

# MODULE 3: ROAD SAFETY AUDITS

## Lesson 1: SCHOOL ZONE SAFETY AUDIT

### GRADE LEVEL: 9 – 12

All students are probably aware of methods for traffic safety around their schools – possible special roadway signage, reduced speed limits during drop-off and pick-up times, exclusive routing and waiting areas for buses and for parents, and marked crosswalks with crossing guards. This lesson challenges students to think critically about the safety aspects of the transportation routes and devices around their own schools.

*Created By:*

NanoSonic, Inc.

Giles County  
Public Schools

Leidos

# Lesson 1: School Zone Safety Audit

***Contributed by:*** NanoSonic, Leidos, Giles County Public Schools

|   |                                      |
|---|--------------------------------------|
| <b>Grade Level:</b> 9-12                        | <b>Lesson in this Module:</b> 1 of 1 |
| <b>Time Required:</b> 90-120 minutes            | <b>Lesson Dependency:</b> None       |
| <b>Keywords:</b> road safety audit, school zone |                                      |

## Related Curriculum

|                         |   |
|-------------------------|---|
| <b>Subject Areas</b>    | Science; technology; engineering; mathematics   |
| <b>Curricular Units</b> | Intelligent transportation systems  |
| <b>Activities</b>       | Creating a Map of the Area; Investigation Time!; Establishing a plan to improve safety! |

## Educational Standards

This lesson plan and its associated activities are correlated to the national standards in the each of the core discipline areas of STEM: Next Generation Science Standards, American Association for the Advancement of Science Standards, Standards for Technological Literacy, International Society for Technology in Education Standards, Common Core Mathematics Standards, and the National Council of Teachers of Mathematics Standards.

## Pre-Requisite Knowledge

None.

## Learning Objectives

- Students will diagram the school property and surrounding transportation infrastructure.
- Students will interview local personnel about transportation safety concerns around the school.
- Students will learn about available ITS solutions and make decisions about implementation of safety improvements.
- Students will construct a model that includes the new transportation improvements.

## Introduction/Motivation

All students are probably aware of methods for traffic safety around their schools – possible special roadway signage, reduced speed limits during drop-off and pick-up times, exclusive routing and waiting areas for buses and for parents, and marked crosswalks with crossing guards. This lesson challenges students to think critically about the safety aspects of the transportation routes and devices around their own schools. Although all schools are different in their transportation methods and needs, this lesson will address the requirements of a broad range of school locations.

## Lesson Background & Concepts for Teachers

A road safety audit (RSA), as defined by the Federal Highway Administration, is a formal evaluation of a road's status with respect to existing or missing safety features. RSAs are conducted with a team of professionals from a variety of different backgrounds from transportation engineers to law enforcement officers to advocacy groups and community members. In plain language, an RSA is a close look at a particular road or intersection to identify potential safety issues. Each RSA has a team that is comprised of members that are not intimately familiar with the specific location and who represent a variety of transportation safety expertise.

Expanding this concept to school zones, where student safety is a top priority, a school zone safety audit is an RSA that occurs within a school zone. In this case, the RSA team may be comprised of engineers, law enforcement officers, school bus drivers, crossing guards, parents, students, etc. The main goal of a road safety audit is to identify potential safety issues within roadway sections and present solutions to make those roadways safer for all roadway users, including passenger vehicles, trucks, bicycles, and pedestrians. School zone safety audits are thus especially important due to the large amount of buses, vehicles, and pedestrians traveling in and out of the school zone at concentrated times of the day (i.e. before school and after school).

- **Steps of a School Zone Safety Audit**

The two main parties involved in a school zone safety audit can be schools, residents, parents of students, and others near the school zone (herein referred to as the “initiator”) in question and the RSA

team itself. There are typically eight steps to performing a school zone safety audit. The first two steps, identifying the school zone and selecting the RSA team, are part of the initiators' responsibilities. The next four steps are performed by the RSA team. These steps are to conduct a start-up meeting, perform field reviews of the school zone being analyzed, conduct analysis and prepare a final report, and present findings to the initiators. The final two steps of the RSA process are for the initiators to prepare a formal response to the final report and to incorporate the RSA findings and recommendations.

- **Benefits to Performing a School Zone Safety Audit**

Successfully performing a school zone safety audit and subsequently taking the necessary steps to implement the suggested solutions for solving the safety issues identified in the audit can have many benefits. Typically, school zone safety audits are cost-effective, meaning that the benefits gained from improving safety outweighs the costs of performing the audit and implementing the suggested solutions. The quantifiable benefits of road safety audits include reducing the number of crashes (and associated injuries and fatalities), reduced number of liability claims associated with school zone crashes, and reduced cost of maintaining newer signs and equipment.

- **Google Maps**

Google Maps is an essential part of Activity 1. Within Google Maps, a user can search for a location by going to <https://www.google.com/maps> and typing in the location, whether it be the name of a building (i.e. a school, hospital, grocery store, etc.), the name of a town, or even a street name/intersection. The maps can be displayed as a standard aerial map ("Map") or as a satellite image ("Earth"). Toggling between views can be done by clicking the square in the lower left-hand corner, which should say either "Map" or "Earth", depending on which view the map is displaying.

