and Mathematics Assessment Project, 2016). The Conversation Guide lays out a series of questions for each dimension that teacher and observer can use in planning the lesson, and in reflecting on it as well. When planning observations, it is useful to think of what the classroom experience looks and feels like from the perspective of a student – students, after all, are the ones experiencing the instruction! The questions in the figure below provide an orientation that helps in seeing the lesson from the student perspective. More information on the Tru Framework can be found here: [The TRU Domain-General and Mathematics-Specific Observation Guides]

Observe the lesson through a student's eyes	
The Mathematics	• What's the big idea in this lesson? • How does it connect to what I already know?
Cognitive Demand	• How long am I given to think, and to make sense of things? • What happens when I get stuck? • Am I invited to explain things, or just give answers?
Equitable Access to Mathematics	• Do I get to participate in meaningful mathematical learning? • Can I hide or be ignored?
Agency, Ownership, and Identity	• Do I get to explain, to present my ideas? Are they built on? • Am I recognized as being capable and able to contribute in meaningful ways?
Formative Assessment	• Do classroom discussions include my thinking? • Does instruction respond to my thinking and help me think more deeply?

BSICS Mathematics Coaching

Each teacher will receive at least 3-4 instructional rounds per month. An instructional round consists of: planning with teachers, observing lessons, and analyzing data gathered.

During the observation phase, the instructional coach is looking to observe the instructional practices covered in this handbook. The debrief will cover what was observed; provide feedback on areas of improvement; suggest strategies; and include the planning of the next instructional lesson internalization. Teachers are expected to bring their technology, any relevant student work/assessments, and plans to the analyzing sessions. Teachers are required to participate in the Video Lesson Protocol as determined by the principal and coach each year. As part of the coaching model, teachers are expected to attend all professional development led by the mathematics coach.

Pacing guides are due to the coach annually the week before the start of school; unit internalizations are due every 4-5 weeks for each unit; lesson internalizations are due the Thursday before the start of the upcoming week by 6:00 PM CST. Teachers are to analyze data to best inform or improve instruction for the following week.

Coaching Best Practices

What is Instructional Coaching?

Instructional coaching provides individual teachers with one-to-one assistance working on identified instructional needs. It is an improvement model based on the belief that teachers, given an opportunity, can diagnose their own teaching and identify ways to strengthen their work. Coaches help teachers identify the focus and then work with them to reflect on and improve their practice. Coaching can serve as a school-wide school improvement strategy. Because its focus is on the core work of teaching, it supports a culture of collaboration (Institute on Instructional Coaching, 2011).

Good Coaching

Coaching is a change from traditional roles. The primary role of the coach is to ask questions that are open-ended and promote cognition. Listening, probing for deeper meaning, and being non-judgmental are critical skills. Good coaching is built on a foundation of trust. It occurs when the coach creates an open, respectful and inviting setting.

Good Coaches Share Several Traits. They . . .

- *Enroll Teachers* – Good coaches create a setting that welcomes teachers and in which teachers choose to participate.
- *Identify Teacher Goals* – Good coaches help teachers identify goals for their work and support the teacher's efforts to improve.

- Listen – Perhaps no other skill is as important as the ability to listen intently to those being coached. Good coaches create a setting where teachers feel comfortable, can be candid without fear of retribution, and are curious and inquisitive.
- *Ask Thoughtful Questions* – Good coaches ask thoughtful, open-ended questions that promote reflection. They are interested in promoting teacher cognition rather than providing answers.
- *Provide Feedback* – Good coaches don't provide feedback in the traditional sense. They are comfortable using data from an observation, or comments made by the teacher, to provide feedback. All feedback is precise and non-judgmental. Good coaches are always open to the teacher's point-of-view. (Knight, 2011)

Getting Started

Good coaching helps a person move from where they are to where they want to be (Aguilar, 2011). Once trusting, respectful relationships are in place, coaches can effectively serve as coaches and help teachers reflect on and improve their teaching.

COACHING MODELS

Three-Step Coaching Model

(Based on work from Williamson & Blackburn 2009 and Jim Knight 2017)

The coaching process generally involves three phases---planning, observation, and analysis and reflection. Much like the clinical supervision model the approach is designed to engage the teacher in reflection on their teaching, a formative process. *The Impact Cycle* is a system or structure that is designed for deep learning. This may take weeks

Step or Phase 1: Planning/Identify

- Send out a Needs Survey to teachers before this step.
- During this step the teacher and coach meet to discuss the coaching, identify a focus for data collection, and agree on when an observation will occur.
- Help teachers identify a current sense of reality in their teaching (a challenge or problem) to improve throughout the cycle.
- The best way to get this is through videorecording. Watch together. Observe students and teachers.
- Other ways are to interview students to ask what they are learning and why, review student work, or gather observational data. Or, have teachers write down one challenge per sticky note and rank more to less frustrating. Base your coaching cycle on challenges teachers list.

- Set a student focus goal and make it measurable (100% of students on task 80% of the time; spend less than 5% on transition time).

Research based questions to consider asking while viewing videotaping or discussions. Keep the questions more positive.

1. What went well? Why do you say that? On a scale of 1-10, with 1 being the worst lesson you've taught and 10 being the best, how would you rate this lesson?
2. What would have changed to make it closer to a 10?
3. What would you see your students doing differently? Describe what that looks like.
4. How can we measure that?
5. The coach paraphrases what was heard…consider the responses being a measurable goal of the teacher.
6. Write the goal down.
7. What teaching strategies would you like to try to hit this goal (Coach may have to suggest proven strategies).
8. What are your next steps?

Step or Phase 2: Observation/Data Collection/Learn

- This step includes a visit to the classroom and collection of data that will inform a discussion about the focus area identified in the planning phase.
- Prior to or during, the coach chooses a researched strategy that works. The teacher learns a strategy. Provide the teacher with a checklist of how to implement strategy. The checklist is also used in observing the teacher.
- The coach can model this strategy in a number of ways; co-teach, watch another teacher, video of modeled lessons, articles.

Step or Phase 3: Analysis and Reflection/Improve

- This phase provides an opportunity to meet with the teacher to talk about the observations and data that were collected.
- The emphasis is on engaging the teacher in a conversation to analyze and think about his or her teaching.
- Conclude with agreement on follow up and appropriate next steps.
- What strategies or resources will you implement to improve the goal?
- Review Progress of the goal
    - What's going well?
    - What are you seeing that shows the strategy is successful?
    - What progress has been made toward the goal?
    - What did you learn?

- What surprised you?
- What roadblocks did you run into?
- Do we need to change the strategy or measurable goal?

After all 3 Steps or Phases: Plan Next Steps

1. Teacher implements and makes improvements
2. Determine next meeting
3. Identify next tasks
4. Add dates to the calendar (send a calendar invitation)
5. Confirm commitment
6. Questions to ask teachers (Kickstart Your Coaching Cycle Allison Peterson 2021 based on Jim Knight's work)
    a. What did you see students do that met your goal?
    b. What did you notice about the data we collected?
    c. What do you feel like is the next step to get students where you want them?
    d. What do you want to try tomorrow with this strategy that may create different results?
7. Additional questions to ask (The Coaching Habit by Michael Bungay, 7 essential kickstart questions.
    a. What's on your mind?
    b. And what else? (is on your mind)
    c. What's the real challenge for you?
    d. What do you really want from me?
    e. How can I help you?
    f. If you are saying yes to this, what are you saying no to?
    g. What was most useful for you.
    h. *Stop offering advice with a question mark.

Steps 3 and 1 can be combined if there is a lack of resource time to meet.

THE FIRST 60 DAYS

The 1st 60 Days (Nicole Turner, Simply Coaching)

Simply Coaching & Teaching

Week 1:

1. Set up an admin meeting to determine vision for the coach's role. Walk out knowing that we are a team, have a united vision and goal, and this remains confidential what is discussed (not shared with other teachers)

2. Set up my space where I will work. Organize materials. Have a space for the coach and teacher to plan. Have a data tracking area. Include inspirational quotes.
3. Review teachers' previous data from last year. Determine which teachers need extra support based upon data. Prepare for the arrival of new teachers.
4. Decide on a tracking system to record data of each teacher. Track each meeting; date and time. Look for trends and patterns. Include Observation form.
5. Set up a weekly schedule. Add recurring tasks on the calendar with time slots to meet with teachers, observe, weekly coaching goals, and curriculum review. Use color coding. Review curriculum and pacing each week.
6. Send a Welcome email to teachers. Introduce myself, let them know what I offer and schedule a one-on-one time.
7. With one-on-one time, create an agenda. Explain role, what I offer, misconceptions of role, develop relationship, give teacher a survey, prepare questions about teachers' needs.

Weeks 2-8

1. Develop relationships.
2. Visit with teachers in the beginning of the day to say hi, what needs are, and have a great day (30-45 seconds).
3. Build trust.

Week 2

1. 5-10 minute walk-throughs.
2. Positive feedback form to leave a comment for the teacher. (Jackie has file of these)
3. Get a feel for the classroom (community).
4. This is not a baseline observation.
5. Create time with the teacher to provide support and lend a hand.
6. Set up my personal coaching goals. This also includes data from conversations for the admins.

Week 3

1. Create a testing schedule for the year and add to the calendar.
2. Set up your schedule on the calendar (work around testing).
3. Work on 2-3 cycles a year per teacher (optional).
4. PLC Planning
    a. Map out an agenda
    b. Set guidelines and norms

c. Set PLC times
d. Identify topics based on survey results of needs

Weeks 3-7

1. Schedule and conduct Baseline Observations with 4 core Look Fors
    a. Organization
    b. Instructional execution (wait time, strategies, pacing)
    c. Management
    d. Content
2. Write everything down
3. Differentiate support on which teachers need Tier 1 support, Tier 2 support, and Tier 3 support according to baseline observations.
    a. Tier 1: Most experienced teachers/less support
    b. Tier 2: Experienced teacher/some support
    c. Tier 3: Least experienced/a lot of support
4. Create Focused Support Plans for weeks 6-7

Weeks 4-5

1. Begin coaching cycle

Non-negotiable Resources (Math)

- Anchor chart
- Word wall
- 100s chart
- Number line
- Desk-numbers, letters, number line, shapes, etc

Resources:

- Coaching Checklist to consider from Jim Knight.
- More Coaching Checklists
- Video of a Complete Impact Cycle
- https://www.instructionalcoaching.com/ https://simplycoachingandteaching.com/

PEERS Goal Framework

Taken from Jim Knight's *The Instructional Playbook, Impact Cycle,* and *Focus on Teaching* books

Decide on a goal after the teacher and coach have observed the video.

Goals are essential. They should be measurable student goals. What are the issues your students are having? Not implementation of teaching. Focus on the process more than the end result. A teacher must be clear about his or her goals, and the act of coaching should help clarify the goals. When teachers partner with coaches to set and meet measurable student goals, coaching improves instruction.

You must also have a teacher goal.

Powerful for students
Easy to understand and communicate
Emotionally Compelling for the teacher
Reachable measurable and strategy is identified
Student Focused beginning with "Students will…"

Powerful

1. Will this goal make a real difference in students' lives?
2. Create a powerful learning experience that's engaging, impactful, and meaningful for students.
3. Incorporate real world connections and authentic learning opportunities.
4. Example: students would move from being on task 76% of the time to at least 90% of the time during math instruction.

Easy

1. Simple goal but not watered-down.
2. Breakdown into digestible chunks providing effective scaffolding.
3. Simplest way to make a difference in children's lives.
4. Goals should be achievable.
5. Example: videotaping revealed that students were not resisting learning, the simple did not understand what they had to do. The teacher Increases the percentage simply by making sure students knew what they had to do.

Emotionally compelling

1. A goal that students can feel.
2. Generating emotional compelling content from instructional materials and activities that are engaging.
3. Real world, deeper connection, and positive emotional climate for learning.
4. Example: the teacher is disappointed by students' lack of engagement.

Reachable

1. Clearly stated and measurable.
2. A goal that builds hope.
3. Identify strategies teachers can use to hit goals.
4. Setting reachable goals that are realistic and attainable for both teacher and student.
5. Align with students abilities, provide appropriate support and resources to ensure progress and success.
6. Can your goal be reached?

7. It has to have a finish line.
8. Example: 90% time on task.

Student Focused

1. Has to be student focused and not teacher focused.
2. Begins with “Students will…”
3. Changes have to make a difference for students.
4. Has a built-in measure of quality.
5. Example: at least 90% of students would be on task on average during math instruction.

Questions to identify a PEERS Goal

Coaches Should:

1. Create a welcoming environment
   - Putting teachers at ease by learning about them.
   - Coaching should take place in a setting where conversations are private.
   - Find a place where there are no interruptions.
2. Build Trust
   - Trust is crucial for coaching.
   - Demonstrate a trustworthy character.
   - Be reliable.
   - Have the knowledge and skills to help teachers achieve goals.
   - Warmth.
   - Have the teachers’ best interest at heart.
3. Listen
   - Commit to listening.
   - Teachers are at the center of the conversation.
   - Affirm before responding.
   - Do not interrupt.
4. Get Clarity
   - Ask a question and give teachers time to respond.
   - Ask teachers to define words.
   - Do not stack question after question.
5. Ask for More
   - Ask, “What Else?”
6. Keep ourselves out of the answer
   - Don’t listen to offer suggestions.
   - Video record coaching conversations with teachers.

✔ CHECKLIST: LISTENING AND QUESTIONING EFFECTIVELY

TO LISTEN AND QUESTION EFFECTIVELY, I	✔
Make sure my conversation partner does most of the talking.	
Pause and affirm before I start talking.	
Don't interrupt (except when it is very helpful).	
Ask one question at a time.	
Ask for clarification when I'm not certain what is being said.	
Ask, "And what else?"	
Assume people are doing their best.	
Am non-judgmental.	
Avoid leading questions.	
Avoid giving advice disguised as a question.	

Questions to help teachers identify a PEERS goal after they watch the videotaped lesson.
(Based on Jim Knight; See Checklist)

1. On a scale of 1-10 with 10 being the best, how would you rank the lesson?
2. What pleased you?
3. What would you change for a 10?
4. What would you see your students doing differently to get a 10?
5. Describe what that would look like (from #4).
6. How can we measure that?
7. Should that be your goal?
8. If you can reach your goal, would it really matter to you? Why?
9. What teaching strategy would you use to hit your goal?
10. What are your next steps?

Examples of measurable goals

1. Increase the average math test scores of 8th grade students by 10% by the end of the school year.
2. Conduct weekly one-on-one meetings with each student to discuss their learning progress and provide feedback.

3. Implement a classroom management strategy to reduce the number of disciplinary incidents by 50% within the next quarter.

How to Set a PEERS Goal

INSTRUCTIONAL COACHING GROUP

After you have gained a clear picture of reality and have had a chance to reflect on what is going well and what could be improved, consider setting a measurable student-focused goal using the three steps below to help you make it clear, simple, and actionable.

Identify a change you'd like to see in your students. Identify your preferred future what you want your students' doing.

Starting Goal:

1. Is this goal a behavioral, achievement, or engagement change? Describe the change. I want my students to...

2. Is your goal a PEERS goal? Add details that would make it a PEERS goal.

- **Powerful:** Makes a big difference in children's lives.
- **EASY:** Simple, clear, and easy to understand.
- **Emotionally Compelling:** Matters a lot to the teacher.
- **Reachable:** Identifies a measurable outcome and strategy.
- **Student-Focused:** Addresses a student achievement, behavior, or attitude outcome.

Find more resources and tools for instructional coaching, at www.instructionalcoaching.com

3. List your top five descriptions of what students will be doing differently in the classroom. Describe the change. I want my students...

-
-
-
-
-

Now add these PEERS details – along with your descriptions of students' actions – to your original goal and rewrite it.

PEERS Goal:

Assessments

I-Ready and IAR assessments are widely used in schools for different purposes. I-Ready is an adaptive online assessment tool that measures students' proficiency and growth in math and reading. It serves as a diagnostic assessment, progress monitoring tool, and instructional resource. The data generated from I-Ready assessments helps teachers personalize instruction and interventions based on individual student needs. I-Ready assessments are typically completed three times a year, allowing for regular monitoring of student progress. At the school level, aggregated data from I-Ready assessments can identify trends, evaluate curriculum effectiveness, and inform instructional planning.

