

K-5 MATHEMATICAL FRAMEWORK

RANDOLPH COUNTY SCHOOL SYSTEM

Classroom Expectations

- The North Carolina Standard Course of Study for Mathematics and the Standards for Mathematical Practice guide the planning and implementation of each math lesson.
- Mathematics is taught daily for 75 minutes. The time allotted for mathematics may be sustained for one block or divided into two smaller blocks to ensure the inclusion of essential lesson components.
- *Investigations in Number, Data, and Space* is the core curriculum and is utilized as the primary resource for planning and instruction. Additional resources and supplemental materials are integrated to support instruction and meet the expectations of the NC Standard Course of Study.
- A variety of formative assessment tools are used to determine instructional decisions and meet the needs of students.



Guiding Principles

Teachers will provide opportunities for students to:

- Work in a variety of formats (independent, pairs, and small groups)
- Use multiple strategies to solve problems and demonstrate understanding (pictures, models, manipulatives, diagrams/tables, words, numbers, equations)
- Persevere and persist through challenging problems
- Apply and connect mathematical concepts in meaningful, real world situations
- Demonstrate and develop deep conceptual understanding
- Justify and explain solution methods orally and in writing using precise language and vocabulary
- Engage in critical thinking, communication, creativity, and collaboration through high-level tasks
- Achieve mastery with daily cumulative review
- Practice and develop fluency with procedures by improving accuracy, efficiency, and flexibility
- Use a variety of tools to explore and represent mathematical concepts
- Self-assess and set goals for personal growth

Mathematical Vision

The mathematical vision of the Randolph County School System is to provide rigorous and engaging, student-centered instruction that empowers students to become flexible and proficient problem solvers.

Mathematical Lesson Components

In the elementary classroom, a variety of lesson components guide mathematics instruction. Regular use of the components ensure opportunities for students to become flexible, fluent, and proficient problem solvers. Teachers have flexibility to incorporate and sequence components to meet the needs of their students.

The following descriptions of each component can guide teachers in making specific and intentional choices for structuring their math time based on the teacher's goals and the needs of students. The tables on the following pages will define teacher and student roles that represent best practices in mathematics education.

Student-Centered Instruction

Math Stations/Workshop

Daily Cumulative Review

Computational Fluency



Student-Centered Instruction

Description:

Student-centered instruction includes inquiry based tasks that stimulate student thinking, begins where students are, and requires justification for answers and solution methods. Students engage in a task for which the method for determining the solution is not known in advance. Problem solving enables all students to build new mathematical knowledge, solve problems that arise in interesting and relevant contexts, apply and adapt a variety of appropriate strategies to solve problems, and monitor and reflect on the process of mathematical problem solving.

Lesson Format:

◆ **Launch (5 - 10 minutes)**

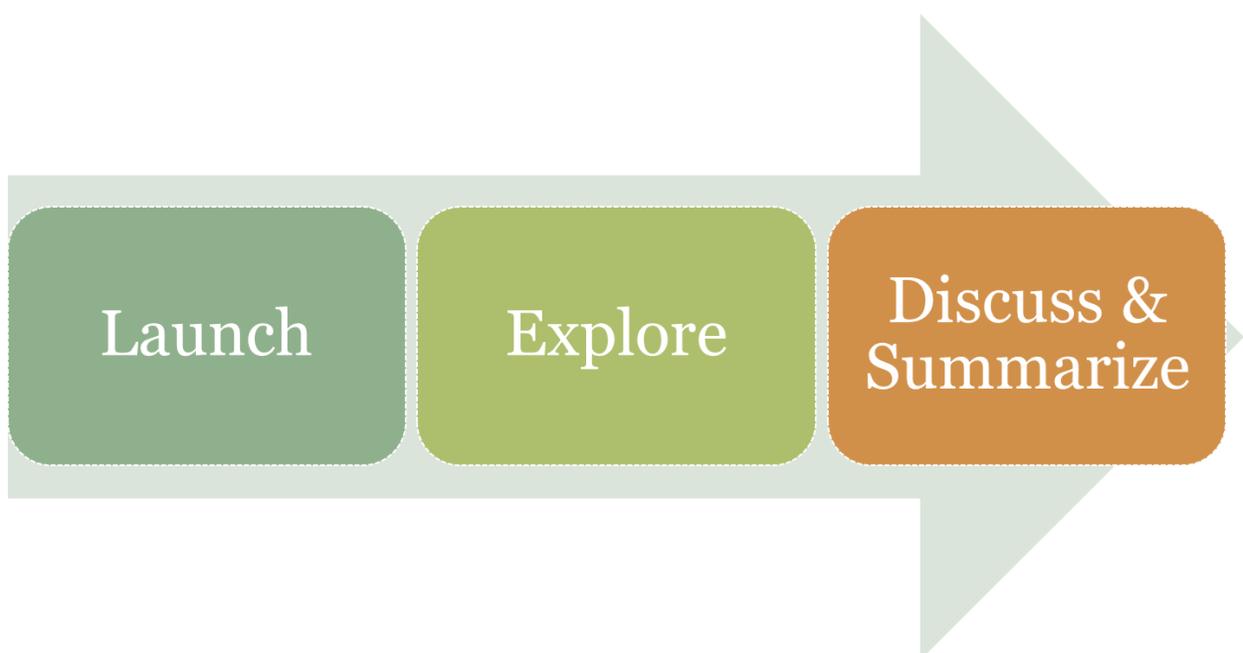
Teacher presents the problem/task to the class. The teacher should give students enough information so that they can do the lesson, but avoid leading students so the level and challenge of the task is not diminished.