Google Maps offers a unique feature called Google Street View which provides map users with the ability to view an image of the location as if they were physically standing or driving on the road. It can be accessed in one of two ways. The first option is to click and drag the yellow character on the toolbar in the lower right-hand corner and dropping him onto the desired location on the map. The second option is to enter the location's address in the search bar, press enter (or click the magnifying glass), and then, after the site has been located on the map, select Street View from the drop down menu that is displayed below the search bar.

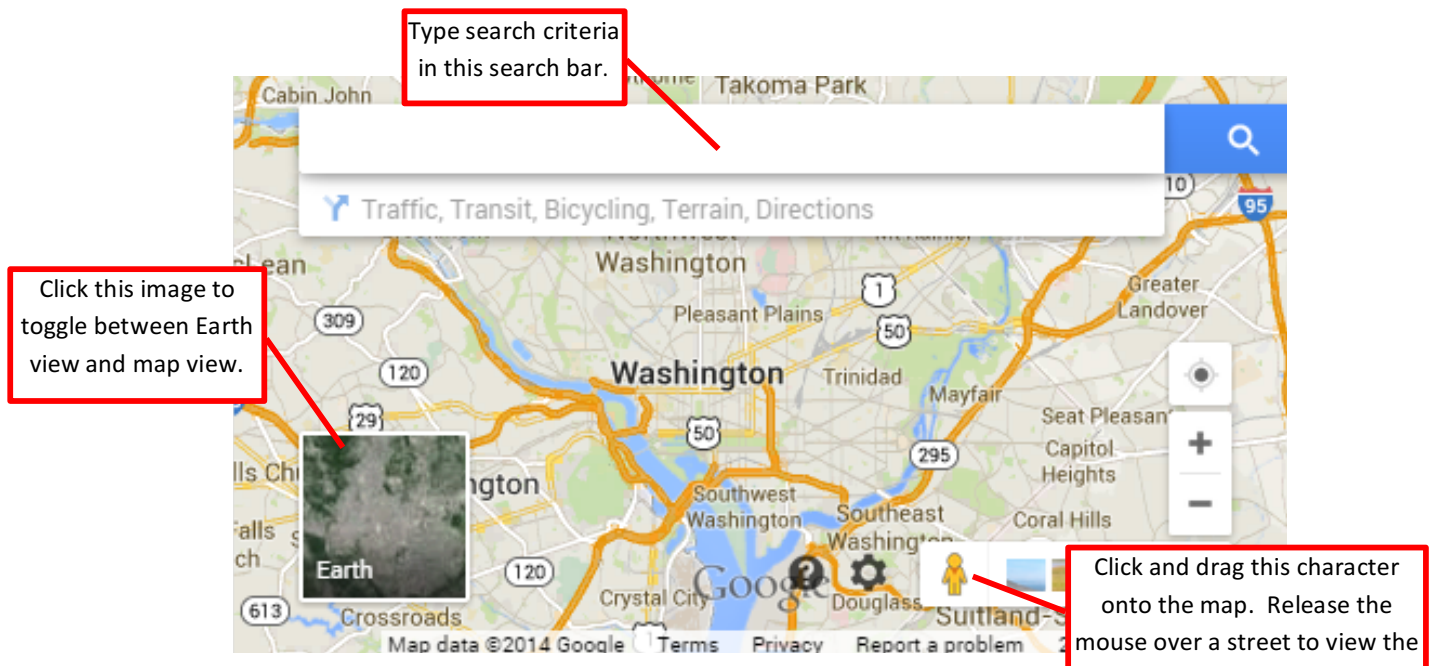


Figure 1: Sample view of Google Maps - location of features may vary by browser.

## Vocabulary/Definitions

| Vocabulary Word                           | Definition   |
|---|--|
| <b>Actuated Traffic Signal</b>            | Traffic signals at a four-way intersection are all automated, rather than on a fixed timer. Automation is achieved by using a camera or other sensory equipment to determine which lanes should receive a green light.   |
| <b>Intelligent Transportation Systems</b> | Advanced technologies that transportation engineers use to improve transportation safety and traffic flow. In this module, actuated or semi-actuated traffic signals represent one form of intelligent transportation systems.   |
| <b>Road Safety Audit</b>                  | An in-depth evaluation performed by a team of multi-disciplinary professionals of the potential safety issues and concerns at a particular road or intersection.   |
| <b>Semi-Actuated Traffic Signal</b>       | A few traffic signals at a four-way intersection are automated, rather than on a fixed timer. This may happen if a smaller, rarely traveled arterial road intersects a busier major road. If the signal is semi-automated, the smaller road will have sensory equipment so when cars arrive, they receive a green light, but otherwise the light stays green on the main road. |

## Associated Activities

The activities in this lesson plan walk the students through an introductory-level school zone road safety audit.