On the other hand, IAR (Illinois Assessment of Readiness) is a statewide assessment in Illinois that measures students' proficiency in English language arts and math. It provides accountability, system evaluation, and instructional planning. The IAR assesses student performance against state standards and helps determine if schools meet benchmarks. The data from IAR assessments is used to evaluate school, district, and state performance, identify areas for improvement, and inform instructional decision-making.

In summary, I-Ready is focused on personalized student growth, providing diagnostic information, progress monitoring, and instructional resources. It is administered three times a year to monitor student progress. IAR serves as a statewide accountability measure, evaluating student performance, identifying areas for improvement, and informing instructional planning at the school, district, and state levels. Both assessments contribute to improving student learning outcomes by providing valuable data that guides instructional decisions, identifies achievement gaps, and supports targeted interventions.

BiWeekly Data Dives

Collaborative Analysis of Student Work and Data

In the pursuit of effective mathematics instruction, it is crucial to rely on evidence-based practices and make data-informed decisions. One powerful method for achieving this is through regular biweekly data dives, where math coaches and teachers come together to review and analyze student work and data. These collaborative sessions provide an opportunity for educators to gain insights into student learning, identify patterns, and

make informed instructional adjustments that cater to the unique needs of their students.

The biweekly data dives serve as a forum for math coaches and teachers to engage in collaborative analysis, reflection, and discussion. By examining student work samples, formative assessment data, and other relevant metrics, this process enables educators to gain a deeper understanding of student progress, misconceptions, and areas of growth. It allows them to identify instructional strategies that have been effective and determine areas where further support or differentiation may be required.

During these data dives, the focus is not solely on individual students but on identifying broader trends and patterns within the classroom or across grade levels. By analyzing aggregated data, math coaches and teachers can uncover common misconceptions, pinpoint areas of instructional strength or weakness, and make informed decisions about adjustments to curriculum, pacing, or instructional methods.

The collaborative nature of these data dives is essential as it promotes a culture of shared responsibility and collective growth. By engaging in meaningful discussions, educators can benefit from diverse perspectives, share successful instructional strategies, and collectively brainstorm solutions to challenges. This collaborative approach fosters a supportive professional learning community where educators can leverage their collective expertise to enhance student learning outcomes.

To ensure the effectiveness of biweekly data dives, it is important to establish a clear structure and purpose for these sessions. The following steps will serve as a guide:

1. **Setting goals:** Begin each data dive session by establishing specific goals or areas of focus. These goals may include identifying common misconceptions, monitoring student progress towards learning objectives, or evaluating the effectiveness of instructional strategies.
2. **Collecting and organizing data:** Prior to the data dive session, gather relevant student work samples, assessment data, and any other data sources that provide insights into student learning. Organize the data in a manner that allows for efficient analysis and comparison.
3. **Analysis and reflection:** During the data dive session, encourage math coaches and teachers to examine the data collectively. Look for patterns, trends, and areas of concern. Reflect on the instructional practices that may have influenced the observed outcomes and discuss potential next steps.

4. **Discussion and collaboration:** Facilitate open and collaborative discussions, allowing educators to share their insights, ask questions, and propose strategies for improvement. Encourage brainstorming and the sharing of best practices, fostering a culture of continuous learning and growth. Consider using Notice and Wonder by stating facts of what you notice, what you wonder, then discuss details. The coach charts responses.
5. **Action planning:** Conclude each data dive session by identifying specific actions or instructional adjustments based on the insights gained from the analysis. Establish a plan to implement these strategies and determine methods for monitoring progress and reassessing student outcomes.

By engaging in regular biweekly data dives, math coaches and teachers can harness the power of data to inform their instructional practices. These collaborative sessions provide a structured framework for analyzing student work and data, promoting a culture of evidence-based decision-making and continuous improvement. Through this collaborative analysis and reflection, educators can enhance their teaching strategies, address individual student needs, and ultimately create a more impactful and supportive learning environment for all students.

Biweekly Data Dive Template

Date: _____ Facilitator: _____

Goals for the Data Dive:

Data Sources: Student Work

Step 1: Collecting and Organizing Data

Create a table or chart to record relevant data and observations. Include columns for student names/identifiers, assessment scores, work samples, and any additional data points for analysis.

Step 2: Analysis and Reflection

During this step, carefully examine the collected data and identify trends, patterns, and areas of concern. Reflect on the instructional practices that may have influenced the observed outcomes and discuss potential next steps.

Data Analysis Prompts:

What overall patterns or trends do you notice in the data?

Are there any common misconceptions or areas of struggle among students?

Do you observe any areas of significant growth or achievement?

Are there any patterns related to instructional strategies or resources used?

Are there any specific students who require additional support or differentiation?

Step 3: Discussion and Collaboration

Engage in open and collaborative discussions to share insights, ask questions, and propose strategies for improvement. Encourage brainstorming and the sharing of best practices, fostering a culture of continuous learning and growth.

Discussion Prompts:

- Based on the data analysis, what instructional strategies or interventions have been successful?
- What challenges or areas of improvement can be identified from the data?
- Are there any specific instructional strategies or resources that could address the identified challenges?
- How can we differentiate instruction to meet the diverse needs of students?
- Are there any cross-grade or cross-content collaborations that could enhance student learning outcomes?

Step 4: Action Planning

Identify specific actions or instructional adjustments based on the insights gained from the data analysis. Establish a plan to implement these strategies and determine methods for monitoring progress and reassessing student outcomes.

Action Planning Prompts:

- What specific strategies or interventions will be implemented to address the identified challenges or areas of improvement?
- Who will be responsible for implementing each strategy or intervention?
- What resources or support will be needed for successful implementation?
- How will progress be monitored and reassessed to determine the effectiveness of the implemented strategies?
- When will the next data dive meeting be scheduled to review progress and adjust instructional practices accordingly?

Action Plan:

Action/Strategy: _____

Responsible Person: _____

Resources Needed: _____

Timeline: _____

Action/Strategy: _____

Responsible Person: _____

Resources Needed: _____

Timeline: _____

Step 5: Follow-up and Reflection

Document any additional notes, insights, or follow-up tasks that arise from the data dive meeting. Consider any adjustments needed to the data dive process or areas for improvement in future meetings. Follow-up and Reflection:

Teacher Math and Instructional Learning Goals Form

This form provides a structure for teachers to define their own math and instructional learning goals. Fill in the objectives you want to achieve and outline specific action steps you will take to work towards those objectives. This form allows you to set goals that align with your professional needs and aspirations, promoting a sense of ownership and autonomy in your professional growth. See PEERS Framework to use as a guide.

Name: _____ Date: _____

Subject/Grade Level: _____

My Misson Statement:

Goal Area 1: Vision for My Students:

Goal Area 2: Growth Objective:

Action Steps:

Goal Area 3: Proficiency/Attainment Objective:

Action Steps:

Goal Area 4: Homework Completion Objective:

Action Steps:

Goal Area 5: Standard Mastery Objective:

Action Steps:

Goal Area 6: iReady and IAR Objective:

Action Steps:

My areas of strength:

My areas of improvement/needed support that I will not use as excuses but work on:

Video Observation Policy

Our mission is to provide an academic and culturally relevant program that integrates and balances cultural knowledge and improves competencies in reading, oral and written language, mathematics, science, technology, social studies, the arts, and the humanities.

We believe that in order to fulfill our mission, we must consistently improve our practice, reflect on our instructional techniques, and provide feedback to our teachers.

We understand that video observations are sometimes met with suspicion and apprehension. Video observations are never meant to be mean-spirited or detrimental to the teacher's practice. Instead, video observations are tools used to improve teacher practice that will in turn improve student competencies.

In fact, research shows that video observations:

- Allow teachers to more easily and frequently identify their strengths and areas for improvement; this is similar to how videos are used by coaches and players in sports.
- Provide more accurate and detailed notes. Having this shared record allows for more constructive feedback that will allow teachers to make more meaningful and impactful instructional decisions.
- Provide opportunities to teachers to observe their own practices, classroom engagement, and behavior in a way that "*hearing* what happened" doesn't.
- Give observers a chance to benefit from the videos and information shared during the debriefs.
- Help maintain a record of instruction, feedback from observers, and reflections over a long period of time that can be used for professional growth and advancement.
- Provide principals the freedom to pay closer attention to components of the observation that they may have missed during a live observation. Further, it's more accurate when used during an observation than simply relying on the principal's notes.
- Give principals more flexibility; they can watch videos during any time of the day from any location. This will help make sure there is consistency with providing the feedback necessary for professional growth.

Instructional Video Expectations

The instructional videos are used for the purpose of improving instruction. They are not the evaluation tool used by principals. However, they will be a component of the

evaluation and re-hiring process. Below are the video expectations for each BSICS teacher:

1. The coach will record and store the observations in SchoolMint unless otherwise requested.
2. If there is a work sample or other documentation that will help support the observers, it should be provided in SchoolMint.
3. Participate in weekly observation rounds as the observer and provide feedback via the "Video Lesson Reflection & Feedback" form in the "Video Observation Protocols" folder.
4. The chosen section of instruction should not exceed 15 minutes and must be no less than 10 minutes.
5. In order for a video to be valid for submission, the following conditions must be met:
    a. Audio can clearly be heard when projected on the Smart TV or other technology used for group viewing.
    b. Video is clear and the quality provides for viewing on a Smart TV or other technology used for group viewing.
    c. The title of the video should be, "Teacher's NameLast Initial 'Focus' MonDateYear", ie, "TraceyC Conceptual Understanding Dec42022"
6. If there are issues with recording and/or saving the video, you must reach out to tech for assistance. DO NOT ATTEND YOUR SCHEDULED PD WITHOUT HAVING MADE SURE THE VIDEO IS READY FOR VIEWING.
7. Please refer to other documents in the "Video Observation Protocols" folder for additional support, exemplars, and other documentation.

FERPA Law

With video observations, it is important that we understand the law and protect the privacy of our students and teachers. The Family Educational Rights and Privacy Act ("FERPA"), 20 U.S.C. § 1232g, does not specifically allow or prohibit recording in schools.

Only employees in the BSICS network who have a valid bsics.org account will be able to view videos. Employees must not share videos outside of the BSICS network.

BSICS Contract

In teachers' contracts, the following sections are included:

6. Intellectual Property Rights in Work Product: Employee acknowledges that all written, printed and electronic instructional plans, charts and maps; course lessons; assessments; educational materials; presentations; reports and other copyrightable

work products developed by the Employee as a part of Employees service to Employer are "works made for hire" under the U.S. Copyright Law (17 U.S.C. Section 101). If such work products are ineligible for treatment as "works made for hire," Employee hereby assigns exclusively to Employer all rights, title, and interest in all such work products, including patents, copyrights and other intellectual property rights.

7. Photo, Video and Audio Release: Employee irrevocably consents to allow Employer to photograph, and video and audio record Employee for any lawful purpose at any Employer site of operation or activity involving Employer where Employee is present. Employee irrevocably authorizes the reproduction, publication, and any other use by Employer, its licenses and assigns of any photographs, audio and video in any medium and or any lawful purpose without any royalty or compensation to Employee. Employee further assigns to Employer all rights of ownership and disposition; full right to copyright, use and publish in print and/or electronically; as well as waives any rights to notice, inspection, or approval; and releases Employer, its licensees and assigns, from any claim or liability arising from or in connection with use of such photographs, audio and video.

Reading Resources

- Sarah Lawrence Lightfoot - The Essential Conversation
- Bell Hooks - Teaching to Transgress
- Betina Love - We Want to Do More than Survive: Abolitionist Teaching and the Pursuit of Freedom
- Alex Shevrin Venet - Equity-Centered Trauma-Informed Education
- Zaretta Hammond - Culturally Responsive Teaching and the Brain
- Lou Mathews - Engaging in Culturally Relevant Math Tasks: Fostering Hope in the Elementary Classroom
- Jacqueline Leonard and Danny Martin (Editors) - The Brilliance of Black Children in Mathematics
- Claudia Zavlasky - Africa Counts: Numbers and Pattern in African Cultures
- Karim Ani - Dear Citizen Math: How Math Class can inspire a more rational and respectful society
- Tracy Zager - Becoming the Math Teacher You Wish You'd Had
- Jennifer Bay Williams - Math Fact Fluency
- Smith & Stein - 5 Practices for Orchestrating Productive Mathematics Conversations
- Martin & Leonard - The Brilliance of Black Children in Mathematics: Beyond the Numbers and Toward New Discourse

- Erika Walker - Building Mathematics Learning Communities: Improving Outcomes in Urban High Schools
- Martin - Mathematics Success and Failure Among African-American Youth
- Gillen & Moses - Educating for Insurgency: The Roles of Young People in Schools of Poverty
- Gloria Ladson-Billings - Culturally Relevant Pedagogy
- Mathematical Mindsets by Jo Boaler
- CULTURALLY RELEVANT PEDAGOGY IN MATHEMATICS: A CRITICAL…
- Danny Martin on Math Education for African American Children
- Rethinking Intervention with Dr. Robert Q. Berry, III
- Black Brown & Bruised: How Racialized STEM Education Stifles Innovation
- The Stress of Success in STEM
- The Algebra Project Bob Moses
- Dr. Marcia L Tate-Healthy Teachers, Happy Classrooms: 12 Brain-Based Principles to Avoid Burnout, Increase Optimism, and Support Physical Well Being

Math Interventionist Theory of Change

We acknowledge that every student's educational journey is unique, shaped by various influences, opportunities, and challenges. In our commitment to provide high-quality education to all students, we recognize the need for tailored strategies that address distinct learning needs, particularly in foundational subjects like Mathematics.

We understand that many BSICS students struggle with Mathematics, which is reflected in the IAR test scores. Our mission, as educators, interventionists, and caring community members, is to address these challenges and foster a nurturing learning environment where every student can thrive.

In light of this, we have developed a *Theory of Change* for our Mathematics Intervention Program. This theory serves as our roadmap for change, guiding our efforts to improve student outcomes in Mathematics. It outlines our understanding of the existing problem, our long-term goals, the necessary preconditions, our planned interventions, and the assumptions underpinning our approach.

Moreover, our Theory of Change encapsulates our commitment to adapt and learn. We have laid out an iterative learning and adaptation plan that ensures continuous improvement throughout the school year. By regularly reviewing and adjusting our strategies, we aim to stay responsive to our students' evolving needs and changing contexts.

At the heart of our Theory of Change is our belief in the power of collaboration. We deeply value the roles of students, parents, teachers, administrators and the math interventionists in this endeavor, and we encourage open and frequent communication among all stakeholders. We see our work as a shared journey towards a shared vision - one where all students develop not only mathematical proficiency but also the confidence and love for learning that will serve them well beyond the classroom. Asante sana.

No excuses,

Mama Assata
Director of Math Education

The Theory of Change

Problem: Low test scores on the IAR.

Long-Term Goal: Increase math proficiency by a factor of four.

Preconditions: Access to a math interventionist, after school homework support, Response to Intervention (RTI) during the school day, parental involvement by attending conferences and building community with other families, and high quality instruction.

Student Grouping Strategy: Students will be grouped based on their specific areas of need by mathematical domain and subdomain, such as number sense, ratio and proportion, etc. These groups will not be solely determined by grade level or general performance but rather by a detailed analysis of individual students' strengths and weaknesses based on the 2022-23 iReady and IAR data.

Pedagogical Strategies: Intervention will utilize a variety of teaching approaches tailored to facilitate student progress. This includes working with children to create models of their reasoning processes that entail conceptual foundations of the problem area, as well as starting with problems that involve smaller numbers to simplify problem-solving and progressively increasing complexity; as described by Magdalene Lampert's insights on problem-solving as described below:

1. *The role of discourse in problem-solving:* Lampert's work emphasizes the importance of student discourse in the math classroom. She encourages students to explain their thinking process and reasoning behind solutions. This kind of discourse helps students articulate their understanding and learn from one another, leading to a deeper conceptual grasp of mathematical ideas.

