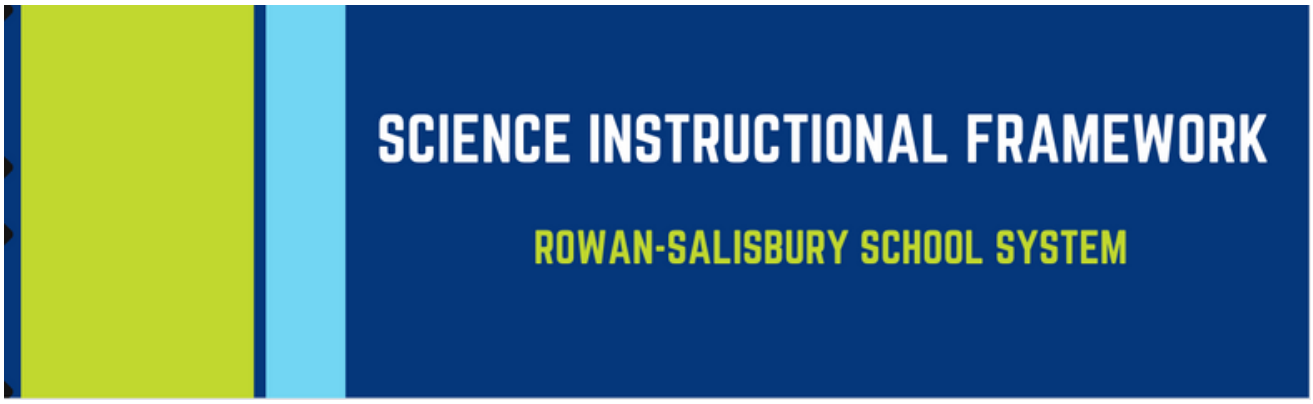


RSS Science Instructional Mission

In Rowan-Salisbury Schools, our mission is to provide students with a rigorous and engaging science education that lays the foundation for future scientific inquiry and discovery. We are committed to using evidence-based teaching strategies and hands-on experiences that enable our students to develop a deep understanding of scientific concepts.

Classroom Expectations

- Instruction is aligned with the North Carolina Standard Course of Study for Science.
- Students should be engaged in Science instruction for a designated amount of time according to grade-level expectations. (See table below)
- Students are involved in Science using hands-on activities, experiencing the natural world through outdoor exploration opportunities, and reading and listening to learn the material.
- Science instruction must include appropriate content and opportunities for students to participate in the 5E model.
- Teachers will foster natural curiosity in students by following inquiry-based practices. (See below for more details)
- Science instruction should provide opportunities to assess student learning and address misconceptions.
- Students will be empowered to use scientific language to communicate an understanding of topics.
- Create and maintain a positive learning environment.
- Students should be engaged with multiple Science & Engineering Practices (SEPs).

Science Lesson Components

In the K-12 science classroom, a variety of lesson components guide science instruction. Consistently applying these components across Rowan-Salisbury Schools helps to promote equity in instructional practices across all schools.

