The Labyrinth Challenge: Designing and Solving Mazes

<table>
<tr><td rowspan="4">Integration</td><td colspan="3">21st Century Theme: Critical Thinking and Problem-Solving</td></tr>
<tr><td rowspan="2">Concepts for STEAM Disciplines</td><td>Mathematics
Geometry
Spatial reasoning</td><td>Arts
Design
3D models</td></tr>
<tr><td>Technology
GeoGebra
Augmented Reality</td><td>Science Education
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<tr><td colspan="3">Prerequisite Knowledge

Mathematics

Basic knowledge of geometry, such as shapes and angles.
Basic understanding of measurements.

Information Technologies
Students are able to use GeoGebra.

Arts
Ability to use basic drawing tools, such as a pencil and ruler.</td></tr>
<tr><td colspan="3">Learning Outcomes

Grade Level: 14-16 years old
Duration: 300 minutes

Learning outcomes for Mathematics
Students can apply mathematical concepts such as geometry, measurement, and spatial reasoning and develop problem-solving skills.

Learning outcomes for Technology
Students will develop their technological literacy and gain experience using digital tools such as GeoGebra and augmented reality.

Learning outcomes for Arts
Students will develop their creativity.
Improve students' drawing and design skills.</td></tr>
<tr><td rowspan="4">Real life Situation</td><td colspan="3">Problem Situation
Design and create a challenging maze using augmented reality for an upcoming school escape room challenge.
Can you create a visually stunning maze?</td></tr>
<tr><td colspan="3">Materials
● Computer with GeoGebra installed
● Smartphones or tablets with camera and AR capabilities
● Paper and pencil for sketching out maze designs</td></tr>
<tr><td colspan="3">Preparation for the lesson
Answers will be sought to the following questions:

● What is augmented reality, and how can it enhance the maze design experience?
● What are some best practices for designing a visually appealing and challenging maze?</td></tr>
<tr><td colspan="3">Resources
● https://www.geogebra.org
● https://youtu.be/rrSdd7eaX60
● https://youtu.be/IO4JrszazWE</td></tr>
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	• https://www.geogebra.org/m/jhcywuqw
STEAM Activity	**Ask** The lesson begins by brainstorming. Students are asked the following questions: • How would you define a maze? • What makes a maze challenging or interesting? • What are some common features of mazes?
	Research During the research stage of the activity, students will have the opportunity to search for information about mazes on Google. To help them find relevant information, students can use search terms such as "maze history", "types of mazes", or "how to design a maze". Once they have completed their search, they will watch the videos provided by the teacher. These videos will offer additional insights and ideas on maze design using GeoGebra AR. After completing the research and watching the video, students can then move on to exploring GeoGebra 3D and creating simple shapes. This will allow them to gain hands-on experience with 3D modelling tools and prepare them for creating their own unique maze designs for the escape room challenge.
	Imagine Students will discuss the information they found during the research stage and consider any additional information they want to include it in their maze designs. They will also showcase the 3D models they created in GeoGebra 3D. Additionally, students will have the opportunity to test out their 3D models in GeoGebra AR, allowing them to see how their shapes will look in a real-world environment. This will help them visualise how their designs will appear to the players in the escape room challenge. Through this stage, students can further refine their ideas and develop a clearer vision of their maze designs, ensuring they are challenging and engaging for the players.
	Plan Students will work in pairs to design their own maze on paper, considering factors such as size, complexity and obstacles. They will then use GeoGebra to create a digital version of their maze, incorporating the shapes they created in the previous stage. The creation process will involve multiple stages of redesign and discussion, with students receiving feedback from their peers and the teacher to refine their designs. They will also explore different features of GeoGebra, such as adding textures and colours to their mazes, to make them more visually appealing. At the end of this stage, students will have a finalised version of their maze design, which they will use in the final stage of the project.
	Create Students will create their own unique mazes using GeoGebra 3D. They will incorporate various design elements such as walls, obstacles, dead ends, and multiple paths to make their maze challenging and engaging for the escape room challenge.
	Test Students will exchange their maze designs with other groups and test them in the schoolyard. This will allow them to experience the challenge and fun of solving a maze, as well as gain feedback from their peers on the design and difficulty level of their maze.
	Improve To the improve stage, students can select one of their maze designs created in the previous stage and construct a physical version using cardboard or other materials. This physical maze can then be shared with other students at the school, allowing them to play and solve the maze as part of the escape room challenge.

Materials	• Computer with GeoGebra installed • Smartphones or tablets with camera and AR capabilities • Paper and pencil for sketching out maze designs • Cardboard • Scissor and utility knives • Tape or glue for assembling
Test	This part will be completed by the teacher after the lesson plan is implemented in the classroom.
Improve	This part will be completed by the teacher after the lesson plan is implemented in the classroom.