2. *The importance of conceptual understanding:* Lampert advocates for a shift from procedural teaching (simply teaching the steps to solve a problem) to a more conceptual understanding of mathematics. Her work emphasizes the need for students to understand the 'why' behind mathematical principles and procedures.

3. *Teaching through problem-solving:* Lampert suggests that teaching through problem-solving can help students build mathematical reasoning skills. In this approach, students learn new mathematical concepts by solving problems that necessitate the use of these concepts, rather than being taught the concepts first and then practicing them through problems.

4. *Progressively complex problem-solving:* Starting with problems that involve smaller numbers to simplify problem-solving and progressively increasing complexity is a pedagogical strategy Lampert suggests. This allows students to grasp the underlying concepts and procedures without getting overwhelmed by complex arithmetic.

5. *The use of models in reasoning:* Lampert highlights the importance of working with students to create models of their reasoning processes that entail the conceptual foundations of the problem area. This helps make abstract concepts more tangible and promotes a deeper understanding.

Interventions:

- Family engagement for the targeted students.
- Two sessions per week at 30 minutes each of Tier 3 intervention, using the grouping strategy and pedagogical approaches described above.
- After school homework support.
- Special activities and excursions to incorporate enrichment.

Assumptions:

Math Interventionist: The math interventionist is adequately trained, motivated, and prepared to provide quality, tailored instruction and guidance to each student. They have the capacity to analyze student data and adjust instruction accordingly.

Students: Students are capable of improvement and are receptive to the interventions. They have the capacity to engage with the intervention resources and are motivated to participate fully in the learning process.

Parents: Parents understand the importance of their involvement in their child's education and are willing and able to participate in conferences and community building. They will support their children's learning outside of school.

Indicators of Success:

- Improved IAR test scores.
- Better attendance.
- Increased confidence in mathematical ability.

Data Collection Methods:

- IAR test scores.
- iReady data.
- Attendance from PowerSchool.
- A student and family survey.

Implementation Timeline: 2023-24 school year (from August 21, 2023, to June 5, 2024).

Iterative Learning and Adaptation Plan:

- *Phase 1:* Focus on establishing routines, setting expectations, starting interventions, and forming student groups. Collect baseline data for later comparisons. Hold initial parent meetings and community-building events.

- *Phase 2:* Review the first set of data, assess the initial impact of interventions, adjust grouping if needed, and make necessary modifications to teaching strategies. Conduct a second round of parent meetings to discuss progress and re-emphasize the importance of community involvement.
- *Phase 3:* Continue monitoring student progress and make further adjustments as necessary. Conduct another family survey to get feedback on the program's effectiveness from the families' perspective. Use this feedback to make improvements.
- *Phase 4:* Conduct final evaluations of student progress and overall program effectiveness. Make plans for any necessary changes or improvements for the next school year.

Throughout the year, maintain open lines of communication with all stakeholders, including students, parents, and other educators. Regular check-ins and progress updates can help keep everyone involved and invested in the program's success.

Math Intervention Program Student Pre-Survey

Please fill out the following survey to help us better understand your needs as we begin the math intervention program. Your responses will be used only for the purpose of tailoring the program to best support you.

Name : _____ Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. I enjoy learning math.					
2. I feel confident in my current math skills.					
3. I understand the areas in math where I need help.					
4. I believe the math intervention program can help improve my math skills.					
5. I feel comfortable asking for help when I don't understand a math concept.					
6. I am willing to devote extra time for the math intervention program.					

Please provide your thoughts on the questions below.

What specific areas in math do you feel you need the most help with?

What strategies or resources have helped you learn math in the past?

What are your expectations from this math intervention program?

How do you feel your family can best support you in this program?

Student Math Intervention Mid-Program Survey

Please fill out the following survey to help us improve our math intervention program.

Name: _____ Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. I feel comfortable asking for help in the math intervention sessions.					
2. The math interventionist understands my learning needs.					
3. The strategies I'm learning in the math intervention program are helping me do better in math.					
4. The after-school homework support is helpful to me.					
5. The special activities and excursions enrich my learning experience.					
6. I feel more confident about my math skills now than before the program started.					
7. I feel that my attendance and participation in the program are improving my math scores.					
8. My family understands the goals of the math intervention program and supports me.					

Please provide your thoughts on the questions below.

What do you like most about the math intervention program?

What do you like least about the math intervention program?

What changes, if any, would you suggest to make the program more effective for you?

Is there anything else you'd like to share about your experiences in the math intervention program?

Student Math Intervention Post-Program Survey

Please fill out the following survey to help us improve our math intervention program.

Name: _____ Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. I felt comfortable asking for help in the math intervention sessions.					
2. The math interventionist understood my learning needs.					
3. The strategies I learned in the math intervention program helped me do better in math.					
4. The after-school homework support was helpful to me.					
5. The special activities and excursions enriched my learning experience.					
6. I feel more confident about my math skills now than before the program started.					
7. I feel that my attendance and participation in the program improved my math scores.					
8. My family understood the goals of the math intervention program and supported me.					

Please provide your thoughts on the questions below.

What did you like most about the math intervention program?

What did you like least about the math intervention program?

What changes, if any, would you suggest to make the program more effective for you?

Is there anything else you'd like to share about your experiences in the math intervention program?

Parent Survey for Math Intervention Program

As we begin our math intervention program, we kindly ask for your input to help us better understand your child's needs and how we can best support you in this process. Your responses will be used only for the purpose of enhancing the program.

Your Name: _____ Child's Name and Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. I am aware of the specific areas in math where my child needs help.					
2. I feel confident in my ability to support my child's math learning at home.					
3. I believe the math intervention program will be beneficial for my child.					
4. I am prepared to attend conferences and participate in community-building activities.					
5. I understand the role of the math interventionist in supporting my child's learning.					

Please provide your thoughts on the questions below.

What challenges does your child currently face in learning math?

What strategies have you found helpful in supporting your child's math learning at home?

What are your expectations from this math intervention program?

How do you think we can improve our communication and partnership with you during this program?

Parent Feedback Survey for Math Intervention Program - First Quarter

As we conclude the first quarter of our math intervention program, we appreciate your feedback to help us better understand how the program is working for your child and what changes, if any, might be needed. Your responses will only be used for the purpose of improving the program.

Your Name: _____ Child's Name and Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. The math intervention program is helping my child improve their math skills.					
2. The after-school homework support is beneficial for my child.					
3. The math interventionist effectively communicates my child's progress.					
4. The parent conferences and community-building activities are helpful.					
5. I understand the program's goals and the ways it is supporting my child.					

Please provide your thoughts on the questions below.

What changes have you noticed in your child's math skills since the beginning of the intervention program?

What aspects of the math intervention program have been most beneficial for your child?

What challenges or concerns do you have about the program so far?

What changes or improvements, if any, would you suggest for the program moving forward?

Parent Final Feedback Survey for Math Intervention Program

As our math intervention program concludes, your feedback is crucial to help us understand the overall impact of the program and areas for future improvement. Your responses will only be used for the purpose of enhancing the program.

Your Name: _____ Child's Name and Grade Level: _____

Please circle the number that best represents your feelings about the statements below, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statements	1	2	3	4	5
1. The math intervention program has helped my child improve their math skills.					
2. The after-school homework support was beneficial for my child.					
3. The math interventionist effectively communicated my child's progress throughout the program.					
4. The parent conferences and community-building activities were helpful.					
5. I understand the program's goals and how they were achieved for my child.					
6. I would recommend this math intervention program to other parents.					

Please provide your thoughts on the questions below.

What changes have you noticed in your child's math skills over the course of the program?

What aspects of the math intervention program were most beneficial for your child?

What challenges or concerns did you have about the program?

What changes or improvements, if any, would you suggest for future iterations of the program?

Do you have any other comments or feedback about the program?

Social Justice in Mathematics Resources

- Racial Justice in Early Math Resource List
- **Rethinking Mathematics: Teaching Social Justice by the Numbers 2nd Edition**
- by Eric (Rico) Gutstein (Author, Editor), Bob Peterson (Author, Editor)
- **Early Elementary Mathematics Lessons to Explore, Understand, and Respond to Social Injustice (Corwin Mathematics Series) 1st Edition**
- by Courtney Koestler (Author), Jennifer Ward (Author), Maria del Rosario Zavala (Author), Tonya Bartell (Author)
- **Mathematics for Social Justice Paperback – November 15, 2021**
- by Gizem Karaali (Author, Editor), Lily S. Khadjavi (Author, Editor)
- Mine the Gap for Mathematical Understanding, Grades 3-5: Common Holes and Misconceptions and What To Do About Them (Corwin Mathematics Series) (September 16, 2016)
- by John J. SanGiovanni (Author)
- Mine the Gap for Mathematical Understanding, Grades K-2: Common Holes and Misconceptions and What To Do About Them (Corwin Mathematics Series) (October 31, 2016)
- by John J. SanGiovanni (Author)
- Mine the Gap for Mathematical Understanding, Grades 6-8: Common Holes and Misconceptions and What To Do About Them (Corwin Mathematics Series) (September 12, 2017)
- by John J. SanGiovanni (Author) , Jennifer R. Novak (Author)
- *"We Got This. Equity, Access, and the Quest to Be Who Our Students Need Us to Be"* by Cornelius Minor

BSICS Math AIR RTI Model

This plan is designed to provide focused, small-group Tier 2 and Tier 3 instruction outside of the primary (Tier 1) instructional time. There is a focus on:

1. **Acceleration:** To provide opportunities for all students to advance regardless of their current level of partial understanding of previously taught topics.
2. **Intervention**: To provide opportunities for students that are having difficulty picking up on current learning goals/standards to receive intervention in a small group instructional setting.
3. **Remediation:** To provide opportunities for students to acquire understandings, concepts, and skills that were missed in prior grades.

Tier 1: Core Instructional Time Tier 2: Small Group Intervention Tier 3: Intense Intervention
RTI: Response to Intervention is a form of MTSS (Multi-tiered System of Support)

First 5 - 7 Mins of Every Class: Formative Loop					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Group A	Small Group with Teacher	Aha!	iReady Personalized Instruction Plan RTI Tier 2 for Lesson Specific Practice	99Math.com	IAR Problem: Math Reasoning Discussion and Written Solution
Group B	IAR Problem: Math Reasoning Discussion and Written Solution	Small Group with Teacher		Aha!	99Math.com
Group C	99Math.com	IAR Problem: Math Reasoning Discussion and Written Solution		Small Group with Teacher	Aha!
Group D	Aha!	99Math.com		IAR Problem: Math Reasoning Discussion and Written Solution	Small Group with Teacher

Intervention	Tier	Format	Support
Formative Loop	3	Online: 5 mins Daily	Targeted Individual Practice for Fluency
iReady	3	Online: Every Weds	Targeted Individual Practice using Data
Small Group with Teacher	2/3	Individual white board/notebook: Once per week	Teacher-Led Goals/Standards Intervention
Aha!	2	Paper & Pencil: Once per week	Mathematical Reasoning & Problem Solving
99Math.com	2	Online: Once per week	Arithmetic & Procedural Skills Practice in a Small Group/Individual Working Setting
IAR Practice	2	Pape & Pencil: Once per week	Standards-Based Open Response Practice Problems; Written and Verbal Reasoning in a Small Group Setting
Imagine Learning Instructional Time	1	Varied: M, T, Th, F	Whole Group Instruction Using Varied Techniques

Accountability

- Formative Loop Implementation: TA — Check: Assistant Principal Daily
- Tier 1 High-Quality Instruction: Teacher — Check: Principal & Coach Daily
- RTI Rotation: Teacher & TA — Check: Principal Daily
- iReady Data: Coach — Check: Principal & Coach Biweekly
- Weekly Participation Grade in GB: Teacher — Check: Principal Weekly

Intervention Menu for Additional Supports

Intervention Strategy	How it Works
EMOTION MENU	Use a visual aid, such as a poster, to teach students how to identify their feelings and emotions. Ask students to point to how they're feeling, and provide strategies to help them manage their emotions. A sample (no need to purchase, can create your own or have students create) provided in the link. ***Tier: 2*** ***Grades: PK-5*** ***Best for Improving: SEL***
GRAPHIC ORGANIZER	Graphic organizers are designed to visually represent thinking and to visually connect key ideas. Graphic organizers can serve many purposes for students, from helping them take notes in class, to recording different perspectives during a group discussion, to prewriting, problem-solving, pre-reading, or synthesizing their thinking at the end of a lesson. ***Tier: 1, 2, 3*** ***Grades: 3-12*** ***Best for Improving: Math, Other Academics***
LUNCH BUNCH	Bring together a group of students to meet with the school counselor or social worker during lunchtime with a specific goal in mind. For example, a lunch bunch may be focused on developing a specific SEL skill or on teaching conflict resolution skills. ***Tier: 2, 3*** ***Grades: K-12*** ***Best for Improving: Behavior, SEL***
CHECK IN, CHECK OUT (CICO)	At the beginning of each day, meet with the student to review the goals you've set together. Confirm the specific goal for that day and offer an incentive for the student to reach the goal. Observe the student and provide feedback throughout the day. Then, at the end of the day, talk about whether they were able to meet the goal. Provide recognition and the reward if they did, and provide encouragement and feedback if they did not. ***Tier: 2, 3*** ***Grades: K-12*** ***Best for Improving: Behavior***
MATH FACT FLUENCY	Fluent understanding of the relationships between numbers is critical for problem solving. Build students' number sense through "number talks," teaching fact families, and strategies like "counting on" and "make 10." ***Tier: 1, 2*** ***Grades: K-8*** ***Best for Improving: Math***

MATH TIME DRILL	Boost students' computational fluency and capacity to solve simple math problems under time pressure. Hand out math worksheets and give students a set amount of time to complete the problems. Learn more. ***Tier: 1, 2*** ***Grades: K-12*** ***Best for Improving: Math***
NUDGE LETTER	Send a letter home to the student's family or caregiver with information about their child's absences. Communicate the importance of attendance, include the child's attendance data, and compare the child's records with other students' attendance. Learn more. ***Tier: 1, 2*** ***Grades: PK-12*** ***Best for Improving: Attendance***
PEER MENTORING & PEER TUTORING	Peer mentoring & tutoring is a structured relationship in which a more experienced or knowledgeable peer helps to guide a less experienced or knowledgeable peer. Models can be the same grade or mixed age; one-on-one, or small group. ***Tier: 1, 2*** ***Grades: 4-12*** ***Best for Improving: SEL, Behavior, Math***
Tier 2 and 3 Math Resource	Tier 2 and 3 RTI Toolkit

