Bongo Balance: Scaffolding Work with Chemical Equations

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Game Description

In *Bongo Balance*, students learn techniques for balancing chemical equations as they balance fruit to feed fair portions to two hungry jungle animals. Players add and subtract groups of fruit in order to feed an equal amount of every type of fruit to each animal (see Figure 1). Some groupings are harder than others, until players learn to multiply types of fruit by coefficients as they would with subscripts and coefficients in chemical equations. Gradually, the representation of the components of the equation changes from fruit to fruit-with-subscripts, and finally to molecules-with-subscripts, so that by the end of the game, the player is working with a recognizable chemical equation (see Figure 2).

Figure 1: Balancing bunches of fruit

Figure 2: Balancing a chemical equation

Learning Objectives

Students will be able to use the engineering design process to adapt and refine their catapult designs to meet their design goals efficiently.

Target Population

Bongo Balance targets 6th - 8th grade students in classroom environments.

Next Generation Science Standards (2013)

PS1.B: Chemical Reactions:
Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3), (MS-PS-5) The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS 1-5)
(NGSS Lead States, 2013)

Common Core State Standards

CCSS.ELA-Literacy.RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-Literacy.RST.6-8.8: Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.
(National Governors Association Center for Best Practices et al, Council of Chief State School Officers, 2010)

Development Process and Teacher Feedback

Bongo Balance is a lean game, meaning that it targets a small number of learning objectives efficiently so that development resources can be conserved to allow the game to be iteratively refined through more cycles of development and feedback than a larger game could sustain. Filament developed this game through the AGILE process, in which each development cycle aims to produce a complete feature or set of features that can be evaluated. This game is part of a series of lean games targeting STEM standards that Filament developed in consultation with teachers during each development cycle.

Bongo Balance Demo Video and Launch Page

The game's launch page can be found here: https://www.filamentgames.com/fws2/products/tikiquations
A video demo of *Bongo Balance* is available here: http://www.youtube.com/watch?v=g7rS4TyE1zc

References

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common Core State Standards.* Washington, DC: National Governors Association Center for Best Practices, Council of Chief State School Officers

NGSS Lead States (2013). *Next Generation Science Standards: For States, By States.* Washington, DC: The National Academies Press.

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