Explore a **Scenario-Based Task**

The Technology and Engineering Literacy assessment is one of the latest measurements of student progress from the National Center for Education Statistics (NCES). In 2014, this assessment was administered to 21,500 eighth-grade students in about 840 schools across the nation. Technology and Engineering Literacy assessment marks a departure from many other NAEP assessment designs because it is completely computer-based and includes interactive scenario-based tasks — an innovative component of NAEP. You can understand the student experience by walking through a task with us below:

Scenario Based Task: Planning for a Safer Bike Route

A city is encouraging its citizens to use bicycling as a form of transportation. We need students to apply their technology and engineering skills to come up with a cost-effective route design for a safe bike lane. Keep in mind when tackling a problem, students need to produce a design that meets specific requirements while accounting for trade-offs between options!

CONTENT AREA
Design and Systems

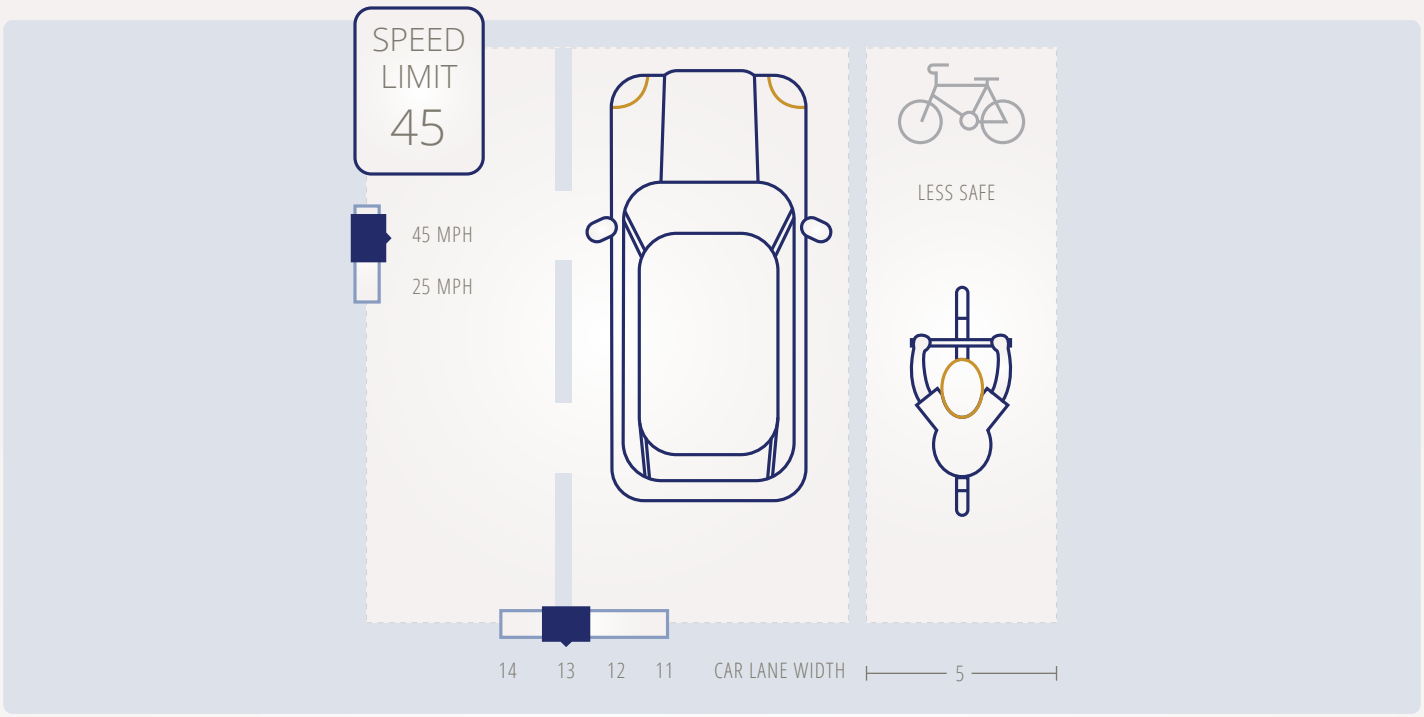
PRACTICE
Developing Solutions and Achieving Goals

TASK TIME
18 minutes

STEP 1 - Learning About Design Criteria

76% of eighth-grade students were able to fulfill the criteria for designing a safe bike lane.