Intervention Planning

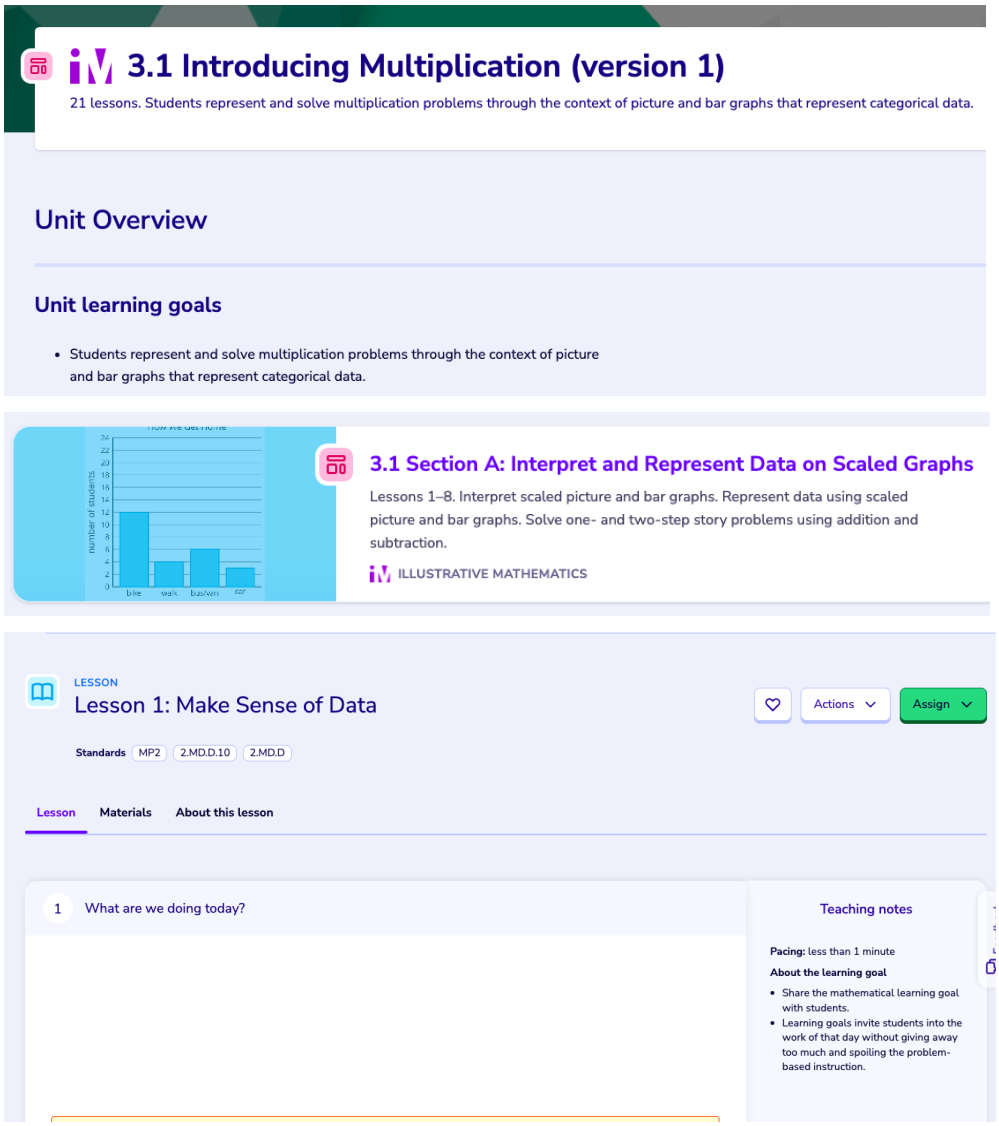
Mwanafunzi Name:	Intervention Type: ☐ ELA ☐ Math ☐ Behavior ☐ SEL ☐ Attendance	Tier: ☐ Tier 2 ☐ Tier 3
Goal (Note the skills you are looking to build or the goal you are looking to help the student reach. We recommend framing these in the positive (an opportunity to grow) rather than the negative (a problem to solve). It can be helpful to use the SMART goal framework—setting a goal that is specific, measurable, attainable, relevant, and timely):		
Intervention Strategies (List the actions or activities you will take to support the student from your district's list. This could be one or more strategies.):		
Mwalimu Name (Adult responsible for carrying out the intervention):	Start Date:	Duration (Six weeks is standard but can be as long as a year or more.):
Monitoring Frequency (Note how often you expect to update the student's progress. For example, this could be weekly, bi-weekly, or monthly.):	Monitoring Method (Enter the assessment you will use to track the student's progress. You can also write in "notes only" here if you plan to track progress through observational notes.):	
Baseline (Most recent iReady score):	Target *(enter the desired assessment score that will indicate that the intervention was successful.)*:	Parent Contact Notes:

Mwanafunzi Progress Monitoring

Mwanafunzi Name:	Date:	Was the intervention performed: ☐ Yes ☐ No
How is the student doing? [Record any observations, insights, and notes. What did you learn about the student? How did the student respond to the intervention? If you are using a quantitative metric (e.g., literacy assessment score), input the numeric score here.]:		
Is the student on track to meet their goal? (If your plan does not have a quantitative metric, use your judgment to record if the student is "On Track," "Progressing," or "Behind."): ☐ On Track ☐ Progressing ☐ Behind		
Mwalimu Name:	Parent Contact Notes:	

Instruction - Tier 1

All students should receive high-quality instruction for 60 - 70 minutes every Monday, Tuesday, Thursday, and Friday using the Imagine Learning curriculum. This may vary by campus.



Lessons can be found on the Imagine Learning Platform. The Platform includes:

- 8 or 9 units per grade level
- Each unit is broken down into sections with a common theme/standard
- Each section has daily lesson plans
- Standards are outlined in the curriculum
- There are teacher notes, materials and other resources included
- The student portal allows teachers to assign practice that can be observed from the teacher's interface
- Lesson internalizations (doing the math) should be submitted each week via SchoolMint

Interventions - Tier 2

IAR Practice: These problems will come from the ISBE Digital Library. Problems from this library are usually open response, require conceptual understanding as well as procedural skills, and have multiple parts. Problems can be found here: https://il.digitalitemlibrary.com/home;
Additional Resource: https://il.mypearsonsupport.com/practice-tests/math/

Implementation

Supplies Needed: Printed copy of problem for each student, pencils with erasers, calculator (optional), Weekly Group Folder, Group Exit Ticket

1. One student from the group should be assigned as the leader for the day. They will serve as the facilitator and time keeper. This should be pre-determined by the teacher prior to the RTI block and rotated daily.
2. The leader passes out the printed copy of the problem to each student.
3. After each student, including the leader, has their problem the leader sets the timer for 10 mins and starts. Students are expected to read the problem, solve each step of the problem, and show their work. If students are having trouble, they are to write what they are having trouble with on the paper.
4. After 10 mins, the leader stops the timer. All students are expected to stop and put their pencils down. The timer is then set again for another 10 minutes.
5. The leader then chooses a student to read the problem and the first part, ie, part A. The same student is to then share how they solved the problem and/or what difficulties they had. After that student is done. The leader calls on a second student to see if they have anything to add, if they agree or disagree, if they solved the problem in a different way, if they have any questions, etc.
6. Next, the leader chooses a different student, someone that hasn't participated yet, to read the next part, i.e. part B, and to repeat the process.
7. The objective isn't to get to a discussion on each part, but to make sure there is good discussion and comprehension of what can be accomplished in the allotted time.
8. After the 10 min discussion timer ends, the leader is to then set the timer for 2 mins and ask each student to self-grade their work as follows (they are to write the numerical value and words):
    a. 1 - I did not put forth my best effort.
    b. 2 - I tried, but did not fully participate or work as hard as I know I can.
    c. 3 - I did really well, participated in the discussion by listening and sharing my ideas.

    d. 4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.
9. The leader is then to collect all papers, making sure there's a name and date on each paper, put them in the Weekly Group Folder, and put them on the teacher's desk or other designated location.
10. The teacher is to combine these scores with the other participation grades and enter a weekly grade out of 20 for each student. The only time a student receives a "0" is if they are absent.
11. All folders should be kept for at least a quarter and kept in the classroom readily accessible if needed by admin or parents.

IAR Group Exit Ticket

Leader: _____ Date: _____

Instructions to Leader: Staple this form to today's IAR student practice work. Put the student's self-grade score in the box specified and then put the grade that you would give them along with any notes to the teacher. Remember: IT'S YOUR JOB TO MAINTAIN ORDER AND TO MAKE SURE LEARNING IS HAPPENING! Asante sana.

Student Name	Self-Grade	Leader's Grade	Notes to teacher

Self-Grading Scale

1 - I did not put forth my best effort.

2 - I tried, but did not fully participate or work as hard as I know I can.

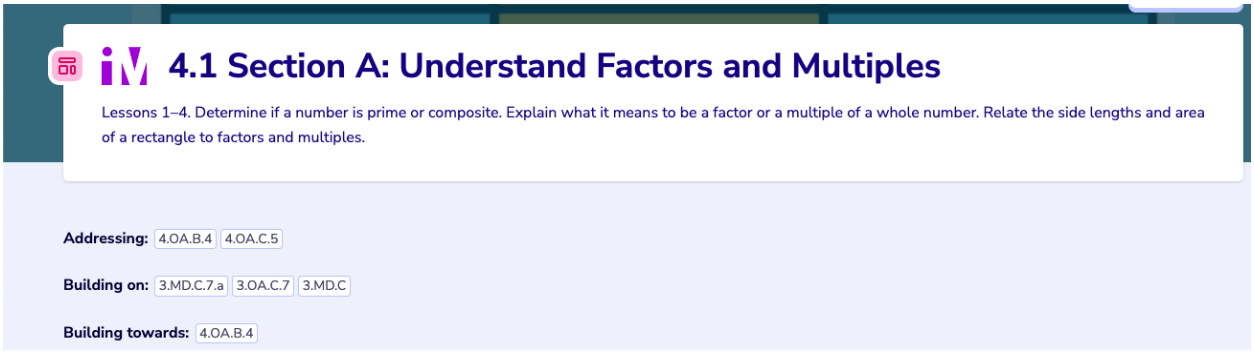
3 - I did really well, participated in the discussion by listening and sharing my ideas.

4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.

IAR Intervention Practice Sample

Student Name: **Date:** **Self-Grade:**

Correlation: Unit 1 Section A Lessons 1 - 4



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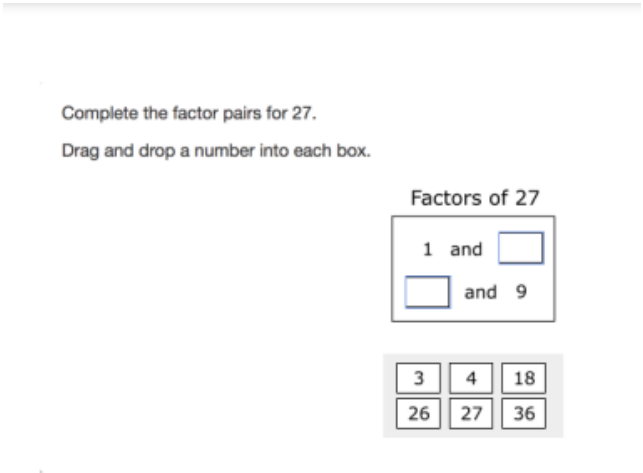
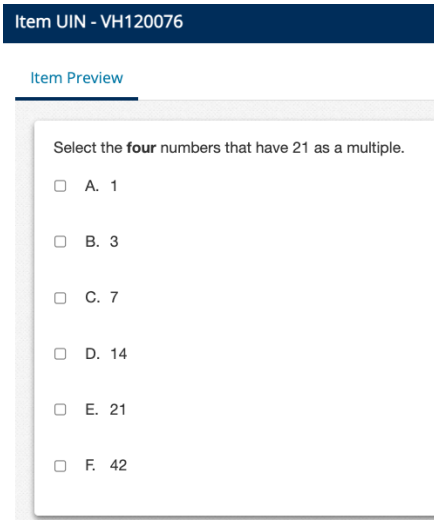
Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.





CCSS.MATH.CONTENT.4.OA.C.5

Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.

The first number in a pattern is 3. The pattern rule is to add 4. What is the seventh number in the pattern?

$3, \_, \_, \_, \_, \_, \square$

Enter your answer in the box.

A pattern has the rule “add 4” and starts with the number 2013. What are the next three numbers in the pattern?

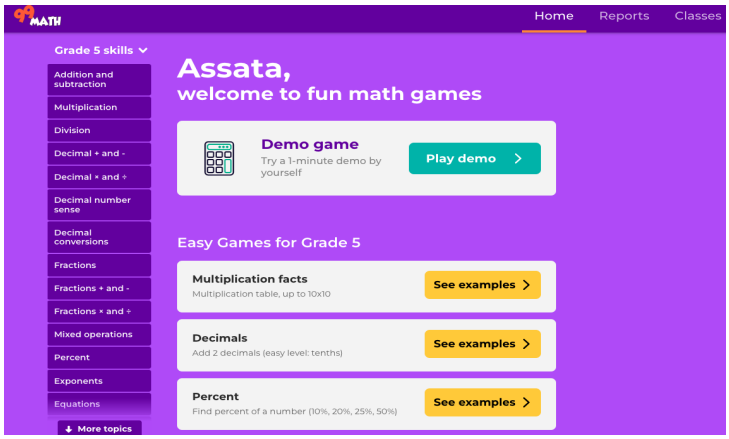
- A. 2017, 2021, 2025
- B. 2017, 2022, 2028
- C. 2018, 2022, 2026
- D. 2018, 2023, 2029

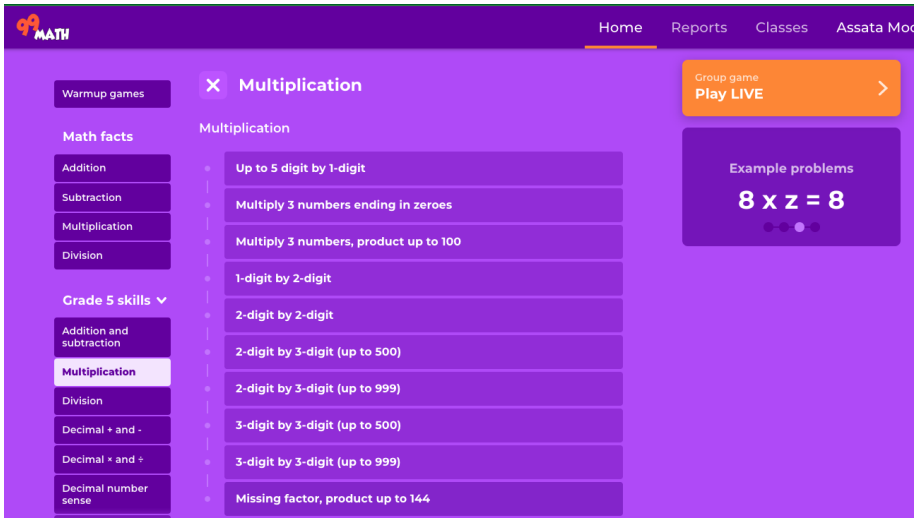
99Math.com: Students will practice skills specified by the teacher in a small group one-to-one online environment. Students will be working on the same skills using the same code generated by the teacher.

Implementation:
Supplies Needed: Computer, Participation Tracker Sheet, Weekly Group Folder, Paper & Pencil, Game Code

1. Prior to the RTI block, the teacher will choose the skill for the students to practice and generate the 'game code(s)'.
2. One student from the group should be assigned as the leader for the day. They will serve as the facilitator and time keeper. This should be pre-determined by the teacher prior to the RTI block and rotated daily.
3. The leader will make sure that each student's, including their own, name is recorded on the 99Math Participation form for the day. They will also make sure that the date is recorded.
4. The leader makes sure that each student has paper and pencil to work computations.
5. The leader will read the skills that will be practiced and set the tone by reading the expectations & setting a goal for the group, *"It is the expectation that we focus on accuracy and understanding and not speed. We will use the provided paper and pencil to work our computations. Today, we're going to practice 2-digit multiplication and we're looking for at least 80% accuracy from each member! Let's do it!"*
6. The leader is to set the timer for 20 minutes to allow students to work independently.
7. The leader is responsible for maintaining order and keeping the other students on task.
8. Once the 20 minutes have ended, the leader is to ask all students to stop and logout.
9. The leader is to then set the timer for 2 mins and ask each student to self-grade their work as follows (the leader should record this on the 99Math Participation Tracker):
    a. 1 - I did not put forth my best effort.
    b. 2 - I tried, but did not fully participate or work as hard as I know I can.
    c. 3 - I did really well, participated in the discussion by listening and sharing my ideas.
    d. 4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.
10. The leader is then to collect all papers and pencils, put the students' work and Participation Tracker in the Weekly Group Folder stapled together, and put them on the teacher's desk or other designated location.
11. The teacher is to combine these scores with the other participation grades and enter a weekly grade out of 20 for each student. The only time a student receives a "0" is if they are absent.
12. All folders should be kept for at least a quarter and kept in the classroom readily accessible if needed by admin or parents.

99Math





Course overview

The big ideas in grade 5 include: developing fluency with addition and subtraction of fractions, developing understanding of multiplication and division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions), extending division to two-digit divisors, developing understanding of operations with decimals to hundredths, developing fluency with whole number and decimal operations, and developing understanding of volume.

