Atlantic City Public Schools

Mathematics

Curriculum Guide

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ACKNOWLEDGEMENTS

This curriculum guide was created and assembled by the mathematics PLC (professional learning community) representing the administrators and teachers of the Atlantic City Public Schools. Below are the names and affiliations.

We wish to express our thanks to all who have helped and for the excellent work they have done in producing a guide that represents the current pedagogy within the teaching of mathematics, as it relates to the needs of the teachers and students in the Atlantic City Public School System.

A final word of thanks to the Atlantic City Board of Education for the continued support and assistance that they provide to us, as we strive to improve our educational practices.

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Mathematics Philosophy of Curriculum

In order for students to understand and use mathematics with confidence, the Atlantic City Public School Mathematics Philosophy of Curriculum embraces daily opportunities for students to actively engage and participate in meaningful mathematical learning experiences through inquiry, problem solving and making connections to the world around them. As a result, students will develop the habits of mind that expand their ability to problem solve, reason critically, construct and defend viable arguments and communicate their thought processes. Strategic access to and use of learning tools and technology provide supports for students to meet the rigor of the curriculum while developing mathematical language, conceptual understanding and procedural fluency. Students will leave Atlantic City Public Schools capable of functioning and contributing to today's global society.

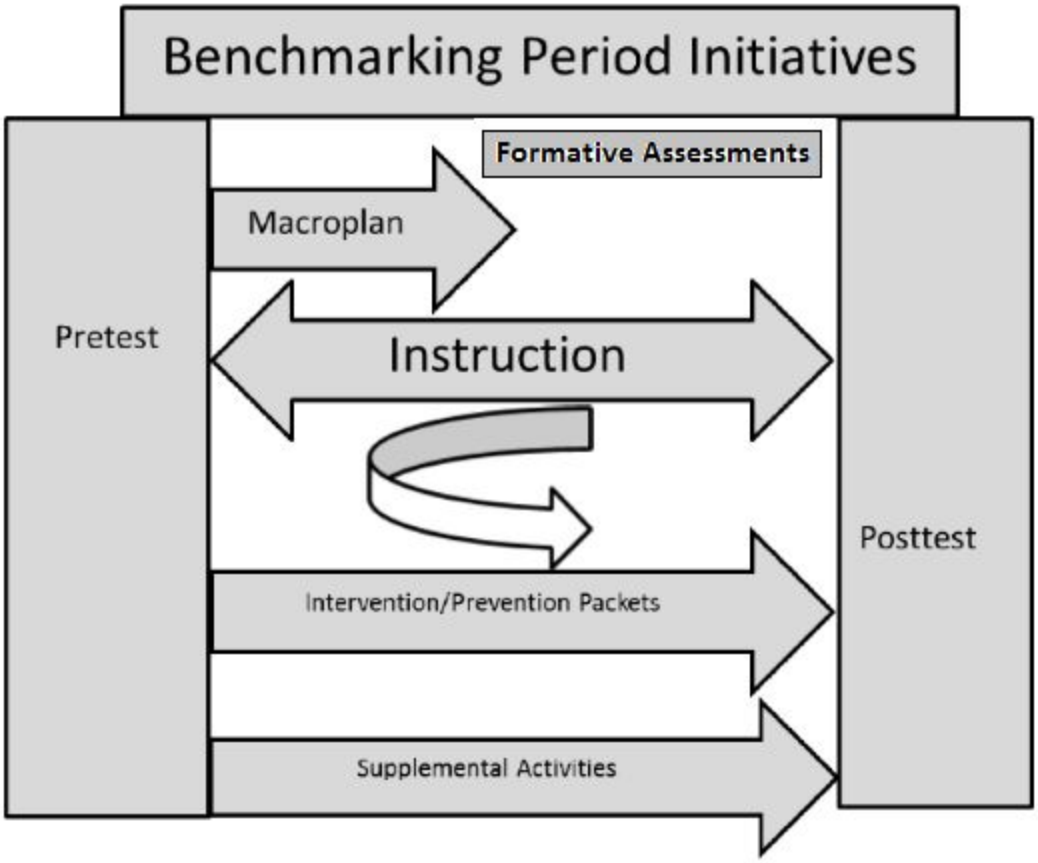
To accomplish this, the Mathematics Curriculum will:

- Be driven by standards-based learning outcomes measured by purposeful, authentic, and varied forms of assessment that will inform instruction and improve student learning and achievement;
- Incorporate best practices and current content knowledge that are grounded in scientifically based research;
- Allow for flexibility that encourages experimentation and innovation within an overall structure that maintains academic rigor and achieves high level standards for all students;
- Promote interdisciplinary approaches and the integration of writing across the curricula;
- Integrate creative and progressing use of technology to engage and promote 21st century thinking and learning;
- Promote differentiation of instruction to meet the diverse learners in our learning communities;
- Promote college and career readiness.

