THAMES & KOSMOS

LESSON PLAN
UBONGO-01

Game: *Ubongo* (2015) by Grzegorz Rejchtman

Standards Alignment:
- **Common Core:** Verify experimentally the properties of rotations, reflections, and translations
  - o Grade 8: 8.G.A.1
- **21st Century Skills:** Critical Thinking
  - o Reason Effectively
  - o Use Systems Thinking
  - o Solve Problems

Objectives:
- Learners will use manipulatives in order to visualize geometric properties.
- Learners will use discussion in order to analyze geometric properties.

Want to learn more about the game?
Watch our video:
https://www.youtube.com/watch?v=L-j2Kh-PbBE
Visit our website:
http://www.thamesandkosmos.com/index.php/kosmosgames/ubongo
Full game instructions:
http://www.thamesandkosmos.com/manuals/full/696184_ubongo_manual.pdf

Game Specifications:
- Ages: 8 and up
- Players: 1 to 4
- Game Duration: 25 minutes
- Round Duration: 5 minutes
- Playing Area: flat surface

Quick Classroom Instructions:

Set up each player tray with one set of 12 tiles. Give each player a puzzle board. Each puzzle board contains a placement area. Roll the die to determine which puzzle board task (i.e. set of tiles) to complete. Flip the hourglass. Before time runs out, arrange the tiles to complete the puzzle board task on the placement area. Scoring points is optional (see instructions, p. 2).

Suggestions for Classroom Play: In order to focus learning, consider one or more of these suggestions:

- **Tutorial rounds #1:** For the first round or two, teach the game by assigning the same placement area to all students at once. Next, allow students to take the lead in selecting placement areas.

- **Tutorial rounds #2:** First, complete the easy tasks (three tiles). Then, move on to the more difficult tasks (four tiles). Determine the switch from easy to more difficult when most students consistently succeed.

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• **Create your own #1:** Create your own placement area. Distribute copies to all students. Using a document camera (or white board), assign the same tiles to all students at once. Then, students use the assigned tiles to complete the task on the placement area that you created.

• **Create your own #2:** Invite students to create their own placement areas. Copy and distribute them to all students. Then, students race to complete the tasks on the placement areas that their peers created.

• **Graph a rotation:** Introduce a new rule: puzzle board tasks are complete only when students can also draw a 90˚, 180˚, or 270˚ rotation of the task on graph paper.

• **Graph a reflection:** Introduce a new rule: puzzle board tasks are complete only when students can also draw a reflection (i.e. "the mirror image") of the task on graph paper.

• **Graph a translation:** Introduce a new rule: puzzle board tasks are complete only when students can also draw a translation of the task on graph paper. This requires drawing the task twice: once at (0,0) and once at other coordinates of your (or their choosing).

• **Group rectangle:** Break the class into small groups of three or four, each with the same set of tiles, divided equally among group members. Direct each group to race the other groups in order to create a placement that most closely resembles a giant rectangle.

Questions for Classroom Discussion: In order to increase learning retention, debrief gameplay with questions like these below. Direct students to use the terms "rotation", "reflection", and "translation" when answering:

• **Reason effectively:** Which is more important: to complete the puzzle board task by physically manipulating the tiles, or by thinking the task through in your mind? Explain why.

• **Using systems thinking:** If you could create one tile to make the game easier or harder, which shape would you create? Explain why.

• **Using systems thinking:** How would it change gameplay to introduce tiles with 45˚ angles? Explain why.

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• **Solving problems:** When completing a task, how did you decide where to start with placing the tiles in the placement area? Explain why.

• **Renaming terms:** In your own words, what other terms can you use to describe rotations, reflections, and translations?

• **Learning transfer:** In everyday life, where do you see rotations, reflections, and/or translations occurring?

• **Evaluating shapes:** In your opinion, which tiles are easier to use or harder to use when completing puzzle board tasks on placement areas? Explain why.

• **Room scan:** Looking around the room, where else can you see the same tile shapes? How would rotating, reflecting, or translating those shapes create a physical change in the room?