- **Activity 1 –Creating a Map of the Area**
  - Use Google Maps to view an aerial image of the school’s property and surrounding road network. Instructors may toggle between the Map view and satellite (Earth) view to point out specific landmarks so students can gain a better understanding of the area and road network surrounding the school.
  - Students will use this image to sketch their own map of the school zone including building footprints and roadways.
  - Use Google Street View to identify which signs, pavement markings, and safety devices on the roads. Indicate their presence on the students’ maps. Use the distance scale to approximate the distance between signs.
- **Activity 2 - Investigation Time!**
  - Interview various people at the school about transportation around the school. Potential personnel include: a school resource officer, crossing guards, bus drivers, principal, teachers, parents, and peers. If time allows, consider allowing students to interview government officials or engineers from the city or county to determine if there have been traffic complains in the school zone.
  - Based on information gathered up to this point, identify and discuss specific safety concerns around the school.
    - Congestion at dismissal: may be caused by buses, parent drivers, children running everywhere, etc.
    - Comingling of buses and cars: do buses have a separate entrance from parents?
    - Visibility of signs: can they be seen around a curve or when vegetation (trees, bushes, leaves, etc.) is overgrown? Do they allow enough time for a vehicle to see the signs and slow down?
    - Vehicles traveling above the school zone speed limit: did any of the interviews reveal this concern? Consider borrowing a radar detector from a local law enforcement agency and assign some students to collect speed readings within an active school zone.
    - Accommodations for all road users: young pedestrians, bicyclists, people who cannot see well, people constrained to wheel chairs, etc.)

- **Activity 3 – Establishing a plan to improve safety! (Recommending Improvements)**

- Discuss potential ITS solutions that relate to school transportation, such as:

- Flashing school zone speed reduction signs (pre-timed to activate and flash during school hours only)
- Speed feedback signs (Figure 2), indicating reduced school speed limit and the speed of approaching vehicles
- Installation of traffic signal (pre-timed to flash when school is not in session; only displays red/yellow/green when needed for dismissal or drop-off)
- Changeable message sign to display message about



Figure 2: Speed feedback sign for a school zone.

schools (especially during early dismissal days)

- **High-intensity Activated crossWALK beacon (HAWK)** is a traffic signal used to stop road traffic and allow pedestrians to cross safely (Figure 3); for more info:

[http://safety.fhwa.dot.gov/ped\\_bike/tools\\_solve/fhwasa14014/](http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa14014/)



Figure 3: High-intensity Activated crosswalk (HAWK signal)

- Have students investigate the standard installation requirements using the Manual on Uniform Traffic Control Devices (<http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part7.pdf>) *These installation requirements standardize the traffic control for school areas. The section of the MUTCD that relates to school zone traffic control has specific sections on the installation of signs, markings, and crossing supervision to be used in school zones.*
- Students will use the map from activity 1 to indicate where and how they think safety could be improved in their school zone. If time permits, allow students will design and construct a physical model of the redesigned system.
- Create a presentation to inform the school principal, school board members, and/or local authorities of their findings and suggestions.

## Lesson Closure

- What are some transportation safety concerns around schools that a school zone safety audit can help identify and solve?  
*Road safety problems that a School Zone Safety Audit can attempt to identify and solve include limited access to crosswalks where there are a high number of pedestrians, cracked/uneven sidewalks, no designated places for people to walk through/across parking*

*lots or nearby roads, traffic backup and congestion during peak hours, speeding vehicles, inefficient routing of traffic, traffic blocking bus lanes or entrances/exits, sight distance obstructions related to pedestrians, signs, trees, parking, etc.*

- How can ITS technologies and systems improve school zone safety?  
*ITS technologies and systems can improve school zone safety in a variety of ways. Installing flashing signs that light up during drop-off and pick-up times can alert other drivers that there may be traffic in the school area. Flashing signs can also be used to highlight a reduced speed limit during school hours. Variable speed limit signs and speed feedback signs can also be used in the same way. Changeable message signs can be used to alert passing drivers to special events or school conditions, such as early dismissal or an after-school event.*
- What are some of the benefits of performing a school zone safety audit?  
*Performing a school zone safety audit can help lower the number of crashes and hopefully stop the more severe crashes where people get hurt and have to go to the hospital. By taking an active role in keeping school zones safe, the number of liability claims within school zones may be reduced.*

## Extensions/Multimedia

- Utilize Edmodo ([www.edmodo.com](http://www.edmodo.com)) to provide further questioning and discussion between students and teacher. Edmodo is a safe social learning website made specifically for teachers and students. It is a way to collaborate on assignments, homework, projects, and after-school STEM programs and is used as a communication tool to provide additional questioning and feedback from teachers and students.
- Invite a police officer or transportation engineer to talk to your class about the existing or proposed transportation safety devices in the school zone.

## References

- "RITA - Intelligent Transportation Systems - USDOT." RITA - Intelligent Transportation Systems - USDOT. US Department of Transportation, n.d. Web. 30 Sept. 2014.
- "Road Safety Audits (RSA)." - FHWA Safety Program. Federal Highway Administration, n.d. Web. 30 Sept. 2014.