We will know we achieved this when all students:

- Recognize the value of numerous approaches and multiple processes;
- Demonstrate ability to transfer their knowledge and skills appropriately to any problem situation;
- Demonstrate ability to self-reflect, think critically and globally, apply higher order thinking skills, principles of logic, and transfer independent thinking beyond the classroom;
- Independently apply mathematical strategies and processes to solve real world problems; and
- Are able to use and keep pace with the technology for this 21st century

Atlantic City Public Schools
Benchmark Cycle Initiatives



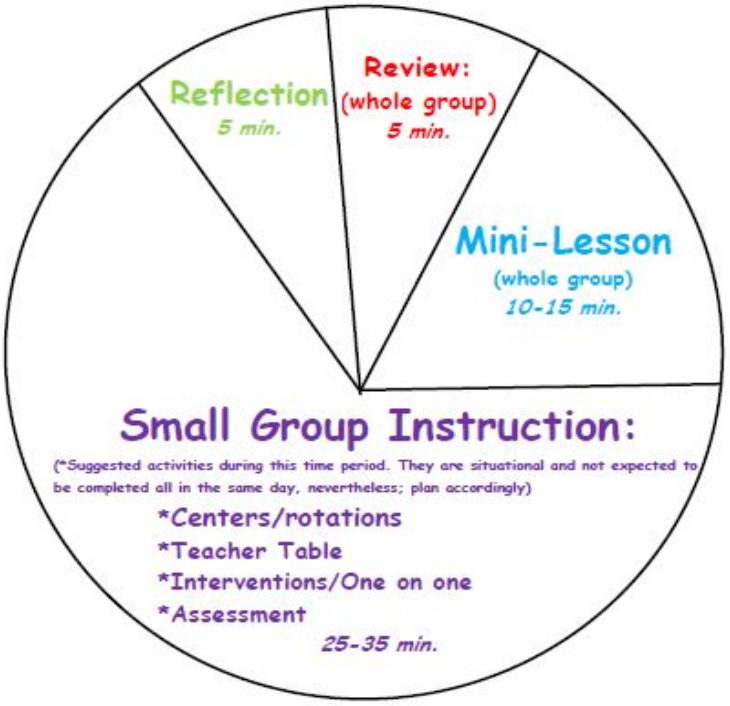
The Atlantic City Public Schools have historically possessed a wealth of data analysis resources, both human and material. The focus at the district level has been to develop methodology that determines how to utilize data in the most effective manner to drive instructional practices, and impact teacher performance and student achievement. An interim testing rhythm has evolved from our benchmark assessments (shown above).

At the classroom level, it is necessary for teachers to have access to not only summative sets of data, such as PARCC, but also to frequent and rigorous formative assessments that measure how well we are delivering our instructional programs. In mathematics, the term benchmark has been expanded to include a pretest, a set of instructional activities, formative assessments, and a post test that are all focused on the New Jersey Student Learning Standards. The gathering of the data is to be used to guide classroom level personnel in altering instruction practices through review, reteaching, or extension activities based on the results.

Proposed Vision for Math Block Structure

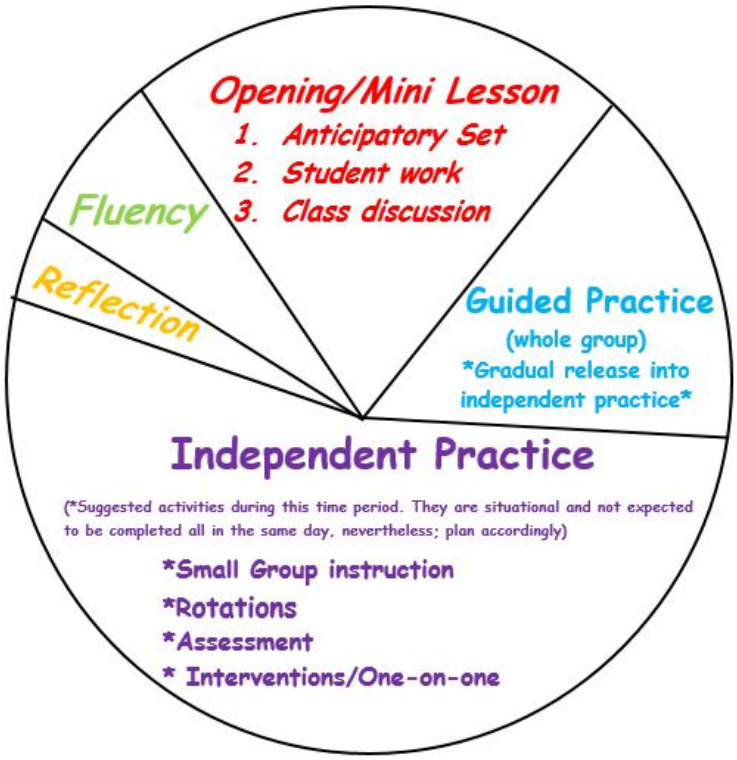
Primary: K-2:

Goal 1: Teachers focus on ***Fluency*** skills daily.
Goal 2: Mini-lessons are kept short, meaningful and ***Standards-based***.
Goal 3: Small group instruction is ***differentiated*** to meet the needs of each student while reinforcing the mini-lesson.
Include formative assessment daily



Intermediate: 3-8:

Goal 1: Teachers focus on ***Fluency*** skills daily.
Goal 2: Mini-lessons are kept short, meaningful and ***Standards-based***.
Goal 3: Students that demonstrate competency with daily objective are ***gradually released*** into independent practice
Goal 4: Small group instruction is ***differentiated*** to meet the needs of each student while reinforcing the mini-lesson.
Include formative assessment daily



The Importance of Fluency in Mathematics

One of the primary goals of every math teacher is to help students learn the basic facts efficiently, gain fluency with their use, and retain that fluency over time. Fluency is the stage of learning where the learner acquires the information at an automatic level. In reading, when a child sees a word, he/she doesn't have to stop and sound it out; when a child has to write a spelling word he/she doesn't have to think about each letter as it is written. Similarly in math, a student must have this fluency of math facts in order to perform multi-digit algorithms. Research shows that using strategies to learn the facts results in a better understanding of math facts and a better attitude towards mathematics than learning math facts through memorization.

Meaningfulness, or the richness of connections, determines how quickly and efficiently anything goes into (and out of) memory." This is why memorization is both difficult for some children, as well as inefficient. "If we strive to memorize something we don't understand, if we're on the wrong side of the glass wall, we'll have difficulty trying to remember it." To really understand addition and subtraction (or multiplication and division), we must understand how they are connected. In grades K-3, we encourage the use of strategies for fact recall. This not only leads to more effective learning and better retention, but also to the development of mental math skills and number sense.

Fluency Expectations by grade:

Grade	Expectation
K	Add/Subtract within 5
1	Add/Subtract within 10
2	Add/Subtract within 20
3	Multiplication facts - PARCC Grade 3 Evidence Statements: "75% of tasks are from the harder three quadrants of the times table ($a \times b$ where $a > 5$ and/or $b > 5$)"
4	Multiplication/Division facts
5	Equivalent Fractions (denominators 2, 3, 4, 5, 6, 8, 10, 12, 100)
6	Fractions - Decimal - Percent
7	Integers
8	Integers & Exponents

We have found that the following addition/subtraction strategies to be very effective:

1. One-More-Than & Two-More Than
2. Facts with Zero
3. Doubles
4. Near Doubles
5. Doubles plus 1 – Ex. 6+7 = 6+6+1
6. Doubles plus 2 – Ex. 6+8 = 6+6+2
7. Making tens – Ex. 9+7 = 10+6
8. Using relationships – Ex. 5+7=12, so 7+5=12, 12–5=7 and 12–7=5

We have found that the following multiplication/division strategies to be very effective:

1. Doubles (facts with a factor of 2)
2. Fives Facts
3. Zeros and Ones
4. Helping Facts

We have found that the following equivalent fraction and fraction - decimal - percent strategies to be very effective:

1. Use models (area, length, & set) to build conceptual understanding that an equivalency means two amounts are the same
2. Be patient with representations prior to rushing to teach rules for finding equivalent fractions and/or equivalent fractions - decimals - percents

We have found that the following operations with integers strategies to be very effective:

1. Use models to *quantity* (number) and *opposite* (direction) to build a conceptual basis for procedural rules. **Counters** and **number lines** are two effective models for integer operations.
2. Maintain quantity while changing direction to expose student misconceptions -1 + -2 cannot be the same as -1 + 2 because the direction of the 2 is different in each problem.
3. Emphasize explanations prior to expecting students to follow procedural rules.

These lists are by no means exhaustive. If you use other strategies to help your students learn their basic facts, please continue to use them.

Possible Resources

Fact Fluency Resources:

- https://www.factmonster.com/math/flashcards
- https://kahoot.com/welcomeback/
- https://quizlet.com/
- https://www.socrative.com/
- https://www.funbrain.com/games/math-baseball
- https://www.multiplication.com/games/all-games
- https://mathfactspro.com/math-fact-fluency-game/

Math Fluency Classroom Ideas:

- https://onestopteachershop.com/2015/06/5-ways-to-make-fact-fluency-fun.html
- https://www.weareteachers.com/15-fun-ways-to-practice-math/