The mathematical work for grade 5 is broken into 8 units:

1. Finding Volume
2. Fractions as Quotients and Fraction Multiplication
3. Multiplying and Dividing Fractions
4. Wrapping Up Multiplication and Division with Multi-digit Numbers
5. Place Value Patterns and Decimal Operations
6. More Decimal and Fraction Operations
7. Shapes on the Coordinate Plane
8. Putting it All Together

99Math Participation Tracker

Leader: _____ Date: _____

Instructions to Leader: Put the student's self-grade score in the box specified and then put the grade that you would give them along with any notes to the teacher. Remember: IT'S YOUR JOB TO MAINTAIN ORDER AND TO MAKE SURE LEARNING IS HAPPENING! Asante sana.

Game Code(s)/Skill:

1.
2.
3.

Name:	Self-Grade:	Leader's Grade	Notes to Teacher

Self-Grading Scale

1 - I did not put forth my best effort.

2 - I tried, but did not fully participate or work as hard as I know I can.

3 - I did really well, participated in the discussion by listening and sharing my ideas.

4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.

Small Group with Teacher: During this time the teacher is working with students to address content-specific standards from the curriculum that students may have struggled with prior to the intervention. Additionally, this time should be used to accelerate students that have mastered the standards.

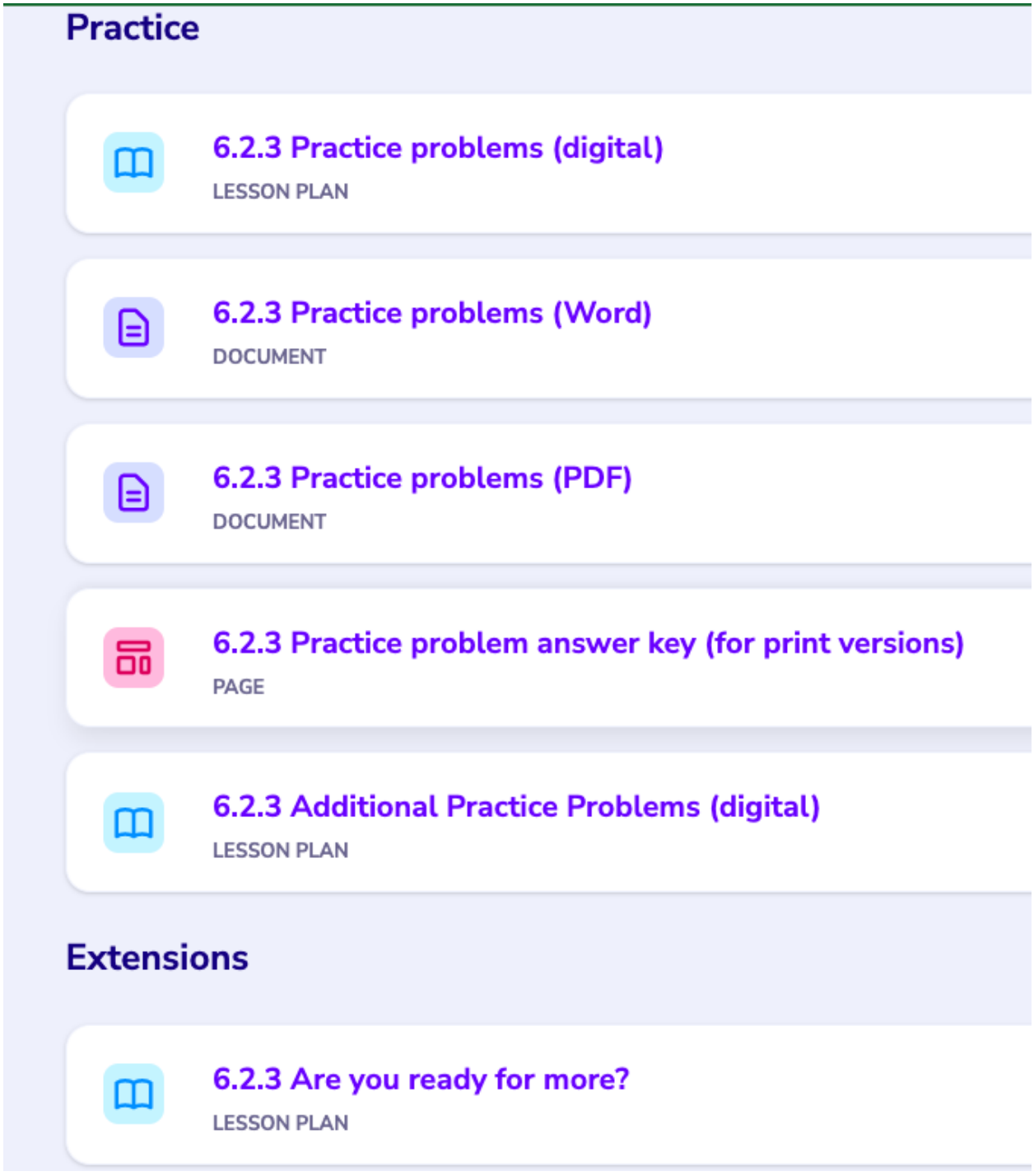
Implementation:

Supplies: Teacher specific materials and practice, individual whiteboards and/or notebooks, dry erase markers and/or pencils, Small Group Participation Tracker, Weekly Group Folder

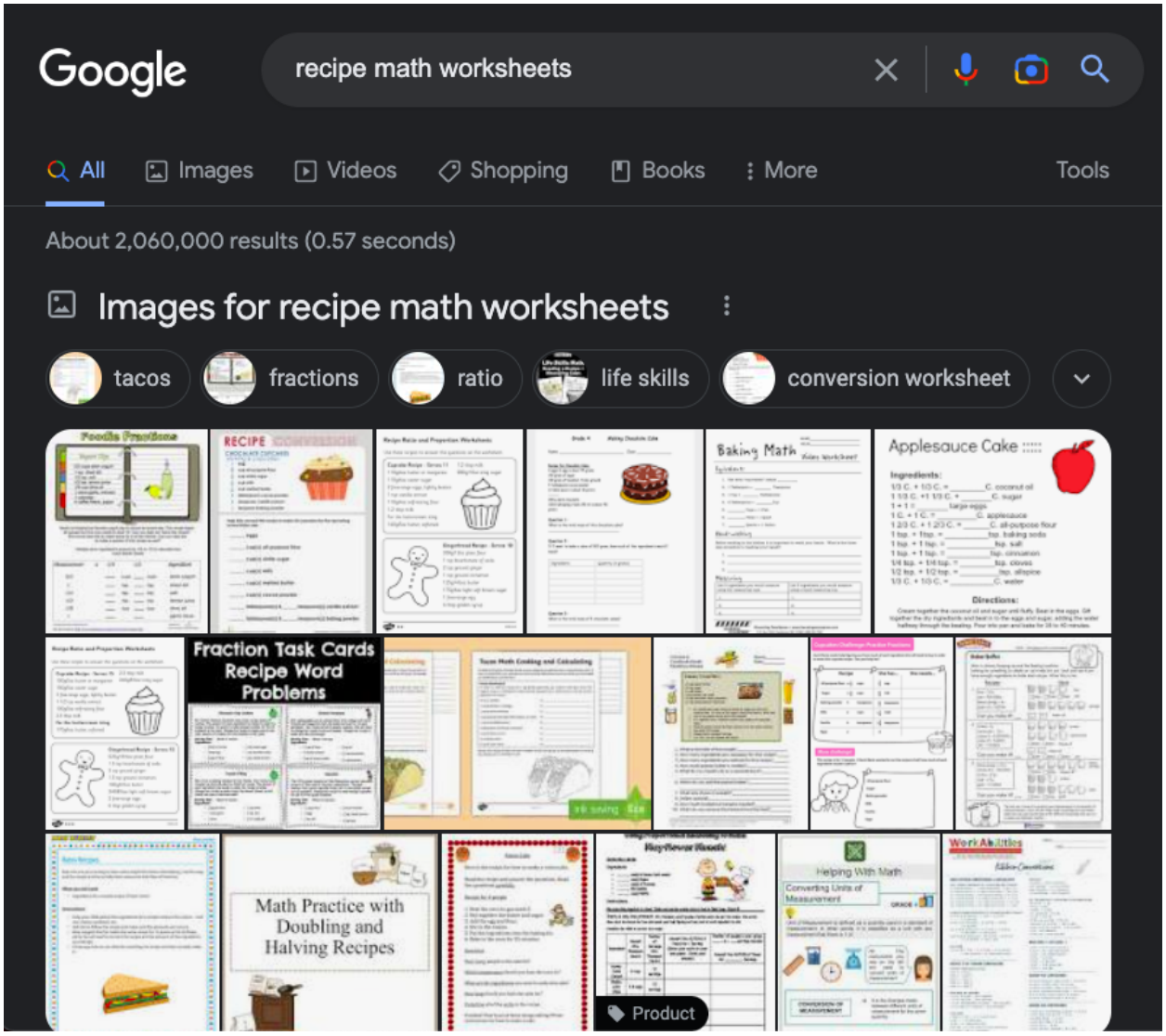
1. Teachers are to prepare during their lesson planning/internalization time, using data from student work to identify the level and type of intervention needed for each student in the group.
2. The teacher should decide the approach, ie, assigning each student the same problem with different levels of difficulty or having the student that has grasped the concept explain it to other students in the group, pushing on their mathematical reasoning and communication skills.
3. The teacher should set the timer for 5 minutes. At the start of the session, teachers should review the standard/objective that was previously taught and students should see their graded work or feedback from teacher to use to ask questions before starting the re-teach/pro-teach portion.
4. The teacher should then set the timer for 10 minutes. During this time, the teacher should re-teach/pro-teach the standard.
5. The teacher should ask students to think of one thing they are still confused about and address it.
6. The timer should then be set for 5 minutes. During this time, students should work on a problem that addresses the standard. These problems should come from practice problems from the Imagine Learning curriculum. The teacher should be closely monitoring the students' work and addressing any misunderstandings when noticed.
7. Students should show their work and thinking using the whiteboards, receiving feedback and instruction, as needed from the teacher.
8. The teacher is to then set the timer for 2 mins and ask each student to self-grade their work as follows (the teacher should record this on the Small Group Instruction Tracker):
    a. 1 - I did not put forth my best effort.
    b. 2 - I tried, but did not fully participate or work as hard as I know I can.
    c. 3 - I did really well, participated in the discussion by listening and sharing my ideas.
    d. 4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.
9. The teacher is then to collect all papers and pencils, put the students' work and Participation Tracker in the Weekly Group Folder stapled together, and store them.
10. The teacher is to combine these scores with the other participation grades and enter a weekly grade out of 20 for each student. The only time a student receives a "0" is if they are absent.
11. All folders should be kept for at least a quarter and kept in the classroom readily accessible if needed by admin or parents.

Small Group With Teacher

Practice from the curriculum



Additional Practice - Used all Practice from Curriculum?



Small Group Instruction Tracker

Standards/Objectives: Date:

Task Notes(or attach a copy):

Student	Intervention or Acceleration? (I) or (A)	Notes	Self-Grade

Self-Grading Scale

1 - I did not put forth my best effort.

2 - I tried, but did not fully participate or work as hard as I know I can.

3 - I did really well, participated in the discussion by listening and sharing my ideas.

4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.

Aha!: This engaging game helps students build their number sense and provides opportunities for students to engage in mathematical practices, precise communication, problem solving, and quantitative reasoning.

> There are a group of problems called ***Aha* Problems**, that are believed to be the precursor to algebra. *Aha* in Ancient Egyptian means "something" or "a quantity." Whenever a problem called for an unknown, the Ancient Egyptians would simply call it "something" or *aha*. Take for instance example 40 from the Rhind Mathematical Papyrus.(*Cf.*, Wilson, p. 28.) Aahmes writes:
>
> *We want to divide 100 loaves between five men in the following way. The second man receives a certain amount more than the first. The third man receives an equal amount more than the second, and so on. Also one seventh of the sum of the three largest shares shall be equal to the sum of the smallest two shares. What is the difference between the shares?*
>
> The Ancient Egyptians figured out that one could call the unknowns "something," in this case, the unknowns being the *smallest share* and the *difference*.

To play Aha!: Each student is to identify clues to a number that only they know (each student randomly chooses their own number for others to guess using mathematical clues). The other students are to use the clues to guess the correct number.

Implementation:
Supplies: Aha! Game slip for each student, Aha! Game Tracker, pencil & paper, Weekly Group Folder

1. One student from the group should be assigned as the leader for the day. They will serve as the facilitator and time keeper. This should be pre-determined by the teacher prior to the RTI block and rotated daily.
2. The leader will make sure that each student receives an Aha! Game Slip and have a pencil.
3. The leader is to set the timer for 5 minutes. During this time, each student will think of a number (keeping it secret) and write down 3 - 5 clues to help the other students identify the Aha number.
4. Once 5 minutes have ended, the leader will determine who goes first and the following order for each student to share their clues.
5. The leader should set the timer each time for 2 minutes. When a student is up to share their clues. They should read each clue one at a time, allowing time for students to write down the clues.

Aha! Game Slip & Participation Tracker

Leader: _____ Date: _____

My Number:	My Clues: 1. 2. 3. 4. 5.

My Guess	Classmate Name & Clues: 1. 2. 3. 4. 5.

My Guess	Classmate Name & Clues: 1. 2. 3. 4. 5.

My Guess	Classmate Name & Clues: 1. 2. 3. 4. 5.

My Guess	Classmate Name & Clues: 1. 2. 3. 4. 5.

Aha! Game Tracker

Leader: _____ Date: _____

Instructions to Leader: Staple this form to today's Aha! Game Slips. Put the student's self-grade score in the box specified and then put the grade that you would give them along with any notes to the teacher. Remember: IT'S YOUR JOB TO MAINTAIN ORDER AND TO MAKE SURE LEARNING IS HAPPENING! Asante sana.

Student	Self-Grade	Leader's Grade	Notes for Teacher

Self-Grading Scale

1 - I did not put forth my best effort.

2 - I tried, but did not fully participate or work as hard as I know I can.

3 - I did really well, participated in the discussion by listening and sharing my ideas.

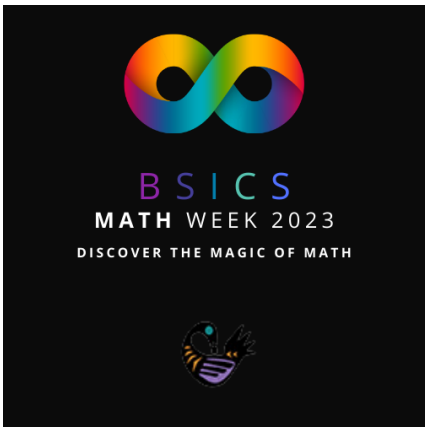
4 - I put forth my best effort, respectfully participated in the discussion by listening and sharing my ideas, wrote down all my thoughts and ideas, and was on my best behavior.

Groupings

Group A	Group B	Group C	Group D

BSICS STEM Fair and STEM Week

****This section should be adjusted and put into a new document each academic year.**



Walimu, Wanafunzi, Mzee, Babas, and Mamas of the BSICS Family:

Get ready to celebrate the magic of mathematics during BSICS STEM Week! This week-long event is a perfect opportunity to explore and discover the fascinating world of math in new and exciting ways. Whether you're a student, a teacher, or just a math enthusiast, there's something for everyone during STEM Week.

During BSICS STEM Week, you will have an opportunity to engage, learn, and discover by participating in the following activities:

Classroom Activities
Walimu will incorporate fun and engaging math activities into their daily lesson plans, such as math games, puzzles, and brain teasers. Encourage your wanafunzi to work together to solve math problems and explore different mathematical concepts.

Black Math Geniuses Learning Expeditions
There are plenty of opportunities to explore and discover math connections around Chicago. For example, at the Museum of Science and Industry, students can explore interactive exhibits on topics such as simple machines, physics, and engineering. At the Adler Planetarium, students can learn about the mathematics behind astronomy and space exploration. At the Art Institute of Chicago, students can explore the mathematics behind art and architecture, such as symmetry, proportion, and perspective. Walimu will schedule and design their respective field trips.

Celebrating Black Math Genius

Walimu will invite local STEM professionals to speak to wanafunzi about the magic of math and its applications in the real world. They will share their own experiences and inspire students to pursue their own interests in mathematics.