◆ **Explore (15 - 45 minutes)**

Students work individually or in small groups to solve the problem. A variety of manipulatives and tools should be available. The teacher moves around the classroom, questioning students to probe their thinking and determining the mathematical focus for the whole-group discussion.

◆ **Discuss & Summarize (15 - 30 minutes)**

Teacher facilitates whole-group discussion of solution strategies. This time allows for the comparison of strategies and discussion of misconceptions and correct/incorrect solutions. The teacher and/or students summarize the mathematical concepts, learning targets, and emphasis of the lesson.



Student-Centered Instruction

| Teacher Role | Student Role |
|---|--|
| <ul style="list-style-type: none"> Throughout the year, establish a classroom environment that encourages students to explore, take risks, and question one another. This supportive community allows students to share and discuss multiple strategies, successes and failures in the problem-solving process, and correct and incorrect solutions. <p>Anticipation & Planning:</p> <ul style="list-style-type: none"> Select or create worthwhile problems and mathematical tasks that are interesting and relevant to students Anticipate students' solution strategies, misconceptions, and challenges Create meaningful critical thinking questions to be used throughout the lesson <p>Launch:</p> <ul style="list-style-type: none"> Clarify any unknown words or vocabulary that are relevant to solving the problem Make the task relevant and interesting to the students <p>Explore:</p> <ul style="list-style-type: none"> Monitor students as they work and listen carefully to their solution strategies Assess students' understanding and progress Provide questions to stimulate student thinking Purposefully select and sequence students to share whose responses will further the understanding of the group If the whole class is having the same problem, pull the students together to discuss issues and clarify the launch <p>Discuss:</p> <ul style="list-style-type: none"> Orchestrate the discussion so students are guided to the big ideas and mathematical learning targets of the lesson Assess how well your students are progressing toward the goal and use this to guide further instruction | <ul style="list-style-type: none"> Be persistent and resourceful in making a plan and solving the problem Use multiple tools and representations (pictures, words, equations, tables, diagrams, graphs) to help conceptualize and solve the problem Solve problems in a variety of ways and describe how these approaches are related to each other Monitor and evaluate the progression of the process and change course if necessary Ask "Does this make sense?" and "Is this reasonable?" Communicate precisely and justify strategies both orally and in writing Actively participate and collaborate with others in productive conversations Understand the approaches of other students' problem-solving strategies Evaluate the reasonableness of results Work with other students to formulate and explore conjectures and listen and understand conjectures offered by classmates Detect possible errors by using estimation and other mathematical knowledge Continually progress to more efficient strategies and representations <div data-bbox="834 1297 1464 1940" style="border: 1px solid #ccc; border-radius: 15px; padding: 10px; background-color: #e6f2e6;"> <p style="text-align: center;">Resources</p> <ul style="list-style-type: none"> "Foundations of Student-Centered Instruction" <u>Teaching Student-Centered Mathematics</u> by Van de Walle & Lovin (Chapter 1) "Student-Centered" vs "Traditional" Math Teaching by Marilyn Burns http://bit.ly/MBMathBlog Planning a Math Unit: Launch-Explore-Summarize Teaching Model http://www.learner.org/workshops/missinglink/support/ Model Lesson: Bean Sprouts Video from Annenberg Learner http://www.learner.org/resources/series32.html?pop=yes&pid=1736 </div> |

