Signals That Adapt

Trace how engineering design changes a public technology

FSL.2 "Students will identify, research, and communicate the development of technology and engineering practices. Research and present a technology that was developed through engineering design. Identify its purpose..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the traffic signal's purpose, circle two design changes, and number two kinds of evidence engineers use to evaluate a change. Use your marks to trace how the design responds to problems.

Who Gets the Green Light?

1 At a busy intersection, a traffic signal does more than take turns showing colors. It assigns right of way to different movements, reducing conflicts between drivers and people crossing the street. Early automatic electric signals often used fixed timing: each direction received a preset interval whether or not cars were waiting. Engineers could choose those intervals by measuring typical traffic, but a sudden rush after a school event might leave a long line. The design solved one problem, organizing crossings, while exposing another: a schedule cannot always match changing demand.

2 Later, engineers added vehicle detectors, including wire loops embedded beneath pavement. A vehicle above a loop changes the loop's electrical properties, which a controller can use as evidence that a vehicle is present. The controller can adjust certain green intervals within programmed safety limits, rather than giving every direction exactly the same time every cycle. Pedestrian push buttons can request a crossing interval, and accessible signals can provide audible or vibrating cues. These alterations serve different users, but detectors cost money to install and maintain. A failed detector may delay a turn.

3 Suppose residents report long waits to turn left near a library. A traffic engineer could count turning vehicles and pedestrians at several times, then compare revised signal timings in a computer model. The model would estimate queues and pedestrian wait times, not prove that collisions would fall. Engineers would check minimum crossing time, emergency vehicle access, cost, and effects on nearby intersections before a field test. Technicians maintain detectors and controllers, while transportation planners examine how a change affects the wider street network. After testing, the team would revise the settings if the data showed a new problem.

2 ANSWER WITH EVIDENCE

Use the passage

1. What problem do traffic signals address, and why might fixed timing still create a problem after a school event?

2. How did adding vehicle detectors change what a signal controller could do? Name one limit of that change.

3. For the library intersection, what would engineers measure or model before changing the signal, and what is one thing the model could not prove?

4. How do the jobs of a traffic engineer, a technician, and a transportation planner differ in the passage's proposed signal change?

3 YOUR TURN

Your own words

In five or six sentences, identify a problem in your community involving shared space or a public service and propose a specific engineered change. Name two criteria or constraints, then explain what data you would gather, how you would test the change, and when you would revise it.

Signals That Adapt

PART 1 · READ AND MARK

Underline the traffic signal's purpose, circle two design changes, and number two kinds of evidence engineers use to evaluate a change. Use your marks to trace how the design responds to problems. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What problem do traffic signals address, and why might fixed timing still create a problem after a school event?	**Signals organize movements to reduce conflicts. Fixed timing does not respond to a sudden rush, so a long line may form.**
2	How did adding vehicle detectors change what a signal controller could do? Name one limit of that change.	**Detectors provide evidence that a vehicle is present, allowing the controller to adjust some green intervals within safety limits. Detectors cost money to install and maintain, and a failed one may delay a turn.**
3	For the library intersection, what would engineers measure or model before changing the signal, and what is one thing the model could not prove?	**They could count turning vehicles and pedestrians and model queues and pedestrian wait times under revised timings. The model could not prove that collisions would fall.**
4	How do the jobs of a traffic engineer, a technician, and a transportation planner differ in the passage's proposed signal change?	**The traffic engineer studies traffic and tests timing changes. The technician maintains detectors and controllers. The transportation planner examines effects on the wider street network.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Rainwater pools on the walkway through our neighborhood park, forcing people onto the grass. I would raise the low section and add a shallow planted drain beside it. The walkway must remain accessible to wheelchair users, and the work must fit the park's budget. I would record puddle depths after storms before construction, then measure them after the next several storms. If water still covered the walkway, I would check where it collects and revise the drain's position.

Accept other accurate limitations of detectors and other relevant design constraints named in the passage. For Your Turn, look for a specific change, two criteria or constraints, measurable evidence, a test, and a condition for revision.