First, students need to learn about the safety features of a well-designed bike lane. To do this, students can use interactive sliders that allow them to see how car speed and lane width impact the safety of the bike lane. Students need to identify different combinations of speeds and lane widths that are safe or unsafe for cyclists.



STEP 2 - Explaining the Design Criteria

48% of eighth-grade students were able to explain the trade-offs among the safety requirements for a well-designed bike lane.

In this step, students complete a data table showing the safety of roads with different combinations of speed limit and lane width. Students need to use the data to explain how trade-offs between speed limits and lane width affect lane safety.

CAR LANE WIDTH	SPEED LIMIT	
	25 MPH	45 MPH
14 feet	Safe	Less Safe
13 feet	Safe	Less Safe
12 feet	Less Safe	Unsafe
11 feet	Less Safe	Unsafe

Explain how the combination of lane width and speed limit affects the safety of a bike lane. Support your answer with information from the table on the left.

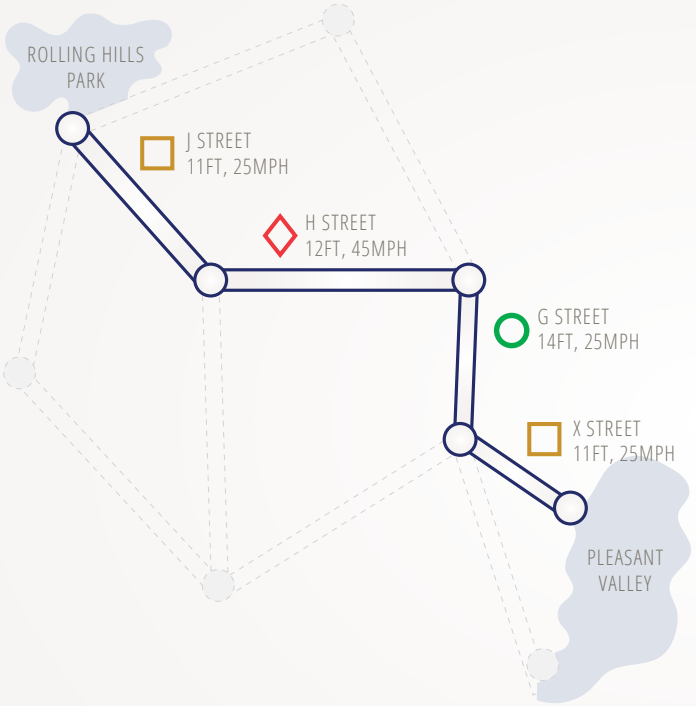
Type your answer in the box below.

Example Student Response
The data in the table show that even if the car is going slower, the lanes need to be wider for the cyclists to be safe.

STEP 3 - Planning for a Safer Bike Route

64% of eighth-grade students were able to select the relevant design changes needed to make streets safer for cyclists.

In this step, students need to review the original bike route from the city and evaluate how safe it is. Students should notice that it is not completely safe and the city needs their help to make it safer by selecting changes to improve the route on the interactive map.



LEGEND ○ Safe □ Less safe ◇ Unsafe

Place the mouse over each street along route XGHJ.

As you move the mouse over each street, you will see the width, speed, and safety information of that street appear in the table below.

STREET	CAR LANE WIDTH	SPEED LIMIT	SAFETY
X	11 feet	25 mph	Less Safe
G	14 feet	25 mph	Safe
H	12 feet	45 mph	Unsafe
J	11 feet	25 mph	Less Safe

You should have discovered that along this route, only G Street is always safe for bikes. ALL streets along the route must be safe for bicyclists.

Look at the list below of possible changes to the route. Some of the changes below will make the streets safer for bikes. Select all the changes that will make the street safer.

