Grade(s): All Grades	**Topic:** Memphis Aquifer System	**Time Frame:** 3 - 90 min class periods
Lesson Description: Students will create an aquifer in a cup and use several pollutants to determine how contaminants can affect the quality of the Memphis Aquifer's drinking water.		
Specific Learning Outcomes: • Determine the Importance of the Memphis Aquifer System • Determine how pollutants can affect our Water Sources • Determine the pH of Water and how pollutants can affect it		**Resources Needed:** 1. Clear Cups 2. Sand 3. Rocks 4. Modeling Clay 5. Litmus Strips / pH Probes 6. Various Pollutants

Activity Standards		
TN Science Standards	**Next Generation Science Standard Practices**	**Common Core Standards**
SPI 0507.Inq.1 Select an investigation that could be used to answer a specific question.	Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)	CCSS.ELA-Literacy.RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
SPI 0507.T/E.2 Recognize between a scientific advance and the development of a new tool or technology.	Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)	CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Guiding Questions

Also known as your essential questions. What do you want the students to be able to answer by the end of this lesson

- What water source is used in Memphis to provide its residents with clean water?
- How does the Memphis Aquifer provide Shelby County with a clean water source?
- How do various pollutants affect the quality of water in the Memphis Aquifer?

Possible Preconceptions/Misconceptions

- Memphis gets its drinking water from a ground water source.
- Students are not familiar with the term Aquifer.
- Students are unable to determine how pollutants affect the quality and availability of clean water sources.

Activities/Task

What learning experiences will students engage in?

Day 1

1. Ask student – Where does the water in Memphis come from?
2. Have students to discuss with a partner or in a group.
3. In a whole class setting discuss with students their perception of where Memphis water comes from.
4. Pass out the article *Memphis Aquifer System.*
5. Inform students that they are to read the article. While reading the article they are to circle the main idea and underline the supporting details. (10-20 mins.)
6. After all students have read the article, place students into group of 3-4 (no larger than 4).
7. Pass out a sheet of chart paper to each group.
8. Inform each group that they will discuss what each member thought was the main idea and supporting details. As a group they are to come up with one main idea that the entire group agrees on as well as supporting details for that main idea.
9. Students are to write their group's main idea and supporting details on the chart paper. (10 min)
10. Once all groups are finished one person from each group will share their chart.
11. The teacher will ask text dependent question that will further students thinking about the Memphis aquifer and its benefits to the metro area.
12. Inform the students that during the next class session they will design an aquifer. Inform them that in their science journal they will, in their own words explain what an aquifer is, using evidence from the reading. Students are also to draw in their science notebook what an aquifer may look like.

Day 2

1. Recap information from previous lesson.
2. Students will create a model aquifer.
3. Pass out aquifer sheet to each student.
4. Go over the Aquifer worksheet with the students. **(Teacher should not tell students how to build their aquifer. Students should investigate what pollutants to add and when to add them.**
5. Tell students that they are to jot down all steps to creating their aquifer in their science journals as well as success and failures.
6. Students should follow the aquifer sheet to complete the different trials.
7. Student will complete the chart with the necessary information from their observations.

Day 3

1. Allow students to share their results as a class.
2. Students will write an essay about the Memphis aquifer and the effect of pollutants.
    a. If applicable have students to type their paper using a word processer.

Reading Task	**Writing Task**
One of the literacy shifts in common core is for students to focus on more complex, non-fiction literature.	In science students are responsible for writing either an explanatory or argumentative piece. Below simply type the writing prompt in which students will dive into.

Students will read an article about the Memphis Aquifer system and the previous water resources Memphis has used. Students will also identify possible pollutants that can affect the quality of the Aquifer System.	Why is the Memphis Aquifer important? What can we do to help keep this aquifer safe and free of pollutants?

Assessment

How will your students be assessed? How will you use the above learning experiences as formative assessment opportunities? (If activity is several days long, please specify the day with the activity/reading task)

- Students will be assessed through the culminating activity.
- The students will be required to complete a drawing of their aquifer.
- They will also identify the pollutants and their effects on drinking water.
- Students will test various pollutants to determine their effect on pH.
- Students will then write a short essay on the Memphis aquifer and what we can do to keep it pollutant free.

Modification/Accommodations:

What curriculum modifications and/or classroom accommodations can be made for students with disabilities in a class

- Students with disabilities will participate in a read aloud session for the article on the Memphis Aquifer.
- Student pairing and small groups will assist with students who have difficulty with connecting the information.
- Extended time for students with disabilities.