Movie Screenings

There are many movies that explore the beauty and power of mathematics. For example, "Hidden Figures" tells the story of three African American women who worked at NASA as human computers and contributed to the successful launch of John Glenn into orbit. This movie explores the applications of math and engineering in the space program, as well as the struggles of women and minorities in science and technology. "The Man Who Knew Infinity" is a biographical drama about the Indian mathematician Srinivasa Ramanujan, who made significant contributions to number theory and other areas of mathematics. This movie explores the creativity and intuition involved in mathematical research, as well as the cultural and social barriers that Ramanujan faced. "A Beautiful Mind" is a biographical drama about the mathematician John Nash, who made contributions to game theory and won the Nobel Prize in Economics. This movie explores the intersection of mathematics and psychology, as well as the challenges of living with mental illness.

Celebrating Black Genius in STEM:

https://mathematicallygiftedandblack.com/
https://www.skypeascientist.com/

BSICS STEM Fair

BSICS STEM Week will conclude with our own STEM fair. Students can work on projects and present their findings to the rest of the school, showcasing the creativity and innovation in mathematics.

By connecting STEM to field trips and movies, our village can see firsthand how mathematics is relevant and applicable to our lives. They can explore the ways that mathematics is used in different fields and industries, and develop a deeper appreciation for the power of this amazing subject. Join us as we celebrate the magic of math and discover the incredible potential of mathematics.

Welcome to the BSICS STEM Fair! This is a chance for students to showcase their mathematical skills and creativity. The fair will be divided into three grade bands: K-2, 3-5, and 6-8. Students will be judged based on a rubric that evaluates their project's creativity, innovation, mathematical skills, and Black contributions.

Introduction

Get ready to embark on a journey through the ages and discover the magic of math like never before at the 2023 BSICS STEM Fair! Join us as we explore the fascinating world of mathematics, from the contributions of ancient Black Egyptians to the cutting-edge technologies of the future.

At this year's fair, you'll get to discover and experience the *Magic of Math* through a range of exciting projects and activities. Learn about the geometry and algebra used by ancient Black Egyptians to build the pyramids and other architectural marvels, and see how their work continues to influence modern mathematics and engineering.

Discover the magic of probability and statistics, and how they help us to understand and predict the world around us. Explore the world of mathematical modeling and simulation, and see how they're used to solve real-world problems in fields such as finance, medicine, and environmental science.

You'll also get to experience the latest developments in math and technology, including artificial intelligence and cryptocurrency. Learn about the algorithms and data analysis techniques used in AI, and see how they're being used to transform fields like healthcare, transportation, and entertainment. Discover the mathematical principles behind cryptocurrencies like Bitcoin and Ethereum, and explore their potential to revolutionize the way we think about money and finance.

With so much to explore and discover, the 2023 BSICS STEM Fair promises to be an unforgettable experience for math enthusiasts of all ages. Come join us and discover the magic of math!

Objective

To create a mathematical project that investigates a problem or question and communicates findings effectively.

Step 1: Choose a topic

Choose a math topic that interests you and fits within the scope of the math fair. Make sure your topic is appropriate and relevant to your grade level and the math fair theme.

Step 2: Develop a problem or question

Develop a clear and concise problem or question that can be investigated through mathematical inquiry. Make sure your problem or question is specific and can be tested through data analysis or mathematical modeling.

Step 3: Collect data or develop a model

Collect data or develop a mathematical model to help answer your problem or question. Use appropriate tools and techniques to collect and organize your data. Develop a clear and concise mathematical model if needed.

Step 4: Analyze data or model

Organize your data or mathematical model in a clear and concise manner. Use graphs, charts, and tables to display your results. Analyze your data or mathematical model to draw conclusions about your problem or question.

Step 5: Communicate findings

Prepare a clear and well-organized display of your project. Use visuals and graphics to enhance your display. Prepare a summary of your problem or question, data analysis or model, results, and conclusions. Be prepared to present your project to judges and/or visitors.

General Guidelines

- ☐ Use mathematical inquiry to guide your project.
- ☐ Use reliable sources for research and background information.
- ☐ Follow all safety guidelines if applicable.
- ☐ Be creative and original in your project design and presentation.
- ☐ Use appropriate language and mathematical terminology.
- ☐ Include "Black Contributions" in your project by showcasing the contributions of people of African descent to mathematics.

- ☐ Consider "Future Implications" by discussing the potential real-world applications of your findings.

Rules

- Projects must be the student's original work.
- Projects must be submitted on time.
- Projects must be appropriate and respectful.

Math Activity Ideas for Math Week

Kindergarten:

1. Shape Hunt: Have students go on a shape hunt around the classroom or school, looking for different shapes (e.g., circles, squares, triangles) and counting how many of each they find.
2. Number Line Hopscotch: Create a number line on the floor and have students hop along it, calling out the numbers as they go.
3. Pattern Making: Use manipulatives (e.g., blocks, buttons, beads) to create simple patterns and have students continue the pattern.

First Grade:

1. Addition and Subtraction Bingo: Create bingo cards with addition and subtraction problems and have students solve the problems to get a bingo.
2. Measurement Scavenger Hunt: Have students go on a measurement scavenger hunt around the classroom or school, looking for things that can be measured (e.g., length, weight, volume) and recording their measurements.
3. Money Math: Use play money to teach students the value of different coins and bills and have them practice making different amounts.

Second Grade:

1. Math Word Problems: Create word problems related to everyday activities (e.g., going to the grocery store, making a recipe) and have students solve them.
2. Time Telling: Use analog clocks to teach students how to tell time and have them practice setting the clocks to different times.
3. Geometry Scavenger Hunt: Have students go on a geometry scavenger hunt around the school or community, looking for examples of different geometric shapes and angles.

Third Grade:

1. Multiplication Match-Up: Create cards with multiplication problems and their solutions and have students match them up.
2. Fractions: Use manipulatives to teach students about fractions and have them practice identifying and comparing fractions.
3. Math Art: Have students create art using different math concepts (e.g., patterns, symmetry, shapes) and present their creations to the class.

Fourth Grade:

1. Math Jeopardy: Create a Jeopardy game with math-related categories and questions.
2. Decimal and Place Value: Use manipulatives to teach students about decimals and place value and have them practice writing and comparing decimals.
3. Data Analysis: Have students collect and analyze data using graphs and charts and draw conclusions from the data.

Fifth Grade:

1. Math Scavenger Hunt: Create a scavenger hunt with math-related clues and challenges.
2. Fraction Pizza: Use paper or play dough to create "fraction pizzas" and have students practice adding and subtracting fractions.
3. Algebraic Expressions: Introduce algebraic expressions and have students practice writing and solving equations.

Sixth Grade:

1. Math Escape Room: Create an escape room where students have to solve math problems to unlock clues and escape.
2. Ratios and Proportions: Use manipulatives to teach students about ratios and proportions and have them practice solving problems.
3. Geometry Construction: Have students use a compass and straightedge to construct geometric shapes and angles.

Seventh Grade:

1. Real-Life Math: Use real-life scenarios (e.g., budgeting, calculating taxes) to teach students about mathematical applications in everyday life.
2. Probability: Have students practice calculating probabilities and use games and simulations to reinforce the concept.
3. Data Analysis: Have students collect and analyze data using spreadsheets and create graphs and charts to present their findings.

Eighth Grade:

1. Trigonometry: Introduce students to trigonometry and have them practice solving problems using sine, cosine, and tangent functions.
2. Algebraic Equations: Have students solve algebraic equations and use manipulatives to help them understand the concepts.
3. Geometry Construction: Have students use a compass and straightedge to construct geometric shapes and angles, and prove geometric theorems.

Additional Project Ideas

Project Ideas for K - 3rd Grade	Project Ideas for 4th - 5th Grade	Project Ideas for 6th - 8th Grade
Building pyramids with blocks	Investigating the Golden Ratio in art and nature	Learning about the math behind encryption and cybersecurity
Creating Egyptian hieroglyphic numbers	Exploring the mathematics of ancient calendars	Developing an understanding of AI and its applications
Creating and measuring tessellations	Investigating the mathematics of music	Creating mathematical models for analyzing stock market trends
Investigating simple machines with ratios	Exploring the math behind computer graphics	Learning about the mathematics of Bitcoin
Measuring and analyzing data with graphs	Investigating the math behind sports statistics	Building and programming robots using geometric and trigonometric principles
Exploring the mathematics of patterns	Investigating the geometry of origami	Developing mathematical models for predicting weather patterns

Project Ideas from ChatGPT

- Math and sports: Explore the role of math in sports, such as calculating statistics for baseball or basketball, analyzing game data to optimize player performance, or designing a workout plan based on math principles.
- The math of music: Investigate the mathematical principles behind music, such as the frequency of notes, the relationship between different musical notes, or the rhythm and time signatures in different types of music.

- The math of cooking: Use math to explore cooking and baking, such as converting recipe measurements, calculating cooking times and temperatures, or analyzing the nutritional content of different ingredients.
- The math of fashion: Investigate the role of math in fashion design, such as using geometry to create patterns and shapes, calculating fabric yardage and costs, or analyzing trends and sales data.
- The math of art: Explore the mathematical principles behind art, such as symmetry, patterns, and proportions, or use math to create your own art projects, such as tessellations or geometric designs.
- The math of finance: Investigate the world of finance and money management, such as calculating interest rates and compound interest, creating a budget, or analyzing stock market trends.
- The math of architecture: Use math to explore the world of architecture, such as designing and building structures using geometry and spatial reasoning, calculating materials and costs, or analyzing the acoustics and lighting of different spaces.
- The math of transportation: Investigate the role of math in transportation, such as calculating fuel efficiency and emissions, designing efficient traffic flow patterns, or analyzing the costs and benefits of different modes of transportation.
- The math of the environment: Explore the mathematical principles behind environmental issues, such as calculating carbon footprints, analyzing weather patterns and climate data, or designing sustainable energy systems.
- The math of video games: Investigate the mathematical principles behind video games, such as designing game levels using geometry and spatial reasoning, calculating probabilities and statistics, or analyzing player behavior and preferences.
- The math of coding: Use math to explore the world of coding and programming, such as designing algorithms, creating computer graphics using geometry and trigonometry, or analyzing data using statistics.
- The math of social media: Investigate the role of math in social media, such as analyzing user engagement and behavior using statistics, designing algorithms to personalize content, or calculating the reach and impact of social media campaigns.
- The math of space exploration: Use math to explore the world of space exploration, such as designing and navigating spacecraft using geometry and calculus, analyzing orbital trajectories and gravitational forces, or calculating the costs and benefits of space missions.
- The math of medicine: Investigate the role of math in medicine, such as analyzing medical data using statistics, designing and optimizing medical devices

using geometry and physics, or modeling disease spread using differential equations.

- The math of cryptography: Use math to explore the world of cryptography and encryption, such as designing and analyzing cryptographic algorithms using number theory and abstract algebra, or investigating the security and privacy of different encryption methods.
- The math of probability: Investigate the mathematical principles behind probability and randomness, such as analyzing game theory and decision-making, modeling complex systems using stochastic processes, or predicting the likelihood of future events based on historical data.

Learning Expedition: The Mathematics of Buildings and Engineering at Willis Tower

Willis Tower (formerly Sears Tower):

As one of the tallest buildings in the world, Willis Tower offers a unique opportunity for students to learn about the mathematics behind its design and construction. Take a trip to the Skydeck on the 103rd floor, where students can experience the building's height and learn about the engineering that makes it possible. Additionally, you can arrange for an educational presentation or guided tour focused on the math and engineering principles used in the building's design.

Duration:

2 hours

Objectives:

- Students will understand the role of mathematics in the design and construction of tall buildings, using Willis Tower as a case study.
- Students will learn about the engineering principles and challenges involved in constructing skyscrapers.
- Students will apply mathematical concepts, such as geometry, measurement, and ratios, to real-world examples.

Materials:

- Handout with facts and figures about Willis Tower
- Rulers or tape measures
- Graph paper
- Pencils
- Calculators (optional)

Introduction (15 minutes):

1. Begin by discussing what students already know about Willis Tower, including its height, history, and significance.
2. Introduce the concept of mathematics in building design and engineering, explaining the importance of math in constructing tall buildings like Willis Tower.

Activity 1: Exploring Willis Tower (30 minutes):

1. Distribute handouts with facts and figures about Willis Tower, including its height, the number of floors, the size of the foundation, and the materials used in its construction.

2. Discuss the key engineering challenges in constructing a building like Willis Tower, such as wind resistance, weight distribution, and the need for a strong foundation.
3. Explain the role of mathematics in addressing these challenges, emphasizing the use of geometry, measurement, and ratios to design and build the structure.

Activity 2: Scaling Willis Tower (30 minutes):

1. Divide students into small groups and provide each group with rulers or tape measures, graph paper, and pencils.
2. Explain that they will be creating a scale model of Willis Tower on their graph paper.
3. Help students determine an appropriate scale for their drawings, such as 1 inch = 100 feet or 1 centimeter = 30 meters.
4. Guide students as they measure and draw the various components of Willis Tower, including the base, the height, and the various structural elements, such as the steel beams and columns.

Activity 3: Calculating Load and Support (30 minutes):

1. Explain the concept of load-bearing structures and how engineers calculate the necessary support for tall buildings like Willis Tower.
2. Introduce the idea of a load-bearing ratio, which compares the weight of the building with the capacity of its support structures.
3. Provide students with sample calculations for Willis Tower, such as the weight of the building, the capacity of the steel beams, and the load-bearing ratio.
4. Encourage students to use calculators (if available) or paper and pencil to practice calculating load-bearing ratios for various hypothetical buildings.

Conclusion (15 minutes):

1. Review the key concepts learned during the lesson, including the role of mathematics in building design and engineering, the challenges of constructing tall buildings like Willis Tower, and the use of mathematical concepts such as geometry, measurement, and ratios.
2. Encourage students to think about other tall buildings they may have seen or heard about and how the mathematical concepts learned in this lesson might apply to those structures.
3. Ask students to reflect on the importance of math in real-world applications, emphasizing the need for a strong foundation in mathematical skills for careers in architecture, engineering, and other related fields.

Learning Expedition: Exploring Chicago Architecture: A Mathematical Perspective

Chicago Architecture Foundation River Cruise:

A river or walking cruise is an excellent way to explore the city's architecture from a unique vantage point. During the tour, students can learn about the mathematics behind the design of various buildings and bridges along the Chicago River. The knowledgeable guides will share information about the role of math in architectural design, including concepts such as symmetry, proportion, and structural engineering. You can also arrange for a private, customized tour that focuses specifically on math-related aspects of Chicago's architecture.

Duration:
2 hours

Objectives:

- Students will learn about the architectural history and styles of Chicago buildings.
- Students will recognize and understand the role of mathematics in architectural design.
- Students will apply mathematical concepts such as geometry, symmetry, and proportion to real-world examples of Chicago architecture.

Materials:

- Handout with facts and figures about selected Chicago buildings
- Clipboards or hard surfaces for writing
- Paper
- Pencils
- Cameras or smartphones for taking pictures (optional)

Introduction (15 minutes):

1. Begin by discussing Chicago's architectural history and the various styles of buildings that can be found throughout the city.
2. Introduce the concept of mathematics in architecture, emphasizing the importance of math in the design and construction of buildings.

Activity 1: Chicago Architecture Tour (60 minutes):

1. Organize a walking or boat tour of Chicago that highlights some of the city's most iconic buildings, such as the Willis Tower, Tribune Tower, Marina City, and the Wrigley Building.
2. Distribute handouts with facts and figures about the selected buildings, including their heights, architectural styles, and unique design features.
3. During the tour, encourage students to take note of the mathematical concepts they see in the various buildings, such as symmetry, proportion, and the use of geometric shapes.
4. If cameras or smartphones are available, encourage students to take pictures of the buildings to help them remember the architectural details.

Activity 2: Analyzing Architectural Features (30 minutes):

1. After the tour, divide students into small groups and provide them with clipboards or hard surfaces for writing, paper, and pencils.
2. Assign each group one of the buildings from the tour and have them discuss the mathematical concepts they observed in its design.
3. Have each group list the specific design features that illustrate these concepts, such as the use of triangles in the structural support of a building or the symmetry of a building's façade.
4. Encourage students to sketch the architectural features they observed, focusing on the mathematical elements.

