

Optimizing Bikeway Path Design

Students will design Class IV bikeway paths for a small town. Three-day lesson for grades 9-college.

INTRODUCTION

Culminating activity:

You are a transportation engineer working for the City of Huron, CA. A recent grant has made funding available for developing Class IV bike lanes that the Huron City Council wants to pursue. Total funding only allows for 2 miles of bike lanes. You will prepare a PowerPoint proposal to inform the community where you think the bike lanes should be developed and your reasoning.

Objectives (Students will be able to...)

- Students will design a bikeway solution for a small city.
- Students will describe a map of bikeway paths in a presentation.

ACTIVITIES

Phase I: Importance of Bikeways

Activity

1. Students watch the humorous video “9 Worst Bike Lanes” and the first 2m30s of “Bike Lanes Are Not Good Enough.”

Questions for Engagement*

- “Why do you think cities want to develop bikeways?”
- “Do we have any bikeways near the school?”
- “Why do you think many motorists oppose bikeways?”
- “Do you think any of the photographs in the video were fake?”
- “Do you think we should build more bikeways, and why or why not?”

*Questions Depth of Knowledge. See Table I.2 in *The Art and Science of Lesson Design*.

Phase I: Bikeway Classification

Activity

1. Students read online report “Fresno-Clovis Metropolitan Area Class IV Bikeway Feasibility Study” in order to identify the four classifications of bikeways.
2. Teacher then summarizes and shows pictures of the four general classifications of bikeways:

(a) Class I bikeways are called *bike paths*, (b) Class II bikeways are called *bike lanes*, (c) Class III bikeways are called *bike routes*, and (d) Class IV bikeways are called *cycle tracks*, *separated bikeways*, or *protected bikeways*.

Checking for Understanding & Engagement

- “Explain the difference between Class ___ and Class ___ lanes.”
- “Here is a picture of a bikeway. What class of bikeway is this and why?”
- “What are the benefits of Class ___ bike lanes over other classes?”
- “Under which conditions do you think a city would not want bikeways?”
- “Why is it important to understand bike lane classifications?”

Activity

1. Students watch the video “Using a Protected Bikeway.”
2. Students review the table of contents of the online manual “Separated Bike Lane Panning and Design Guide” published by the Federal Highway Administration.

Checking for Understanding & Engagement

- “Summarize the contents of Chapter ___ in your own words.”
- “Which of the figures in the manual seem irrelevant to installing Class IV bikeways in a small town with no medians and only two-way streets?”

Phase II: Bikeway Design

Activity

1. Teacher instructs students how to use the street view feature of Google maps using the Google map of Huron as an example.

2. Teacher then asks students to indicate where prominent residential areas and business are in the city of Huron and models an example.
3. Students work independently to mark their Google maps with these features.

Checking for Understanding & Engagement

- How did you find the residential area on the Google map?
- Do you think apartment complexes should be considered differently from ordinary houses when it comes to the design of bike paths?

Activity

1. Students analyze the Google map of Huron to determine likely levels of traffic flow. Teacher first models for students how this is done using a typical city street. ("Hmmm ... this street is wide, has two lanes, and I notice that in the street view there are a lot of cars driving down the street. On the Google map this road clearly connects major features of the town. To me, this street is probably high-traffic.")
2. Once the instructor is satisfied students understand the decision-making involved in determining the likely traffic flow of a street, students work independently to highlight the high-traffic streets in their Google map.

Checking for Understanding & Engagement

- How did I determine whether a street is high-traffic?

Activity

Develop vocabulary using a Frayer model: *residential*, *commercial*, & *compass*.

Checking for Understanding & Engagement

- Use the following words in a sentence and read aloud: *residential*, *commercial*, & *compass*.

Activity

1. The teacher uses a think-aloud on how they would design the bike lanes for a smaller portion of the city (or use a completely different city), including how they would decide on the best barrier to protect cyclists from cars.

Checking for Understanding & Engagement

- How did I decide on the barrier and where to put the bike lanes?
- Would you have done it differently? If so, why?

NOTE: An accident map of Huron and Active Transportation Plan for Huron is also provided for those teachers that want to accumulate that data into the students' path designs.

Resources and Materials

- Accident Map for Huron, CA
- California Active Transportation Program Map & Summary

Phase III: Presentation

Activity

1. Student groups present a PowerPoint slide of their bikeway design, discussing the features of the bikeway and their decision making.

Checking for Understanding & Engagement

- What type of barrier did you use and why?
- What other aspects of the city would you want to investigate to determine whether bike lanes will benefit its residents?

Phase III: Career Relevance

Activity

1. Teacher discusses the need for transportation engineers to speak in public.
2. The teacher then discusses the transportation engineering field including their pay scales, which organizations hire them, and their roles/responsibilities. (See the [payscale.com](https://www.payscale.com) entry for Transportation Engineer Salary for information.)

Checking for Understanding & Engagement

- How much do transportation engineers make each year?
- Who hires transportation engineers?
- Name one thing that a transportation engineer does.
- What is the relationship between transportation engineering and civil engineering?
- Do transportation engineers have to present to the public?
- What kind of skills do you think you have that would make for a good transportation engineer?

- What skills would you like to improve if you wanted to be a transportation engineer?
- Does the field of transportation engineering interest you? Why or why not?

SUMMATIVE ASSESSMENT

Assessment Type: Observations

Teacher will observe student presentations, paying close attention to the manner in which students describe features of their map in terms of compass directions and use and knowledge of technical vocabulary (e.g., compass directions, distances, residential, commercial, route, and high-traffic).

Notes:

- Development of this lesson plan funded by The Fresno State Transportation Institute (FSTI).
- This lesson plan developed using the approach described in The Art and Science of Lesson Design by J. Walkup and S. Squire.
- Throughout the lesson, students will complete a Metacog Log (p. 112, Walkup & Squire) to assess their own understanding and confidence.

Standards and Objectives

Standards

California's 2013 CTE Standards

- **CTE.T.KPAS.10.3** Construct projects and products specific to the Transportation sector requirements and expectations
- **CTE.T.KPAS.7.5** Apply high-quality techniques to product or presentation design and development.
- **CTE.T.KPAS.5.4** Interpret information and draw conclusions, based on the best analysis, to make informed decisions
- **CTE.T.A.3.1** Identify and understand transportation options such as rail, air, road, and sea

California English Common Core Standards

- **SL.K.5** Add drawings or other visual displays to descriptions as desired to provide additional detail.
- **SL.K.6** Speak audibly and express thoughts, feelings, and ideas clearly.
- **SL.1.5** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
- **SL.1.6** Produce complete sentences when appropriate to task and situation.
- **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Author: John Walkup

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