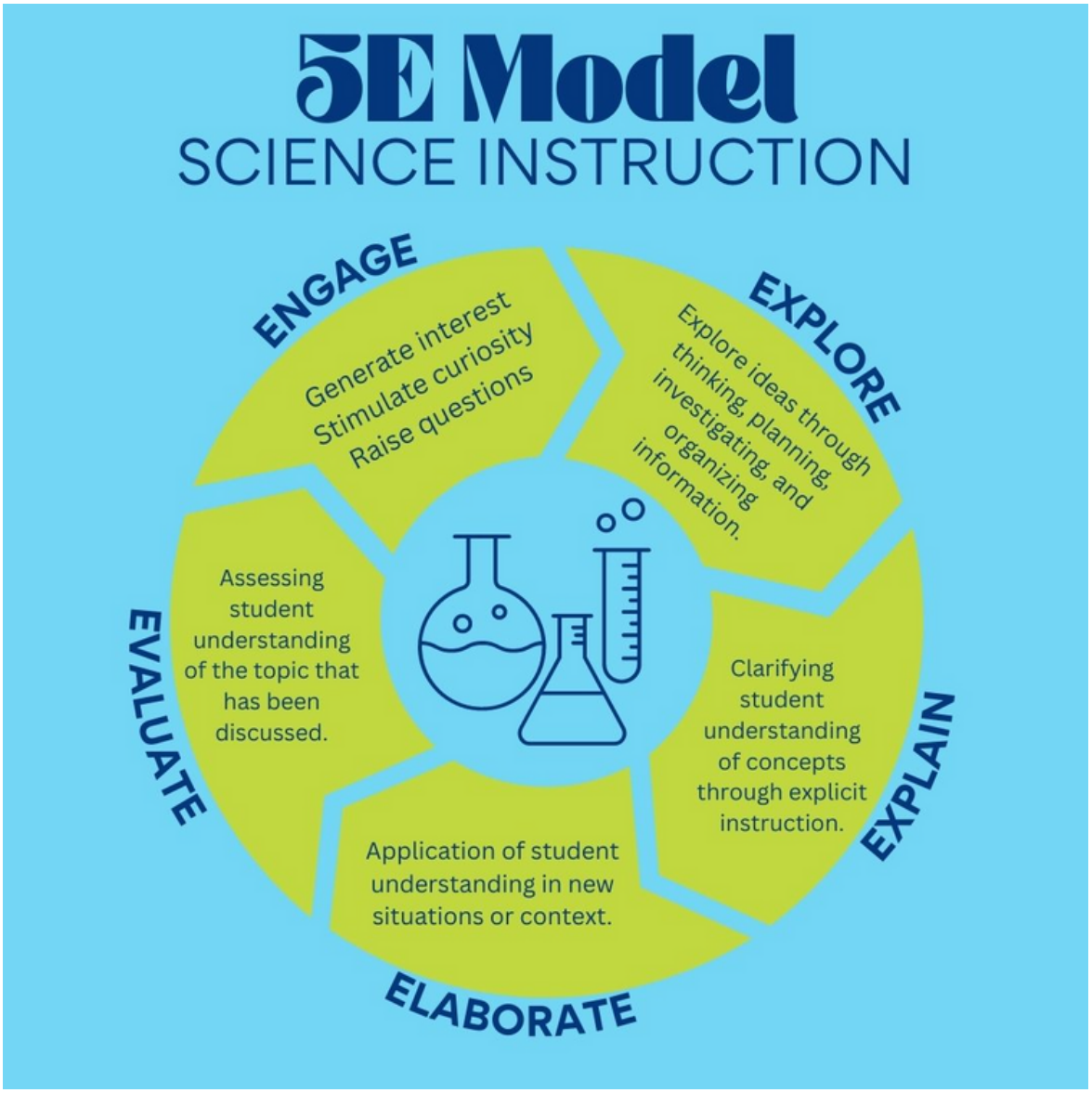
Components within the Science Block:

- whole group instruction
- hands-on instruction and experiences
- science and engineering practices
- data collection and interpretation
- constructing explanations
- vocabulary instruction
- differentiated small groups
- assessment opportunities to show learning

SCIENCE AND ENGINEERING PRACTICES	
Asking Questions & Defining Problems	Wondering (science) & Deciding the "rules"
Developing & Using Models	Drawing diagrams & building models to represent
Planning & Carrying Out Investigations	Doing "exploriments" as experiments
Analyzing & Interpreting Data	Comparing and looking for patterns
Using Mathematical & Computational Thinking	Counting and measuring
Constructing Explanations & Designing Solutions	Describe what happened (science) & Tinkering
Engaging in Argument from Evidence	"I think ___ because I see or know ___."
Obtaining, Evaluating, & Communicating	Writing, drawing, or talking (acting out) about what

RSS Science Quarterly Curriculum Overview and Pacing Guides

Science Block Time Allotments for Different Grade Levels	
K-4	150-225 minutes per week (about 30-45 mins per day)
5	250-300 minutes per week (about 50-60 mins per day)
6-8	250-300 minutes per week (about 50-60 mins per day)
9-12	300-450 minutes per week (about 60-90 mins per day)



Why do the 5E model?