Math Workshop & Stations

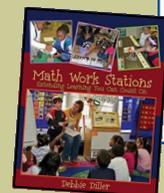
Description:

Through a variety of small group activities, math stations are designed for students to explore and reinforce similar mathematical content. The activities are not sequential; as students move among them, they continually revisit the important concepts and ideas they are learning. By repeatedly playing a game or solving similar problems, students are able to refine strategies, use different contexts, and bring new knowledge to familiar experiences. Student groups are created and changed based on the needs of students as determined by data.

| Teacher Role | Student Role |
|---|--|
| <ul style="list-style-type: none"> • Create a routine and set of expectations for rotating and working in groups • Intentionally plan activities to correlate with standards and goals • Provide clear directions and expectations for each math activity and station • Organize materials and manipulatives so they are readily accessible to students • Work with individuals and small groups of students • Frequently monitor and assess for student understanding and engagement • Provide feedback to students as they interact with tasks and assignments • Ask higher order questions to encourage deep thinking about the concept or skill • Help students develop independence and learn to take responsibility for their own learning as they choose activities, keep track of their work, use and take care of classroom materials, and work with others • Facilitate a whole group discussion at the culmination of the math lesson to reinforce procedures and summarize critical mathematical understandings | <ul style="list-style-type: none"> • Follow procedures and expectations for working in math stations • Productively engage in activities and tasks • Complete assignments thoughtfully • Participate in small groups and respectfully collaborate with peers to discuss mathematical thinking • Ask questions of other students when stuck • Communicate precisely and justify strategies both orally and in writing • Take responsibility for learning • Use time efficiently to complete activities <div data-bbox="933 1129 1333 1444" data-label="Image"> </div> |

Resources

- *Investigations in Number, Data, and Space* Textbook Series
- “All About Math Workshop” *Implementing Investigations* p.12
- Role of Math Workshop (<https://investigations.terc.edu/inv2/curriculum-features/math-workshop/>)
- Making Math Workshop Work (<https://investigations.terc.edu/inv2/curriculum-in-the-classroom/math-workshop/>)
- “Using Math Menus” by Marilyn Burns (<http://bit.ly/MBMathMenus>)
- Teaching Channel: Learning Menus (<http://bit.ly/TCLearningMenus>)
- K-5 Math Teaching Resources (www.k-5mathteachingresources.com)
- Math Work Stations by Debbie Diller



Daily Cumulative Review

Description:

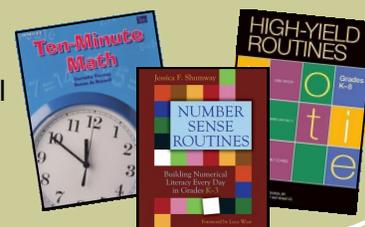
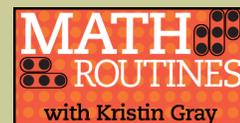
Daily Cumulative Review may include Classroom Routines (K-2), Ten Minute Math (3-5), Daily Math Minutes (K-2), or other activities that provide practice and review of key concepts. Daily Cumulative Review occurs at regular intervals throughout the week. These short activities are designed to take no longer than 10 - 15 minutes and are intended to support and balance the core curriculum. Problems should be targeted and intentionally planned to match student needs. This component can take place during the math block or at another time in the day.



| Teacher Role | Student Role |
|---|--|
| <ul style="list-style-type: none"> Review previously taught concepts and skills Use the progression of K-6 standards to intentionally design review tasks that correlate with the needs of students Use assessments to determine concepts or skills that students need to practice Model and reinforce strategies for developing fluency Provide daily opportunities for students to practice skills and improve fluency | <ul style="list-style-type: none"> Be actively involved and engaged in the activity Discuss strategies with others Listen attentively to the strategies and justifications of others When appropriate, use various representations to model understanding Communicate precisely and justify strategies both orally and in writing Evaluate the reasonableness of solutions |

