Building the Best Playground

Lesson Setup

Real-World Context	Possible Math Tools
Students divide into groups, and each group imagines rebuilding the school playground. Students may brainstorm one of many different modeling problems: • What kind of playground would they want at school? • How many of each piece of equipment should there be? • What is the most efficient way to organize the playground? Is efficiency a measure of area, time to travel between parts of the playground, minimized cost, or something else (maybe a combination of several factors)? • How can you minimize cost of the new playground without reducing the number of kids who can play on it at the same time?	3 – 5 students: Use of the four operations, calculations of area and perimeter, data collection, working with money, estimation, rates, unit conversions

Possible Learning Objectives:

Students will collect data on playground use through surveys or observation. Students will then use addition and work with money to create a budget, which will help students create a playground layout in combination with area calculations. Lastly, students will use ratios, rates or rankings to interpret their data and improve their playground designs.

Cross-curricular Connections:

This modeling problem goes well with an art or design course. It can also be combined with a finance course and emphasis can be put on budgeting and the cost of the playground.

Materials List:

Measuring tools, grid paper, pencils

Additional Notes:

Regardless of the variation you chose, be aware that design tasks are prone to non-mathematical solutions. To combat this, limit student choices in the design phase and be clear about what questions the model is answering. Are you trying to minimize the cost of the zoo? Determine the most popular exhibits?

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Anticipate:

Where might students go with the provided context?

These questions are adapted from the GAIMME report – Guidelines for Assessment and Instruction in Mathematical Modeling Education. You can freely download the report here: http://www.siam.org/reports/gaimme.php.

What questions might students ask to **define a focused problem** from the broader real-world context?	What makes a playground "good"? Fun? Safe? Fair? What kinds of things can we put in the playground? What can we change about the playground in this new design? What can't we change? Is the area fixed? The budget fixed? The equipment types fixed?
What **information** might students need, and who will provide/find that information?	Costs of various playground items (apparatuses or pieces of equipment) – teachers should probably provide this. Popularity of each playground item, length of time a given student would use each item – students can observe the playground and record this for themselves.
What **vocabulary** should students learn before they begin the task?	Dimension, budget, layout
What **assumptions or generalizations** might students make using the information they have?	Students may choose to ignore maintenance costs and only look at initial costs. Students may also assume that all slides are equivalent, all swings are equivalent, etc. and that the specific brand and model doesn't matter.
What **mathematical tools** might your students gravitate towards?	When designing the playground, students should be using graph paper to more accurately represent the sizes of the pieces of equipment, as well as the distances between pieces of equipment. Students should also use addition and multiplication to work with money and calculate the price of a new playground.
Which parts of the modeling process should happen in **small groups** and which with the **whole class**?	Each group should estimate the cost of their playground, and either survey the rest of the class or take data during recess to estimate popularity of each toy on the playground. The whole class should conduct the initial brainstorming, imagining possible costs and pieces of equipment.
How will students **record** their ideas? In what format will they **present**?	Students should have a poster or slide show with the playground blueprint and budget. There should be some discussion of how students built the model and why the model is good.