Students' attitudes towards science instruction are more positive when they are allowed to explore concepts through experimentation and other hands-on activities before discussing them, as it is structured within the 5E model. The sustained use of an effective, research-based instructional model can help students learn fundamental concepts in science and other domains.

Through the implementation of the 5E instructional model, students experience an integrated, hands-on, investigative unit of study which are connected to other types of science learning which includes but is not limited to read-alouds, discussions, teacher demonstrations, and/or digital representations and simulations.

Embedding the science and engineering practices within the framework helps students understand how scientific knowledge develops and form an understanding of the crosscutting concepts of science and engineering which enables students to make meaning of what their learning and deepens their worldview.

Benefits

The 5E Model allows educators to create a unique learning experience for students. The 5E Model of Instruction is an inquiry-based model. It is student-led, with the teacher acting mainly as the facilitator. Through open-ended questions, real-life experiences, guided investigations, hands-on projects, and research, students gain a deep understanding of the scientific topics that are covered in the unit. Each stage of the model serves as a foundation for the next, creating a coherent model that frames lessons, activities, and units.

The 5E Model promotes collaborative, active learning in which students work together to solve problems and investigate new concepts by asking questions, observing, analyzing, and drawing conclusions. By understanding and reflecting on activities, students are able to reconcile new knowledge with previous ideas.

The 5E Model is most effective when students encounter new concepts for the very first time because there is an opportunity for a complete learning cycle. The 5E Model is best suited in a unit of two to three weeks in which each phase is the basis for one or more distinct lessons (Baylee, 2013).

Science Block within the 5E Instructional Model

	Phase of Instruction*	Description of Instruction	Inquiry Questions**
Whole Group Instruction	Engage	• Activate prior knowledge through videos, hands-on experiences, or other phenomena appropriate to the topic • Foster an interest in a topic • Identify gaps in knowledge • Ask questions to generate discussion	• What have you heard about___? • Describe an experience you've had with _____? • What do you notice about _____? • What do you wonder _____? • Can describe what you see _____?
	Explore	• Hands-on learning • Conduct experiments • Pose questions to investigate • Make predictions • Gather and analyze data • Draw conclusions • Chart information to organize	• What do you notice when this happened? • What do you wonder? • What does it remind you of? • How might you explain this? • What steps are needed? • How is that similar/different than ___ ? • Any question you (the teacher) don't already know the answer to!
	Explain	• Teacher-led demonstrations and guided notes • Synthesize new knowledge • Share the learning of new knowledge • Use videos or other apps to boost understanding	• What did you find out about...? • How will you be able to tell if...? • Summarize what you just learned. • What are you still wondering about?
	Elaborate	• Apply new learning • Collaborative or independent presentations • Additional investigation or research • Design a lab experiment	• What makes you think that? • Can you say more about that? • What's your evidence? • Can you compare this to something else that you know about? • Do you agree/disagree with what _____ just said? • Any question you don't already know the answer to!