Conclusion (15 minutes):

1. Bring the class together and have each group share their observations and sketches, discussing the mathematical concepts they identified in the architecture.
2. Review the key concepts learned during the lesson, including the role of mathematics in architectural design and the application of mathematical concepts such as geometry, symmetry, and proportion in real-world examples.
3. Encourage students to think about other buildings they may have seen or heard about and how the mathematical concepts learned in this lesson might apply to those structures.
4. Ask students to reflect on the importance of math in real-world applications, emphasizing the need for a strong foundation in mathematical skills for careers in architecture, engineering, and other related fields.

Suggested Walking Tour Route:

Building Name	Distance to Next Building	Walking Time
Monadnock Building	0.2 miles (0.32 km)	4 min
Marquette Building	0.1 miles (0.16 km)	3 min
Chase Tower	0.5 miles (0.80 km)	11 min
The Carbide and Carbon Building	0.1 miles (0.16 km)	3 min
Tribune Tower	0.1 miles (0.16 km)	2 min
Wrigley Building	0.1 miles (0.16 km)	2 min
333 North Michigan	0.4 miles (0.64 km)	8 min

Learning Expedition: Exploring Mathematics in Art at the Art Institute of Chicago

The Art Institute of Chicago:

The "Exploring Mathematics in Art at the Art Institute of Chicago" field trip aims to engage elementary students in understanding the connections between mathematics and art. Through a guided or self-guided tour of the museum, students observe and analyze various artworks that incorporate mathematical concepts such as geometry, patterns, and symmetry. Examples of featured artworks include those by Grant Wood, Georges Seurat, Piet Mondrian, M.C. Escher, and Bridget Riley. After the tour, students work in groups to discuss the mathematical concepts observed in assigned artworks and create sketches highlighting these aspects. The lesson concludes with each group sharing their findings, fostering a deeper appreciation for the interdisciplinary nature of mathematics and its relevance in fields like art.

Duration:

2 hours

Objectives:

- Students will explore the connections between mathematics and art.
- Students will identify and analyze mathematical concepts in various artworks at the Art Institute of Chicago.
- Students will apply mathematical concepts, such as geometry, patterns, and symmetry, to their observations of art.

Materials:

- Handout with information about selected artworks at the Art Institute of Chicago
- Clipboards or hard surfaces for writing
- Paper
- Pencils
- Cameras or smartphones for taking pictures (optional)

Introduction (15 minutes):

1. Begin by discussing the connections between mathematics and art, including the use of mathematical concepts in various forms of art throughout history.
2. Introduce the idea that the Art Institute of Chicago houses numerous artworks that incorporate mathematical concepts, such as geometry, patterns, and symmetry.

Activity 1: Art Institute of Chicago Tour (60 minutes):

1. Organize a guided tour of the Art Institute of Chicago, focusing on artworks that showcase mathematical concepts. Alternatively, you could create a self-guided tour using a handout with information about selected artworks.
2. During the tour, encourage students to observe and analyze the mathematical concepts found in the artworks, such as geometric shapes, patterns, and symmetry.
3. If cameras or smartphones are available, encourage students to take pictures of the artworks to help them remember the mathematical connections.

Examples of artworks to include in the tour:

- Grant Wood's "Daughters of Revolution" (patterns and symmetry)
- Georges Seurat's "A Sunday on La Grande Jette" (pointillism and geometry)
- Piet Mondrian's "Composition with Red, Blue, and Yellow" (geometry and proportion)
- M.C. Escher's "Ascending and Descending" (optical illusions and tessellations)
- Bridget Riley's "Fall" (Op Art and geometric patterns)

Examples of artworks by Black artists to include in the tour:

1. Jacob Lawrence (1917-2000): An African American painter known for his narrative style and use of bold colors, Lawrence often depicted scenes from African American history and culture. His artworks often feature geometric shapes and patterns that can be analyzed from a mathematical perspective. *Example artwork: "The Builders" series*
2. Faith Ringgold (b. 1930): A prominent African American artist, Ringgold is known for her narrative quilts, which combine painting, quilted fabric, and storytelling. Her quilt designs often involve mathematical concepts, such as patterns, symmetry, and geometric shapes. *Example artwork: "Tar Beach" (part of the "Woman on a Bridge" series)*
3. Alma Thomas (1891-1978): As an African American abstract painter, Thomas was known for her use of vibrant colors and geometric patterns. Her paintings often feature repetitive shapes and patterns that can be analyzed through a mathematical lens. *Example artwork: "Sky Light" or "Mars Dust"*
4. Sam Gilliam (b. 1933): An African American abstract artist, Gilliam is known for his color field paintings and draped canvases. His artworks often involve mathematical concepts in the form of geometric shapes, patterns, and the use of color theory. *Example artwork: "Carousel Form II"*

Activity 2: Analyzing Mathematical Concepts in Art (30 minutes):

1. After the tour, divide students into small groups and provide them with clipboards or hard surfaces for writing, paper, and pencils.
2. Assign each group one of the artworks from the tour and have them discuss the mathematical concepts they observed in the piece.
3. Have each group list the specific elements of the artwork that illustrate these concepts, such as the use of geometric shapes, patterns, or symmetry.
4. Encourage students to sketch the elements they observed, focusing on the mathematical aspects.

Conclusion (15 minutes):

1. Bring the class together and have each group share their observations and sketches, discussing the mathematical concepts they identified in the artworks.
2. Review the key concepts learned during the lesson, including the connections between mathematics and art and the application of mathematical concepts in various forms of art.

3. Encourage students to think about other artworks or artistic styles they may have seen or heard about and how the mathematical concepts learned in this lesson might apply to those examples.
4. Ask students to reflect on the importance of math in real-world applications, emphasizing the interdisciplinary nature of mathematics and its relevance in various fields, including art.

Learning Expedition: Mathematics in Science and Innovation at the Museum of Science and Industry

The Museum of Science and Industry:
The "Mathematics in Science and Innovation at the Museum of Science and Industry" field trip engages elementary students in understanding the connections between mathematics, science, and technology. By visiting exhibits that demonstrate the application of mathematical concepts in various scientific fields and innovations, students learn the importance of math in the development of these fields. The tour includes exhibits like Science Storms, The Great Train Story, Numbers in Nature: A Mirror Maze, and the seasonal Black Creativity: Innovation Studio, which highlights the achievements and contributions of Black scientists, inventors, and engineers. After the tour, students work in groups to discuss the mathematical concepts observed in assigned exhibits and their application in scientific innovations. The lesson concludes with each group sharing their findings, promoting an appreciation for the interdisciplinary nature of mathematics and its relevance in science and technology.

Duration:
2 hours

Objectives:
- Students will explore the connections between mathematics, science, and technology at the Museum of Science and Industry.
- Students will understand the importance of mathematical concepts in various scientific fields and innovations.
- Students will recognize and appreciate the contributions of Black individuals in science and technology.

Materials:
- Handout with information about selected exhibits at the Museum of Science and Industry
- Clipboards or hard surfaces for writing
- Paper
- Pencils
- Cameras or smartphones for taking pictures (optional)

Introduction (15 minutes):
1. Begin by discussing the connections between mathematics, science, and technology, emphasizing the importance of math in various scientific fields and innovations.
2. Introduce the idea that the Museum of Science and Industry features exhibits showcasing the application of mathematical concepts in science and technology, including exhibits highlighting contributions by Black individuals.

Activity 1: Museum of Science and Industry Tour (60 minutes):
1. Organize a guided tour of the Museum of Science and Industry, focusing on exhibits that demonstrate the application of mathematical concepts in science and technology.

2. During the tour, encourage students to observe and analyze the mathematical concepts found in the exhibits and to recognize the importance of math in the development of various innovations and scientific fields.
3. If cameras or smartphones are available, encourage students to take pictures of the exhibits to help them remember the mathematical connections.

Examples of exhibits to include in the tour:

- Science Storms: Explore mathematical concepts related to physics and natural phenomena, such as patterns and geometric shapes in fluid dynamics and fractals in weather patterns.
- The Great Train Story: Examine mathematical principles used in transportation, such as scale and ratio in model railroads, and time-distance calculations in real-life train schedules.
- Numbers in Nature: A Mirror Maze: Discover the role of mathematics in understanding patterns and symmetry found in the natural world.
- Black Creativity: Innovation Studio (seasonal exhibit): Learn about the achievements and contributions of Black scientists, inventors, and engineers, and explore the mathematical concepts involved in their work.

Activity 2: Reflecting on Mathematical Concepts in Science (30 minutes):

1. After the tour, divide students into small groups and provide them with clipboards or hard surfaces for writing, paper, and pencils.
2. Assign each group one of the exhibits from the tour and have them discuss the mathematical concepts they observed in the exhibit and how these concepts were applied in the development of scientific innovations.
3. Have each group list the specific elements of the exhibit that illustrate these concepts and describe the importance of math in the development of the innovation or scientific field.

Conclusion (15 minutes):

1. Bring the class together and have each group share their observations and findings, discussing the mathematical concepts they identified in the exhibits and their importance in scientific innovations.
2. Review the key concepts learned during the lesson, including the connections between mathematics, science, and technology, and the contributions of Black individuals in these fields.
3. Encourage students to think about other areas of science, technology, or engineering they may have seen or heard about and how the mathematical concepts learned in this lesson might apply to those examples.
4. Ask students to reflect on the importance of math in real-world applications, emphasizing the interdisciplinary nature of mathematics and its relevance in various fields, including science and technology.

Scoring Rubric

Criteria	1 (poor)	2 (fair)	3 (good)	4 (excellent)	Score
Mathematical Understanding	The project shows a poor understanding of the mathematical concepts involved.	The project demonstrates some understanding of the mathematical concepts involved.	The project shows a good understanding of the mathematical concepts involved and presents them clearly.	The project demonstrates an excellent understanding of the mathematical concepts involved and presents them clearly, accurately, and creatively.	
Presentation	The project is poorly presented, with many errors and omissions.	The project is presented adequately, but with some errors or omissions.	The project is presented well, with a clear structure and good use of visuals.	The project is presented in an outstanding way, with a clear structure, excellent use of visuals, and exceptional organization.	
Originality	The project lacks originality and does not show much creativity or innovation.	The project shows some originality and creativity, but there is room for improvement.	The project shows good originality and creativity, with some unique ideas or approaches.	The project shows excellent originality and creativity, with many unique and innovative ideas or approaches.	
Black Contributions	The project does not mention or acknowledge any contributions by people of African descent to mathematics.	The project briefly mentions some contributions by people of African descent to mathematics.	The project acknowledges several contributions by people of African descent to mathematics.	The project acknowledges numerous contributions by people of African descent to mathematics, and presents them in a clear, accurate, detailed, and creative manner.	
Future Implications	The project does not discuss any potential future implications of the mathematical concepts or topics presented.	The project briefly mentions some potential future implications of the mathematical concepts or topics presented.	The project discusses several potential future implications of the mathematical concepts or topics presented.	The project very clearly discusses numerous potential future implications of the mathematical concepts or topics presented..	
Overall Impression	The project does not leave a positive impression.	The project leaves a somewhat positive impression.	The project leaves a positive impression on the judges.	The judges were blown away by the project.	

Celebrating Black Math Genius During Math Week

During BSICS Math Week, we want to inspire and motivate all of our students to see the magic in mathematics and its applications in the real world. We recognize the importance of representation and diversity in STEM fields and want to highlight the contributions of Black professionals in these industries. One way we plan to do this is by inviting Black STEM professionals to speak to our students about their own experiences and the ways in which math plays a role in their work and industries. Through their experiences, we hope to inspire our Black students to pursue their own interests in math and STEM fields and to see the possibilities that await them in the future.

Suggested List of Professionals to Invite:

1. Mathematicians and Statisticians, Engineers (e.g., Civil Engineers, Mechanical Engineers, Electrical Engineers)
2. Computer Scientists and Programmers
3. Financial Analysts and Investment Bankers
4. Architects and Urban Planners
5. Data Scientists and Analysts
6. Epidemiologists and Public Health Officials, Physicists and Astronomer

Questions to Ask Guest Speakers:

1. How did you become interested in math? What inspired you to pursue a career in this field?
2. Can you share a project or problem you have worked on that involved math? What were some of the challenges you faced and how did you overcome them?
3. In what ways does math play a role in your work or industry? How has it helped you to solve problems or make decisions?
4. How do you see math evolving in the future and what new opportunities do you think will emerge?
5. What advice would you give to students who are interested in pursuing a career in math or STEM fields?

Other Resources:

https://mathematicallygiftedandblack.com/
https://www.skypeascientist.com/

Movie Selections for BSICS STEM Week

1. "The Banker"

   This movie is based on the true story of two African-American entrepreneurs in the 1960s who hire a working-class white man to act as the head of their business empire while they pose as a janitor and chauffeur. They use their knowledge of mathematics and finance to successfully navigate the racial prejudices of the era and become some of the wealthiest men in the country.

   Discussion Topics:

   a. How did the protagonists use their knowledge of mathematics to overcome systemic racism and discrimination?
   b. What does this movie teach us about the history of Black entrepreneurship in the United States?
   c. How can we use math and finance to create social change and address economic inequalities faced by Black communities?
   d. What lessons can we learn from the strategies used by the protagonists to build and grow their business empire?
   e. In what ways do math and finance intersect with issues of race and inequality in modern society?

2. "See you Yesterday"

   This science fiction movie follows two teenage prodigies who create a time machine in order to prevent a police shooting that killed one of their brothers. As they travel back and forth through time, they use their knowledge of mathematics and physics to make sure their actions don't have unintended consequences.

   Discussion Topics:

   a. How did the protagonists use their understanding of physics and math to design and build their time machine?
   b. What do the characters' experiences with police violence and systemic racism reveal about the Black experience in America?
   c. What ethical considerations should we take into account when using science and technology to address social justice issues?
   d. How can we use math and science to prevent and respond to instances of police violence?

e. In what ways do science and math intersect with issues of race and inequality in modern society?

3. "The Man who Knew Infinity"

   This biographical drama tells the story of Srinivasa Ramanujan, a self-taught Indian mathematician who travels to Cambridge University during World War I to work with British mathematician G.H. Hardy. Despite facing racism and prejudice, Ramanujan makes significant contributions to the field of mathematics, including groundbreaking work on prime numbers and partition functions.

   Discussion Topics:

   a. How did Srinivasa Ramanujan's background and culture shape his approach to mathematics?
   b. What challenges did Ramanujan face due to racism and colonialism in his pursuit of mathematical knowledge?
   c. What can we learn from Ramanujan's persistence and perseverance in the face of adversity?
   d. How can we use math education to empower and uplift underrepresented groups in STEM fields, including Black students?
   e. In what ways do math and science intersect with issues of race and inequality in modern society?

4. The Boy Who Harnessed the Wind

   This drama is based on the true story of William Kamkwamba, a Malawian teenager who builds a windmill to provide electricity for his family and village during a drought. Kamkwamba uses his knowledge of physics and engineering to design and construct the windmill, which he learns about from a library book.

   Discussion Topics:

   a. How did William Kamkwamba's understanding of physics and engineering help him address the challenges facing his community during a drought?
   b. What does this movie teach us about the importance of education and access to knowledge in overcoming poverty and environmental challenges?
   c. What other examples of sustainable technologies could be used to address the needs of rural communities in developing countries?

d. How can we use STEM education to empower Black students to make positive changes in their communities?
e. In what ways do STEM fields intersect with issues of race and inequality in modern society?

Incorporating BSICS STEM Week and STEM Fair into Your Lessons

Greetings Literacy and Social Studies Walimu,

As we approach BSICS STEM Week and STEM Fair, we would like to encourage you to integrate these events into your lesson plans for the week. By doing so, we can help our students understand the importance of math and its applications in the world around them.

