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# Magna-Ville: Engineering a City of Tomorrow

## Materials Needed

- A set of Magna-Tiles (including squares, small and large triangles)
- Magna-Tiles road pieces (curves, straights, and intersections)
- A few small toy cars or vehicles
- A flat, open space to build on (floor or large table)
- **Optional:** Small figurines (people, animals), blue felt or paper for a river, blank paper and markers for drawing a city plan.

## Lesson Information

- **Subject:** STEAM (Science, Technology, Engineering, Art, Math)
- **Age Group:** 6-8 years old (Perfect for a 7-year-old)
- **Time Allotment:** 45-60 minutes
- **Focus:** Engineering design, problem-solving, spatial reasoning, and creative expression.

## Learning Objectives

By the end of this lesson, the student will be able to:

- Design and construct a functional city layout with connected roads and at least three different types of buildings.
- Incorporate at least one simple machine concept (e.g., a ramp/inclined plane for a parking garage) into their city design.
- Identify and solve a simple structural problem during the building process (e.g., making a bridge more stable, making a tower taller without it falling).
- Verbally explain the purpose and function of their city's main features during a "city tour."

## Lesson Activities

### Part 1: The City Planner (Introduction & Brainstorm - 10 minutes)

1. **The Hook:** Start with a story! "Imagine you are a world-famous city planner and engineer. A group of tiny toy car citizens has hired you for a big job. They need a brand new city, 'Magna-Ville,' to live in! Their only requests are that it must have places to live, fun things to do, and roads that actually connect. Are you ready for the challenge?"
2. **Brainstorming:** Ask your student questions to get them thinking like a planner:
    - "What does every great city need?" (Guide them to ideas like houses, a hospital, a fire station, a park, stores, bridges, etc.)
    - "How can we make our buildings strong?" (Talk about using a wide base with large squares.)
    - "How will the cars get from one place to another?" (Introduce the road pieces.)
3. **The Blueprint (Art):** On a piece of paper, encourage your student to draw a simple map or "blueprint" of their city. This doesn't have to be perfect! It's just to help them visualize their ideas. Where will the houses go? Where will the main road be? Will there be a river that needs a bridge?
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Part 2: The Engineer (Main Build - 25 minutes)

1. **Foundation First:** Encourage the student to lay out the roads first, based on their blueprint. This creates the skeleton of the city.
2. **Construction Zone:** Now, it's time to build! Let the student take the lead in constructing the buildings and features they planned. Encourage experimentation with different shapes and designs.
3. **Introduce a Challenge:** While they build, introduce mini-engineering challenges to encourage problem-solving.
    - **The Bridge Challenge (Engineering):** "Oh no! There's a river (lay down blue felt/paper) cutting through your city. Can you engineer a bridge that is tall enough for a car to pass *under* it and strong enough for a car to drive *over* it?"
    - **The Parking Garage Challenge (Science/Technology):** "The city is getting busy! It needs a parking garage. Can you build one with a ramp (an inclined plane) so the cars can drive to the second floor?"
    - **The Skyscraper Challenge (Math):** "The citizens want a really tall skyscraper. What is the tallest tower you can build that won't fall over? How can we make its base stronger to support its height?"

Part 3: The Tour Guide (Closure & Reflection - 10 minutes)

1. **Welcome to Magna-Ville:** Once the city is complete, have the student become the official tour guide. Using a toy car, they will drive you through their city and explain what each building is and how it works.
2. **Reflection Questions:** Ask open-ended questions to reinforce their learning experience.
    - "What is your favorite part of the city you built? Why?"
    - "What was the trickiest part to build? How did you solve that problem?"
    - "If we built another city tomorrow, what is one thing you would do differently?"
3. **Photo Documentation:** Take a picture of the final creation! It’s a great way to celebrate their hard work and track their design skills over time.

Differentiation and Extensions

- **For Extra Support:** Work side-by-side with the student to build the base of each structure. Focus on building just one or two key features, like a house and a simple road loop. Use picture cards of different buildings for inspiration.
- **For an Advanced Challenge:**
    - **Add a Budget:** Give the student a set number of tiles they can use ("You have a budget of 50 tiles to build your city"). This introduces resource management.
    - **Introduce a "Crisis":** Create a scenario they must solve with their build. "A pretend earthquake happened! How can you reinforce your bridge to make it stronger?" or "The hospital needs a helipad on the roof for emergencies. Can you design a flat, stable roof to support a toy helicopter?"
    - **Zoning Laws:** Challenge them to build specific "zones"—a residential area for houses, a commercial area for stores, and a recreational area for a park.

Assessment

Assessment is informal and based on observation and conversation. Look for:

- **Task Completion:** Did the student build a city with roads and buildings?
- **Problem-Solving:** Did the student actively try to fix a wobbly tower or a disconnected road? Watch their process of trial and error.
- **Creativity & Application:** Did the student use the tiles in unique ways? Did they successfully create a ramp or a sturdy bridge?

- **Communication:** Could the student explain the function of their city's parts during the final tour?

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