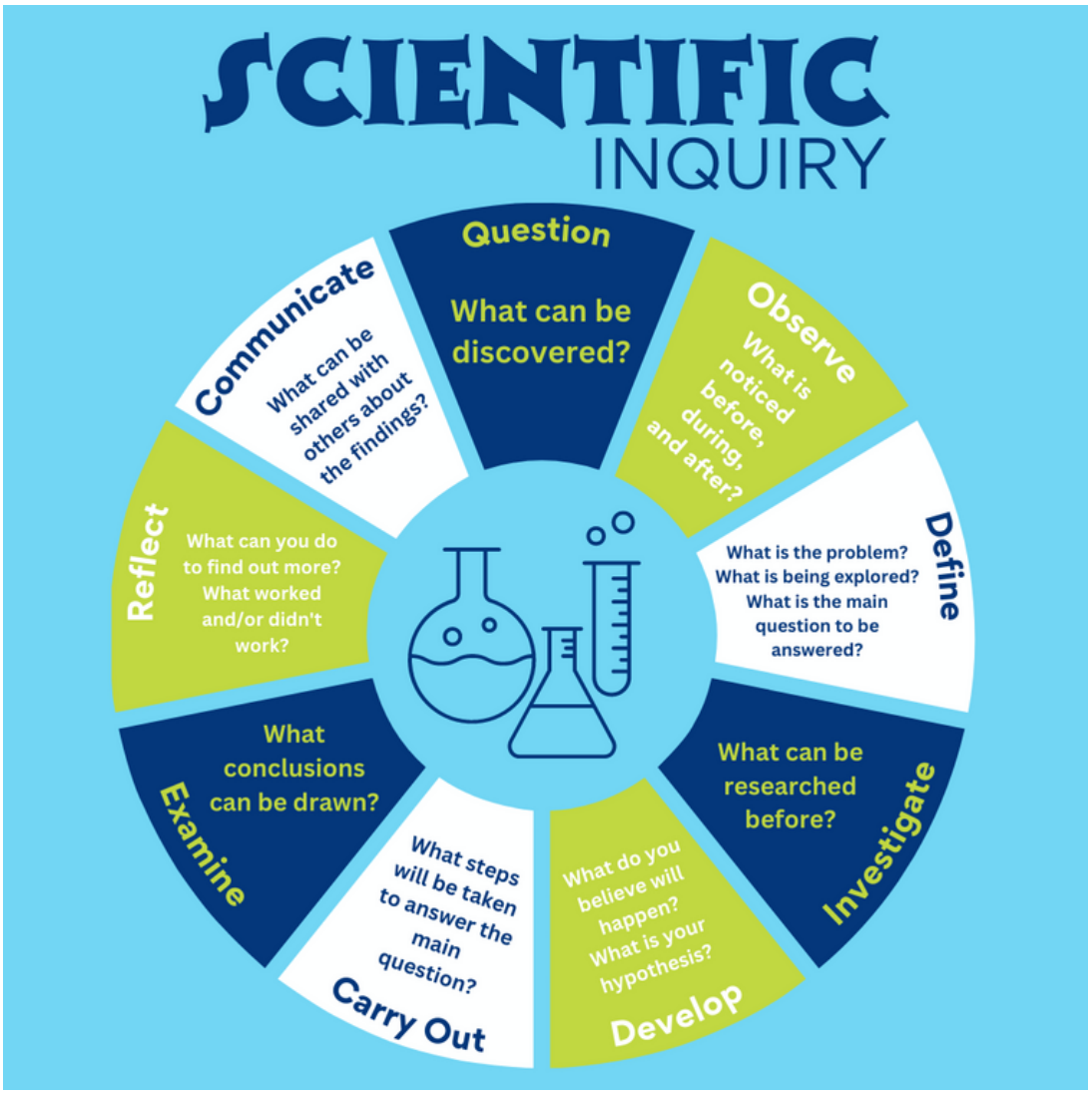
	Evaluate	• **An informal or formal assessment** • **Exit tickets** • **Self-assessment** • **Peer assessment** • **Written response** • **Turn and Talk**	• **What helped you to learn?** • **What surprised you?** • **Did any of your ideas change during this activity?** • **What made your ideas change?** • **How might you explain or show some of what you learned in this activity to a family member?**
Differentiated: **Small Groups** Interactive opportunities for instruction varied to meet students' needs. Various instructional strategies are used to meet the needs of learners and move them to mastery of content standards as well as Science & Engineering practices.		• **Use of prior knowledge of the topic to group students (pre-assessment)** • **Explicit instruction to build conceptual learning of content.** • **Literacy connections with relevance to the topic** • **Flexible groupings based on anecdotal notes, formative assessments, and observation** • **Use illustrations instead of written responses for alternative assessment options**	

***There is not a set amount of time that is required for each phase of the 5E instructional cycle, but more of a balance of phases. Depending on the concepts being explored and investigations implemented, some phases will require more time than others.**

****The questions included are suggestions and not a script.**

Cultivating Scientific Inquiry

Scientific inquiry mobilizes the 5Es and facilitates deeper investigation and meaning-making. This process engages students, develops critical thinking skills, promotes the scientific method, encourages collaboration and communication, deepens understanding, and nurtures curiosity and lifelong learning. By incorporating scientific inquiry, educators can create meaningful learning experiences that go beyond memorization and foster a genuine understanding and appreciation of science.



