

Creating a Traffic Light

I n t e g r a t i o n	21st Century Themes: Learning and innovation skills		
	Concepts for STEAM Disciplines	Mathematics Basic geometric shapes Intervals	Science Time and distance
		Technology GeoGebra	Arts Design
	Prerequisite Knowledge		
	<p>Mathematics Basic geometric shapes</p> <p>Information Technologies GeoGebra</p> <p>Science Education The principles of motion and velocity, including the relationships between speed, distance and time</p> <p>Arts –</p>		
	Learning Outcomes		
	<p>Grade Level: 13-15 years old Duration: 300 minutes</p> <p>Learning Outcomes for Mathematics Students will be able to apply mathematical concepts such as geometric shapes and angles. Students will be able to apply time intervals to create a virtual traffic intersection.</p> <p>Learning Outcomes for Information Technologies Students will be able to use basic programming concepts such as sequencing and loops to program traffic light patterns in GeoGebra.</p> <p>Learning Outcomes for Science Education Students will be able to understand the principles of motion and velocity.</p> <p>Learning Outcomes for Arts Design</p>		
R e a l	Problem Situation		
	Your town is experiencing heavy traffic congestion at a busy intersection where two major roads cross. Design and program a virtual traffic light system using GeoGebra to improve traffic flow and reduce accidents. Consider the flow of traffic and safety for both cars and pedestrians.		
W o r l d	Materials		
	<ul style="list-style-type: none"> ● Laptops or desktop computers with GeoGebra software installed ● Sketch paper and pencils 		
C o n t e x t	Research to Prepare Lesson		
	<p>The following questions will be sought answers for preparing the lesson plan.</p> <ul style="list-style-type: none"> ● What are the different types of traffic lights and signals, and how do they work to regulate traffic? ● What programming language is used in GeoGebra? ● What are some of the basic programming concepts that can be used in GeoGebra's programming language? 		

	<p>Resources</p> <ul style="list-style-type: none"> • https://www.geogebra.org/ • https://wiki.geogebra.org/en/Scripting • https://wiki.geogebra.org/en/Scripting_Commands • https://youtu.be/84lvCpJPOfU • https://youtu.be/MeTy7ZHpc8g • https://youtu.be/nDhJcP79bEc • https://www.geogebra.org/m/s7vattvg
<p>S T E A M A c t i v i t y</p>	<p>Ask</p> <p>To start the class, the teacher will ask the students if they have ever experienced traffic congestion or seen a busy intersection with traffic lights. Students will be encouraged to share their experiences and observations. The teacher will then prompt students to brainstorm and discuss the possible factors that contribute to traffic congestion and accidents at intersections, such as pedestrian traffic, turning vehicles, and rush hour traffic. Students will be encouraged to think about how these factors might affect traffic flow and safety.</p> <hr/> <p>Research</p> <p>The teacher will ask students to gather information about the traffic lights near the school. Students will be asked to record the following information:</p> <ul style="list-style-type: none"> • What types of traffic lights are there at the intersection? • What is the duration of each light? • What happens with the traffic light at the other corner during each light? <p>Students can collect this data by observing the traffic lights near the school and recording their observations in a table or a chart. They can also take pictures or make sketches of the intersection to help them remember the details.</p> <hr/> <p>Imagine</p> <p>After gathering information about the traffic lights near the school, students will be asked to imagine different scenarios that might occur at the intersection. Students will then discuss their ideas with their peers, sharing their observations and insights. They can use the data they gathered earlier to support their arguments and ideas. The teacher will facilitate the discussion and encourage students to ask questions and engage in critical thinking.</p> <hr/> <p>Plan</p> <p>The students will work in pairs to create a GeoGebra file for the design and programming of a traffic light system. This will help them understand the concept behind programming a traffic light system. They can refer to the suggested videos in the resources for guidance and assistance.</p> <p>After creating a basic traffic light in GeoGebra, students will work in pairs to design and program a more complex traffic light system for a real-world intersection. They will begin by sketching a diagram of the intersection and identifying where the traffic lights will be placed. Next, they will program the traffic lights to work together to manage the flow of traffic and ensure the safety of pedestrians and drivers. The teacher will provide guidance and support as needed, and students will have access to resources such as online tutorials and reference materials.</p> <p>Students will also add design elements to their GeoGebra file, such as streets, lines, and other relevant features. This will help them to visualise how their virtual traffic light system will function in a real-world setting. The teacher will provide guidance and feedback to ensure that the design is both functional and aesthetically pleasing.</p>

	<p>Create</p> <p>The students will create a GeoGebra file with at least two traffic lights at an intersection and program them to function properly. They will also add basic design elements.</p> <p>During this part of the activity, the teacher will provide guidance and support to help students create their virtual traffic light system. The teacher will encourage students to use the information they gathered during the Research and Imagine stages to inform their design decisions.</p> <p>Students will work in pairs to create their GeoGebra file, allowing them to collaborate and share ideas. They will be encouraged to experiment with different programming techniques to achieve their desired traffic flow and safety outcomes.</p>
	<p>Test</p> <p>the students will create a video demonstrating how their traffic light system works. They should explain the design and programming choices they made and any data they collected during the Research phase that influenced their decisions.</p> <p>The videos will be presented in class, and the students will have an opportunity to share and discuss their virtual traffic light systems with their peers.</p> <p>The teacher can provide feedback and evaluate the student's understanding of the concepts involved in designing and programming a traffic light system.</p>
	<p>Improve</p> <p>To further challenge the students, they can be asked to add more elements to their GeoGebra file, such as images of cars and program them to move according to the traffic light signals.</p>
<p>M a t e r i a l s</p>	<ul style="list-style-type: none"> ● Laptops or desktop computers with GeoGebra software installed ● Sketch paper and pencils
<p>T e s t</p>	<p>This part will be completed by the teacher after the lesson plan is implemented in the classroom.</p>
<p>I m p r o v e</p>	<p>This part will be completed by the teacher after the lesson plan is implemented in the classroom.</p>