Here are some suggested activities and discussion topics:

- Have students read stories that involve math concepts, such as "The Very Hungry Caterpillar" and "One Grain of Rice."
- Have students create their own math stories or write about how they use math in their daily lives.
- Read books or articles that highlight the role of math in history, such as "The Man Who Knew Infinity" or "Hidden Figures." Please see the movie selection for Math Week.
- Have students research the history of math in different cultures, such as ancient Egypt, the Dogon people of Mali, The Ahmes Papyrus, etc.
- Conduct a debate on the topic of math education and whether it should focus more on real-world applications or abstract concepts.
- Have students read articles on topics such as game theory, probability, or data analysis.
- Conduct a mock trial where students use math and statistics to make arguments and present evidence.
- Have students research and present on the role of math in fields such as finance, engineering, or computer science.

During the STEM Fair, encourage students to participate in activities that highlight the different ways math can be applied, such as games, puzzles, and experiments. This will help them see the practical applications of math beyond the classroom.

We hope that you will find these ideas helpful and that you will join us in celebrating the beauty and importance of math during BSICS STEM Week and STEM Fair. If you have any questions, please see Mama Assata or Mama Soyini.

Sincerely,
The STEM Team

Math Fair & Week Planning Checklist

- ☐ Finalize doc
- ☐ Review Week/Fair Dates
- ☐ Submit plan to principals for approval to NLT Monday
- ☐ Identify movie showings
- ☐ Organize field trips
    - ☐ https://www.explorableplaces.com/blog/five-fantastic-chicago-math-field-trips
- ☐ Organize Math Fair
- ☐ Identify planning times
- ☐ Identify who is responsible for what and put DEADLINES on this doc.

Notes:

- At least a month out from Fair checklist
- Work with Science Department to make STEM fair
- Budget
- How to choose project ideas
    - Arbitrarilyclose.com
- Want engaging, STEM
- Cross campus and cross curricular
- Introduce Math Fair after Spring Break April 17th - Give to parents at PTC on the 19th
- Week of May 15th - Math Week; May 19 Math Fair
    - Monday [kickoff]
        - Goals: organized, staggered times, theme rooms,
        - Morning Math Parade (art/dance) - Mama Karla, Baba Kwaw,art, and dance teachers
            - Music: number/multiplication rap songs outside
            - Mos Def-Mathematics
        - Principals to introduce week on service - Principals
        - Provide a plan to teachers
            - ELA
            - Math - stations, real world applications,
            - Science
            - History
        - Rotate by room; parent involvement to help, rooms are themed
    - Tuesday
        - Field trip day; create field trip packet - half the school

- Wednesday
  - Movie day at school; different movies in different rooms; popcorn and discuss math
  - "The Banker"
  - "See you Yesterday"
  - "The Man who Knew Infinity"
  - The Boy Who Harnessed the Wind
- Thursday
  - Field trip day; other half of school
- Friday
  - After lunch
  - Presentations (Science Fair Style)

BSICS Math Department Checklists

New Teacher Checklists

- ☐ Paperwork: HR
- ☐ Keys (Sign off)
- ☐ Get classroom assignment
- ☐ Pick-up Technology
- ☐ Set up technology accounts:
    - ☐ Email
    - ☐ Clever
    - ☐ PowerSchool
    - ☐ Kickboard
    - ☐ Class Tag
    - ☐ Department Specific
- ☐ Familiarize yourself with policies and procedures - handbooks
- ☐ New Teacher Orientation sessions:
    - ☐ Learn about the school's mission, values, and goals.
    - ☐ Gain insight into the school's culture, expectations, and support systems.
- ☐ Tour the school
- ☐ Meet colleagues and administrators
- ☐ Set up your classroom: Accessible for you and your students
    - ☐ Arrange your classroom
    - ☐ Bulletin boards
    - ☐ Instructional materials.
    - ☐ Purchase new materials as needed (contact coach)
- ☐ Review student records:
    - ☐ IEPs
    - ☐ 504 plans, health information,
    - ☐ Any special considerations or accommodations required for students
- ☐ Establish communication channels
    - ☐ Teachers
    - ☐ Parents
    - ☐ Students

Math Department Checklist

- ☐ Set up Technology:
    - ☐ Illustrative Math
    - ☐ I-Ready
    - ☐ Formative Loop
  - ☐ Inventory Checklist
    - ☐ Books
    - ☐ Manipulatives
- ☐ Establish routines and procedures:
  - ☐ Procedures for attendance
  - ☐ Transitions
  - ☐ Behavior Management
  - ☐ Classroom logistics.
  - ☐ Clear Expectations
  - ☐ Homework
- ☐ Familiarize yourself with the math curriculum:
  - ☐ Review the math curriculum documents, textbooks, and resources provided by the school.
  - ☐ Understand:
    - ☐ Scope and Sequence
    - ☐ Standards
    - ☐ Learning objectives for each grade level or course you will be teaching.
- ☐ Explore instructional resources:
  - ☐ Textbooks
  - ☐ Online platforms
  - ☐ Manipulatives
  - ☐ Technology tools
- ☐ Assess prior knowledge:
  - ☐ Understand the math skills and knowledge students are expected to have at the beginning of the school year.
  - ☐ Review assessment data from previous years, if available, to identify any common areas of strengths or weaknesses.
- ☐ Plan lessons and units specified by math coaches
- ☐ Differentiate instruction:
  - ☐ Identify strategies for differentiating math instruction to meet the diverse needs of your students.
  - ☐ Plan activities and assessments that offer varying levels of challenge and support for different learners.

- ☐ Create a math-rich environment:
  - ☐ Display math anchor charts
  - ☐ Display problem-solving strategies,
  - ☐ Display math vocabulary/ Word Wall
  - ☐ Display and student work.
  - ☐ Display data Wall
  - ☐ Read and sign Math Department Handbook
- ☐ Attend New Teacher & Pre-Service Annual Professional Development
- ☐ Collaborate with colleagues

Discourse Checklist

Figure 8.4 Think, Pair, Share Checklist

Students know . . .	✓
Who their learning partner will be before they start.	
Exactly what the thinking prompt is to which they are responding.	
How much time they will have to write their response.	
That they are to use all the time they are given to think and write about their response.	
The outcome they need to produce for the class (a written product, a comment to share with the class, thumbs up, and so forth) at the end of the conversation.	
How they should communicate with each other (in particular, how they should listen and talk).	

HOW TO GET THE MOST OUT OF WATCHING YOUR VIDEO

Goal

Identify two sections of the video that you like and one or two sections of video you'd like to further explore.

Getting Ready

Watching yourself on video is one of the most powerful strategies professionals can use to improve. However, it can be a challenge. It takes a little time to get used to seeing yourself on screen, so be prepared for a bit of a shock. After a little time, you will become more comfortable with the process.

- Find a place to watch where you won't be distracted.
- Review the Watch Yourself and Watch Your Student forms to remind yourself of things to keep in mind while watching.
- Set aside a block of time so you can watch the video uninterrupted.
- Make sure you've got a pen and paper ready to take notes.

Watching the Video

- Plan to watch the entire video at one sitting.
- Take notes on anything that catches your attention.
- Be certain to write the time from the video beside any note you make so that you can return to it should you wish to.
- People have a tendency to be too hard on themselves, so be sure to also watch for things you like.
- After watching the video, review your notes and circle the items you will discuss with your coach (two you like, and one or two you would like to explore further).
- Sit back, relax, and enjoy the experience.

WATCH YOUR STUDENTS

Date: _____

After watching the video of today's class, please rate how close the behavior of your students is to your goal for an ideal class in the following areas:

	NOT CLOSE						RIGHT ON
Students were engaged in learning (at least 90% engagement is recommended).	1	2	3	4	5	6	7
Students interacted respectfully.	1	2	3	4	5	6	7
Students talked about learning an appropriate amount of time.	1	2	3	4	5	6	7
Students rarely interrupted each other.	1	2	3	4	5	6	7
Students engaged in high-level conversation.	1	2	3	4	5	6	7
Students clearly understand how well they are progressing (or not).	1	2	3	4	5	6	7
Students are interested in learning activities in the class.	1	2	3	4	5	6	7

Comments:

WATCH YOURSELF

Date: _____

After watching the video of today's class, please rate how close your instruction is to your ideal in the following areas:

	NOT CLOSE						RIGHT ON
My praise to correction ratio is at least a 3-to-1 ratio.	1	2	3	4	5	6	7
I clearly explained expectations prior to each activity.	1	2	3	4	5	6	7
My corrections are calm, consistent, immediate, and planned in advance.	1	2	3	4	5	6	7
There was very little wasted time during the lesson.	1	2	3	4	5	6	7
My questions are appropriate for the learning occurring.	1	2	3	4	5	6	7
My learning structures (stories, cooperative learning, thinking devices, experiential learning) were effective.	1	2	3	4	5	6	7
I used a variety of learning structures effectively.	1	2	3	4	5	6	7
I clearly understand what my students know and don't know.	1	2	3	4	5	6	7

Comments:

Coaching Checklists - Optional Forms to Use

IMPACT CYCLE

Identify:	✓
Teacher gets a clear picture of current reality by watching a video of their lesson or by reviewing observation data, student interviews, or student work.	○
Coach asks the identify questions with the teacher to identify a goal.	○
Teacher identifies a student-focused goal.	○
Teacher identifies a teaching strategy to use to hit the goal.	○

Learn:	✓
Coach shares a checklist for the chosen teaching strategy.	○
Coach prompts the teacher to modify the practice if the teacher wishes.	○
Teacher chooses an approach to modeling that they would like to observe and identifies a time to watch modeling.	○
Coach provides modeling in one or more formats.	○
Teacher sets a time to implement the practice.	○

Improve:	✓
Teacher implements the practice.	○
Data is gathered (by teacher or coach in class or while viewing video) on student progress toward to the goal.	○
Data is gathered (by teacher or coach in class or while viewing video) on teacher's implementation of the practice (usually on the previously viewed checklist).	○
Coach and teacher meet to confirm direction and monitor progress.	○
Coach and teacher make adaptations and plan next actions until the goal is met.	○

20-MINUTE HIGH-IMPACT SURVEY

COMMUNITY BUILDING

Time on Task

MINUTES	STUDENTS	ON TASK	% ON TASK
:10			
:20			

Ratio of Interactions

REINFORCING	CORRECTING

Expectations

CLEARLY POSTED OR STATED

☐ **YES** ☐ **NO**

Respect

SHOWN TOWARD TEACHER AND OTHER STUDENTS

☐ **YES** ☐ **NO**

INSTRUCTION

Check which of the following teaching practices were present and record the number of minutes for each:

CHECK	PRACTICE/ ACTIVITY	MINUTES	CHECK	PRACTICE/ ACTIVITY	MINUTES
	Beginning routine			Transition time	
	Stories			Quizzes	
	Thinking prompts				
	Cooperative learning				
	Experiential learning				
	Labs				
	Seat work				
	Direct instruction				

Kinds of Questions

OPEN	CLOSED

Levels of Questions

KNOWLEDGE	SKILL	BIG IDEA

PLANNING, ASSESSMENT, LEARNING

	YES	NO
Teacher clearly states learning target for the lesson		
Teacher clearly describes success criteria for the student learning		
Teacher gathers data showing whether or not students are learning		
Teacher modifies teaching or learning to improve student achievement based on data gathered		

Assessment for Learning

- ❑ The teacher clearly describes the lesson's learning target.
- ❑ The teacher effectively checks for understanding.
- ❑ The teacher can precisely describe how well all students are learning.
- ❑ Students can precisely describe how well they are learning.

Comments:

Community Building

- ❑ Time on task: _____ percent
- ❑ Opportunities to respond: _____/minute
- ❑ Ratio of interactions: Reinforcing _____: _____ Corrective
- ❑ Disruptions: _____/minute
- ❑ Expectations posted: Yes _____ No _____

Comments:

Content Planning

- ❑ Instruction is aligned with state standards.
- ❑ The day's lesson is shaped by guiding questions.
- ❑ The teacher and students refer to a learning map for the unit's content.
- ❑ Percentage of students who have the learning map out when class starts: _____ percent.
- ❑ The learning map and guiding questions are used to provide an advance organizer for the day's lesson.
- ❑ A review of the critical content and student thinking occurs at the end of the class.

Comments:

BSICS Math Inventory Form

Teacher's Name_____

Item #	Item Description	Location/ Room	Quantity

Teacher Signature: _____ Date:_____

Operations Signature:_____ Date:_____

Additional Readings and Strategies

- THE FIVE STRANDS OF MATHEMATICAL PROFICIENCY | Adding It Up: Helping Children Learn Mathematics
- **Equity-Based Mathematics Teaching Practices**

  The 2013 book The Impact of Identity in K-8 Mathematics Teaching: Rethinking Equity-Based Practices by Julia Aguirre, Karen Mayfield-Ingram, and Danny Bernard Martin, focuses on teacher reflection and practice in the context of student learning and the development of students' mathematical identities. Part 1 of the book focuses on learning and identities, Part 2 describes five equity-based instructional practices, and Part 3 focuses on engaging families and communities as partners in learning and identity development. The five practices described below have many similarities with NCTM's eight effective mathematics teaching practices, but some key differences that make them equally worthy of being used to frame what good mathematics instruction should look like.

  The five Equity-Based Mathematics Teaching Practices come from The Impact of Identity in K-8 Mathematics Teaching: Rethinking Equity-Based Practices (2013) by Julia Aguirre, Karen Mayfield-Ingram, and Danny Bernard Martin.

  - Going deep with mathematics
  - Leveraging multiple mathematical competencies
  - Affirming mathematics learners' identities
  - Challenging spaces of marginality
  - Drawing on multiple resources of knowledge
- **5 Practices for Orchestrating Productive Mathematics Discussions**

  Based on the book by Margaret Smith and Mary Kay Stein

  Facilitating productive discussions about mathematics is very challenging for any teacher. Some lessons can end effectively with a "share and summarize." At other times, though, a more purposeful discussion is needed to bring out the key mathematics of a lesson.

A key component of productive discussion is teacher facilitation. This facilitation is not accidental and cannot, generally, happen on the fly.

Here are 5 concrete steps that can help improve the quality of mathematics discussion in your class.

- 1. *Anticipating likely student responses to mathematical tasks.*

  Involves envisioning potential student responses, strategies (correct or incorrect), representations, procedures, and interpretations.

- 2. *Monitoring students' actual responses to the tasks.*

  Involves paying close attention to students' mathematical thinking as they work on a problem. Commonly done by circulating around the classroom during group work.

- 3. *Selecting student response to feature during the discussions.*

  Involves choosing particular students to present their work because of the mathematical responses. These responses need not be chosen solely because they are correct, but rather because they emphasize different approaches to the problem. In fact, it may be advantageous to choose incorrect responses to highlight how and why they are incorrect. This choice can highlight a variety of responses or strategies for a task, or it can show a progression from simple to complex representation. Make sure over time that all students feel they are authors of mathematical ideas.

- 4. *Sequencing student responses during the discussions.*

  Involves purposeful ordering of the featured student responses in order to make the mathematics accessible to all students. This also helps build a mathematically coherent story line during whole class discussion.

- 5. *Connecting student responses during the discussions.*

  Involves encouraging students to make mathematical connections between different student responses. This helps ensure that key mathematical ideas remain the focus of the lesson debrief.

The 5 Practices for Orchestrating Mathematical Discourse were adapted from the Japanese model of Teaching Through Problem-Solving.

- **Teaching Through Problem Solving:** Teaching Through Problem-solving
- **14 Building Thinking Classrooms Practices (Liljedahl, 2020):** 14 Practices
- Focus on Teaching, Using Video for High-Impact Instruction (Jim Knight, 2014)
- High Impact Instruction (Jim Knight, 2012)

Closing

The Mathematics Handbook of Betty Shabazz International Charter School serves as a testament to our unwavering commitment to excellence in mathematics education. It is a comprehensive resource that empowers students, educators, and enthusiasts with the knowledge, skills, and strategies needed to navigate the intricate realm of mathematics. As we embark on this mathematical journey together, let us embrace the opportunities it presents, celebrate the beauty of mathematical exploration, and unlock the limitless potential within ourselves. May this handbook be a guiding light, illuminating the path to mathematical understanding, critical thinking, and a lifelong love for the remarkable world of mathematics.

If you have any questions or need additional support, please contact your coach and/or principal.

Mathematics Department, Betty Shabazz International Charter School