The What?

Scientific inquiry is a method of studying the natural world to explore questions and discover conclusions. It involves a process of creating questions, conducting investigations, and making discoveries about the world leading to more questions, investigations, and discoveries.

The How?

Scientific Inquiry Strategy	What is it?	Want more information?
I notice, I wonder...	Tool to promote student curiosity and enhance observational skills	I Notice, I Wonder... Directions I Notice, I Wonder... Video
Discussion Map	Framework to help promote discussion	Discussion Map Directions
Thought Swap	Discussion technique to foster discourse among student partners	Thought Swap Directions
Open Ended Questions	Questioning technique that allows for multiple responses from all students	Open Ended Question Video

Putting it all together: What does a science class following the 5E model look like?

- Observing diverse scientific phenomena that prompt students to ask questions and wonder
- Hands-on investigations where students explore cause and effect relationships, collect data, measure, or explore properties of matter or objects
- Teacher demonstrations that prompt students to develop models or construct explanations
- Discovery-based, inquiry centers or stations that deepen student understanding of scientific concepts

Literacy & Math Integration into the 5E Science Instructional Model

Phase	Literacy Integration	Math Integration
Engage **Generate interest, stimulate curiosity, and raise questions.**	• Introduce the topic through engaging texts such as children's books, articles, quotes, short stories, or speeches. • Ask open-ended questions and encourage discussions • Short Video (captions turned on) • Scavenger hunt in non-fiction text for things relating to the topic	• Look for patterns in a short video • Scavenger hunt for patterns/numbers relating to the topic (video or book based)
Explore **Explore ideas through thinking, planning, investigating, and organizing information.**	• Guided hands-on activity/experiment with on-grade level written directions (Use this site to check the readability of your directions.) Students should read directions and follow themselves to perform the task. • Have students list questions or observations and discuss them with others. • Encourage students to record their observations, procedures, and results in scientific journals or lab reports. Emphasize the use of scientific vocabulary and accurate descriptions to enhance literacy skills.	• Hands-on manipulatives • Integrate math tools • Students can measure and compare variables, record data, and create graphs or charts to analyze their findings.

Explain **Clarifying student understanding of concepts through explicit instruction.**	• Have students write out their findings in different genres - a "scientific" paper, a comic strip, or a non-fiction short story. • Have students research and present information using charts, diagrams, or multimedia presentations. Encourage them to cite evidence from texts to support their explanations. • Vocabulary introduction sorting or game	• Write about the data collected and what it might mean. • Guide students in making connections between numerical data and scientific explanations. For example, students can calculate averages, percentages, or ratios to analyze the results of experiments or surveys.
Elaborate **Application of student understanding in new situations or contexts.**	• Research the topic - online or in the library. Add this information to your writing. Have students communicate their findings and insights through written reflections or persuasive essays. • Science spelling/vocabulary words	• Change a variable and retake the data • Extend the math integration by having students analyze real-world data sets or conduct statistical investigations related to the science topic. For instance, students can examine population data or analyze environmental data to identify trends, patterns, or correlations.

Evaluate **Assessing student understanding of the topic that has been discussed.**	• Have students create a demonstration or presentation to explain their understanding of the science topic. • Incorporate literacy skills in the evaluation phase by having students reflect on their learning experiences and write summaries or reflections on the science topic. Encourage them to connect their understanding to real-life applications or discuss the impact of the science concept on the environment or society.	• Provide math-based scenarios or questions that require students to apply measurement, estimation, or data analysis skills.