Resources

- *Investigations in Number, Data, and Space* Textbook Series
- “Classroom Routines” & “Ten-Minute Math” *Implementing Investigations* p.24
- Curriculum Features: Classroom Routines and Ten-Minute Math (<https://investigations.terc.edu/inv2/curriculum-features/classroom-routines/>)
- Using Classroom Routines and Ten-Minute Math Activities (<https://investigations.terc.edu/inv2/curriculum-in-the-classroom/classroom-routines-and-ten-minute-math/>)
- Practice and Review in Investigations (<https://investigations.terc.edu/inv2/curriculum-in-the-classroom/practice-and-review/>)
- Daily Math Minutes (RCSS K-5 Instruction)
- Teaching Channel: Math Routines with Kristin Gray (<https://www.teachingchannel.org/blog/categories/math-2/math-routines/>)
- Marcy Cook Math (www.marcycookmath.com)
- *Number Sense Routines* by Jessica F. Shumway
- *High-Yield Routines for Grades K-8* by Ann McCoy
- *Ten-Minute Math* by Cornelia Tierney & Susan Jo Russell



Computational Fluency

Description:

Computational fluency includes accuracy, flexibility, efficiency, and appropriateness. Students need to be fluent in mental math, paper and pencil methods, estimation, and using technology in computing answers to situations involving numbers. Daily opportunities should be provided for students to build flexibility with numbers and solution strategies, compute fluently with whole numbers, and investigate computation strategies based on place value, properties of numbers, and relationships of operations.

| Grade | Required Fluency |
|-------|--|
| K | Add/Subtract within 5 |
| 1 | Add/Subtract within 10 |
| 2 | Add/Subtract within 20 using mental strategies Add/Subtract within 100 using computation strategies |
| 3 | Multiply/Divide within 100 Add/Subtract within 1,000 using computation strategies (By end of year, know from memory all products with factors up to 10.) |
| 4 | Add/Subtract within 100,000 |
| 5 | Multi-digit multiplication |

Teacher Role

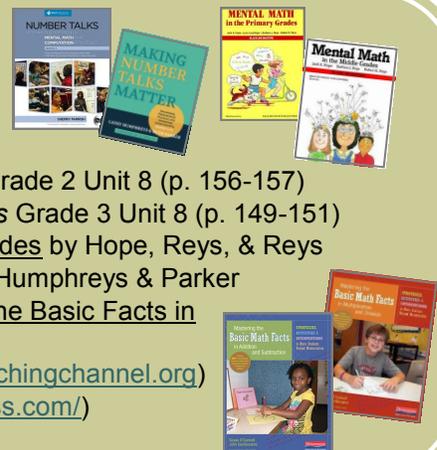
- Ground procedural methods with conceptual understanding
- Facilitate discussion of multiple computational strategies
- Scaffold instruction to allow students to build fluency with increasingly larger numbers and across multiple operations
- Sequence instruction so students develop flexibility, fluency, and connections across operations
- Use a variety of formative assessment tools (excluding timed tests) to assess students' fluency
- Model and reinforce strategies to develop fluency

Student Role

- Use a strategy, or multiple strategies, to efficiently determine the answer to a problem or series of problems
- Determine the most efficient strategy to use for each problem
- Share solution strategies
- Analyze solution strategies and discuss how one strategy compares and/or connects to another strategy
- Set goals and track progress

Resources

- “Helping Children Master the Basic Facts” (Chapter 3) *Teaching Student-Centered Mathematics* by Van de Walle & Lovin
- NCDPI Building Fluency Through Games
- “Strategies for Learning the Addition Combinations” *Investigations* Grade 2 Unit 8 (p. 156-157)
- “Learning and Assessing Multiplication Combinations” *Investigations* Grade 3 Unit 8 (p. 149-151)
- *Mental Math in the Primary Grades* & *Mental Math in the Middle Grades* by Hope, Reys, & Reys
- *Number Talks* by Sherry Parrish & *Making Number Talks Matter* by Humphreys & Parker
- *Mastering the Basic Facts in Addition and Subtraction* & *Mastering the Basic Facts in Multiplication and Division* by O’Connell & SanGiovanni
- Teaching Channel: Number Talks & Mental Math Videos (www.teachingchannel.org)
- Elementary Number Talks (<https://elementarynumbertalks.wordpress.com/>)



RANDOLPH COUNTY SCHOOL SYSTEM

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Third Grade: Amie Kay
Fourth Grade: Holly Dunn
Fifth Grade: Ashley Brewer

**Instructional Websites**

Randolph County School System
www.randolph.k12.nc.us

NC Standard Course of Study
www.dpi.state.nc.us/curriculum/

North Carolina Collaborative for Mathematics Learning
<https://www.nc2ml.org/>

TERC Investigations
<http://investigations.terc.edu/>

National Council of Teachers of Mathematics
<http://www.nctm.org/>