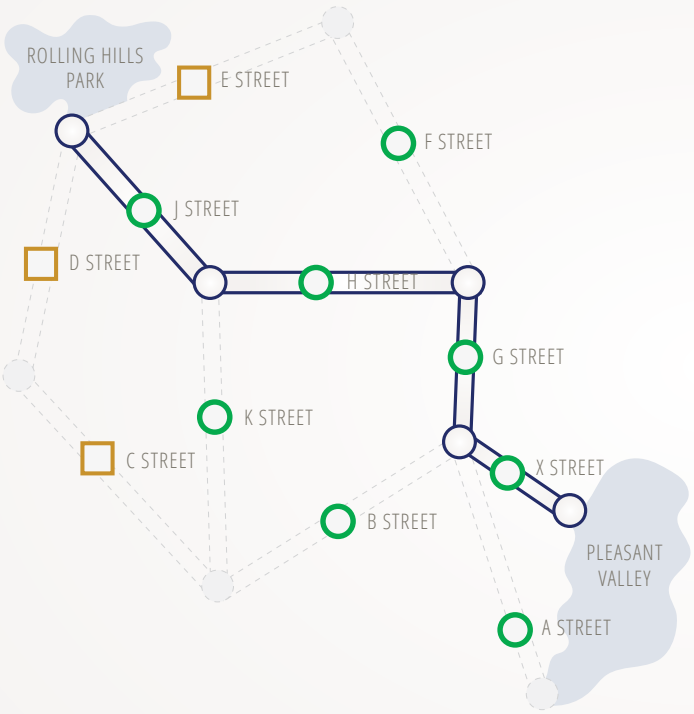
- [ ] Increase the speed limit of J Street to 45 mph.
- [x] Increase the lane width of J Street to 14 feet.
- [x] Decrease the speed limit of H Street to 25 mph.
- [x] Increase the lane width of H Street to 14 feet.
- [ ] Increase the speed limit of G Street to 45 mph.
- [ ] Decrease the lane width of G Street to 13 feet.
- [x] Increase the lane width of X Street to 13 feet.

Click Table to review the width, speed, and safety information of all the streets along this route.

STEP 4 - Redesigning the Route

45% of eighth-grade students were able to redesign the bike route taking into account criteria and constraints on the final design solution.

Turns out that the town cannot afford to make all possible street modifications for the new bike route! Students need to design the least expensive and shortest possible route, prioritizing the cost over the route length. Students can use the interactive map to explore different design options. By clicking on different streets they can see the road length and cost of the route change associated with the streets.



LEGEND Safe Less safe Unsafe

Design a different SAFE route connecting Pleasant Valley and Rolling Hills Park. Your route should include only minimal changes (if any) to existing streets.

Your safe route must be the following (in order of importance).

- First: The least expensive route
- Second: The shortest route

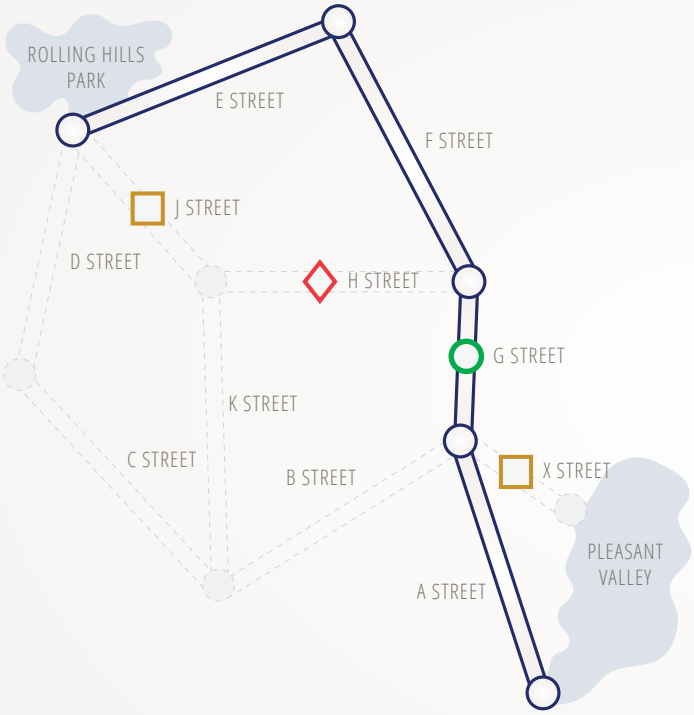
NOTE: Changing the width of a street is a lot more expensive than changing its speed limit.

STREET NAME	ROAD LENGTH (MILES)	COST OF CHANGE
X	0.75	$10,000
G	1	$0
H	1.75	$22,000
J	1.5	$10,000
XGHJ	5 miles	$42,000

STEP 5 - Providing a Design Rationale

11% of eighth-grade students were able to provide a rationale for their design, which included a complete explanation of the compromises among design criteria.

The city needs to know the reasoning behind the proposed route design. Students need to explain how their route was a compromise between cost and route length.



LEGEND Safe Less safe Unsafe

You have selected route AGFE. Explain below why you selected this route. Refer to the information in the table to support your answer.

Example student response
Route AGFE is the best route because even though it is not the shortest possible route, it is the cheapest route.

Experience this task as students did. Take the safe bike lane task and three others here: **www.nationsreportcard.gov/tel_2014/#tasks**