Imagination Lab Unit Plan: Architecture

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| STEM Focus: | Mathematics (Grades 3-5) |
| Topic: | Geometry/Spatial Reasoning |
| Goal: | Reason with shapes and their attributes. |
| CCSS Connection: | CCSS.MATH.CONTENT.3.G.A.1<br>Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. |

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**Pre-Activity Assessment**

1. [handout] Use the grid below to **Design a Robot** using as many shapes as possible. How many could you create? **Count them**. How many can you name? **Label them**. Remember, your lines can be at a slant or diagonal, but their corners (vertices) need to touch a dot on the grid.
2. Many of these shapes are Quadrilaterals because they have four sides. **Color them**.

**Central Questions**

1. Why are different shapes important?
2. Can they help us build better structures?
3. Can they communicate different moods or ideas?

**Warm-up Activity: Tangram Challenge**

1. Open your Tangram envelope. How many different shapes do you see? **Count them**. **Name them**.
2. Are any of the shapes the same? **Categorize them**.
3. We have a Triangle, Square, and a Parallelogram. Which one is not a Quadrilateral? Why? **Discuss**.
4. Can you combine any of the shapes to make "twin shapes" the exact same size? **Make them**.
5. How many more "twins" can you make? **Make those**. (These are called Congruent Shapes.)

**Book Connection and Exploration: Iggy Peck, Architect**

1. Look at the skyscraper buildings on the page. Use your shapes and a partner's to see which building you can create. **Build it**.
2. Now challenge your partner. Make a shape only using your Tangrams. See if you partner can make the same shape. **Play**. (Again, these will become Congruent Shapes.)

**Design Challenge Part 1: Building 2D and 3D Shapes**

1. Imagine a mini-golf course. What shapes can you design and build as obstacles? **Make them**.
2. Arrange your obstacles on your mini-golf course to challenge another team. **Play**.
3. Look at another team's design. Which ones are Quadrilaterals? Which ones are not? **Discuss them**.

**Book Connection: Iggy Peck, Architect**

1. Look through the book. What structure does it look like Iggy Peck builds at the end? **Explore/Discuss**.
2. Do you notice any Triangles in the overall shape? These are the strongest shape but why? **Discuss**.
3. Show images of bridges. (Project slide images.) Do you see any Triangles? **Explore/Discuss**.

**Design Challenge Part 2: Building a Bridge**

1. A "dangerous river" has now been placed on your mini-golf course. Design a bridge that helps a golf ball safely cross it. Does your design need any Triangles? **Build it**.

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| | 2. Now see if you can safely put your golf ball across another team's bridge. **Play**. |
| **Design Journal Entry:** | 1. Use today's vocabulary words when sketching and describing your mini-golf course. (I notice…, It reminds me of…, I wonder…) |
| **Additional Focus:** | 1. But wait! Can shapes also communicate moods or feelings?<br>2. Explore *Logo Shapes: What They Mean and Why They're Important (URL in Additional Resources) |

**Additional Resources:**

Categorizing Shapes Check
https://www.education.com/worksheet/article/categorizing-shapes-check/

*Logo Shapes: What They Mean and Why They're Important
https://looka.com/blog/logo-shapes-meanings/#:~:text=The%20psychology%20of%20shapes&text=Circular%20shapes%3A%20Unity%2C%20community%2C,Aggression%2C%20masculinity%2C%20strength%2C%20progress

Making Quadrilaterals (updated, see below)
https://www.education.com/worksheet/article/making-quadrilaterals/

Naming Quadrilaterals
https://www.education.com/worksheet/article/naming-quadrilaterals/

Tangram as Teaching Aid in Mathematics - Part 1 or 2
https://www.youtube.com/watch?v=D0nu2tvsYsA

Tangram as Teaching Aid in Mathematics - Part 2 of 2
https://www.youtube.com/watch?v=ye2PmJy16_Y

Using Tangrams to Tell a Story: The Coyote and the Bear
https://www.youtube.com/watch?v=C4wFwBYebYg