Traffic Flow
A Develop Understanding Task

Purpose: In this activity, students will act as a Civil Engineer for SEPI: A Division of TransSystems and will work to determine the level of service on a stretch of highway in Raleigh, NC. Students will also predict future population and the level of service of the roadway based on the predicted population.

Career Field: Civil Engineering

SEPI: A Division of TransSystems

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NC Math 4 Standards:
NC.M4.AF.1.2 Execute a procedure to determine the value of a composite function at a given value when the functions are in algebraic, graphical, or tabular representations.

Unit Alignment:
Indicate where this lesson would be used in the course
NC Math 4 - Unit
WTCC Math 121, 171

Common Core State Standards for Mathematical Practice
Indicate which of the standards are highlighted in this lesson
> 1. Make sense of problems and persevere in solving them.
> 2. Reason abstractly and quantitatively.
> 4. Model with mathematics.
> 5. Use appropriate tools strategically.

Prerequisite Skills
List any prerequisite skills that may need to be addressed in a warm-up
- Unit Conversions
- Evaluating Functions
- Solving Literal Equations

Time Required
The time required to complete this activity is approximately 120 minutes.

Materials Needed
- Student Activity Sheet

The Teaching Cycle:
Launch:

Assign the Desmos Launch activity for homework the night before. Alternatively, the Desmos Launch activity could be provided at the end of one class and the Explore part could be completed the next day in class.

The launch of this activity will review the necessary vocabulary for the activity. In doing so, it will also review skills such as evaluating functions which students will need to be able to do for this activity.

Students will work in groups of 2-3. They will complete the attached student activity sheet. The teacher will facilitate this activity by monitoring student participation. In an online course, the teacher can choose to schedule check-ins with the group to monitor progress.

Activity Background Information:
Civil Engineers work to design our roads so that vehicles can travel freely most of the time. One thing that civil engineers look at is how to improve the level of service of our roads so that traffic isn't too heavy. However, there are many considerations that go into this decision including money, time, population, etc. In this activity students will investigate a stretch of highway and determine the current level of service. After that, students will determine the population 10 years from now and determine the level of service of the same road in 10 years. Students will investigate what it would take to have a level of service that is classified as level A and why this might not be the best idea.

Initial thought questions:
Students will first spend some time thinking about traffic, what causes traffic, when they have been caught in traffic, ways to possibly alleviate traffic, and how they know when roads are operating at an optimal level.

Task 1:
After the initial thought questions, students will move into the problem. Students should work collaboratively on the activity with the teacher monitoring their progress. The teacher can walk around and offer suggestions to the students but should not give explicit steps or directions.

Discuss 1:
After task 1, you can bring the students back together and have them give their answers to questions 2, 3, 8, 9, and 10. Each group will likely have the same answers to these questions. Not all groups need to provide their answers to all the questions but perhaps if two groups get two different answers, the teacher and students can discuss why this occurred and determine if both groups are right or if one group needs to change their answers.

Explore 2:
Continuing to work in groups, students will determine the level of service of the highway in 10 years given a certain population growth percentage. They will also determine how many lanes are needed to improve the level of service by one level and how many lanes are needed to achieve a level of service of A.

Discuss 2:
Ask students to share their answers to these questions. Discuss any similarities and differences among the answers.

Exit Ticket:

As students prepare to leave, ask them to reflect on their learning. What did they learn today? Do they have any lingering questions?

Two example assessments for testing:

[Student Activity Sheet](#)

Answer Key