Lego Labyrinth: Building STEM Paths for HEX Bugs

You might have to adjust the amount of time for each section or break it up into 2 days. **1st day:** They build and test their own. **2nd Day:** They make innovations on another group's creation.

Grade Levels: 2nd through 5th

Objective:

- Students will understand the Engineering Design Process and its iterative nature.
- Students will demonstrate creativity and innovation in designing and refining LEGO paths for HEX bugs.
- Students will collaborate effectively in testing and improving their own designs as well as those of their peers.

Materials Needed:

- LEGO bricks
- HEX bugs
- 12" x 12" LEGO square platforms
- Paper and pencils for sketching designs

Standards:

- Next Generation Science Standards (NGSS):
  - NGSS.ETS1.A: Defining Engineering Problems
  - NGSS.ETS1.B: Developing Possible Solutions
  - NGSS.ETS1.C: Optimizing the Design Solution
- Common Core State Standards (CCSS):
  - CCSS.MATH.CONTENT.3.MD.D.8: Solve real world and mathematical problems involving perimeters of polygons. (Seen in the Extension Portion)
  - CCSS.ELA-LITERACY.SL.4.1: Engage effectively in a range of collaborative discussions.

Procedure:

Introduction (15 minutes):

- Begin by introducing the Engineering Design Process (EDP) to the students. Explain each step: Ask, Imagine, Plan, Create, Test, and Improve.
- Discuss how engineers use this process to solve problems and create innovative solutions.
- Show examples of simple LEGO mazes and HEX bugs to the students to give them a sense of the activity.

Planning and Design (20 minutes):

- Provide each student or group with paper and pencils.
- Instruct them to sketch out their mazes designs, considering factors like complexity, pathways, dead-ends, and challenges for the HEX bugs.
- Encourage students to think creatively and plan their designs before starting to build.

Building (30 minutes):

- Distribute LEGO bricks and platforms to the students.
- Allow them time to construct their maze designs based on their sketches.
- Circulate the room to provide assistance and guidance as needed.

Testing and Adjustments (20 minutes):

- Once the mazes are built, provide each group with a HEX bug.
- Instruct students to test their mazes and observe how the bugs navigate through them.
- Encourage them to identify any challenges or areas for improvement.
- Guide students in making adjustments to their mazes to address any issues.

Rotation and Innovation (30 minutes):

- Have each group rotate to another group's maze.
- Emphasize that now they will practice being innovators by testing out new paths and discussing potential improvements.
- Instruct students to test the new mazes with their HEX bugs, noting any innovative features or challenges.
- Facilitate a group discussion where students share their observations and ideas for innovation.
- Encourage students to collaboratively brainstorm and make improvements to the mazes they tested.

Conclusion (10 minutes):

- Gather the students back together for a final discussion.
- Review the Engineering Design Process and highlight the importance of iteration and innovation in problem-solving.
- Allow students to showcase their final maze designs and share any insights gained from the activity.

Assessment:

- Observe students' engagement and collaboration during the planning, building, testing, and innovation phases.
- Review students' maze designs and notes to assess their understanding of the Engineering Design Process and their ability to refine and innovate.
- Encourage students to reflect on their experiences and identify what they learned about problem-solving and teamwork.

Extension:

- Encourage students to continue exploring engineering design principles by designing and building more complex mazes or experimenting with different materials and obstacles.
- Integrate concepts of measurement and geometry by having students calculate the perimeter or area of their mazes.
- Connect the activity to real-world applications by discussing how engineers use similar processes to design buildings, bridges, and other structures.