Backyard Engineers

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Short Game Description: Create the ultimate catapult and launch water balloons at your neighbors! Customize different mechanical elements of the catapult, manipulating movement, accuracy, range, and damage to drench even the most evasive of targets. Each level of the game is a unique open-ended puzzle that challenges players to think like real engineers and find the fastest and most efficient way to soak their neighbors!

Educational Goals

Backyard Engineers is a physical science game that was created to teach introductory engineering and mechanical design concepts to be used within middle school classrooms. The game exposes players to how different parts of a machine can be customized and manipulated to achieve greater or lesser values in movement, accuracy, range, and damage. After creating a working design for a catapult, the player can then launch water balloons to soak their opponents. *Backyard Engineers* allows for players to experiment through trial and error to come up with a working solution to the level, and there are often multiple mechanical combinations that will work to solve each level. This allows for players to generate their own creative solutions to the engineering design problems they confront in the game.

Reinforcing Learning Objectives

Our development team started with standards from Benchmarks for Science Literacy, Common Core State Standards, and Next Generation Science Standards when developing *Backyard Engineers*. Game designer Matt Haselton made sure that gameplay would properly expose students to these standards and created learning objectives around them. For a full list of standards, see the Further Resources section at the end of this submission.

Backyard Engineers comes with two tools for educators that help reinforce learning objectives and key concepts: supplemental curriculum and a teacher dashboard.

As studies have shown, the greatest gains in learning outcomes have been achieved when educators surround students' game experiences with additional support and instruction (Wouters et al., 2014). The standards-based curriculum works in tandem with gameplay and provides a mixture of activities, labs, discussions, and assessments to solidify ideas. At the end of each unit, students are given both a traditional assessment and a Next Generation assessment. The traditional assessment is administered in the form of a multiple-choice test or quiz and tests students on key terms and definitions. The Next Generation assessment gives students an opportunity to apply their knowledge by sketching their own catapult and labeling different types of simple machines and how they operate.

The second tool for educators to use with *Backyard Engineers* is the teacher dashboard. The teacher dashboard gives educators instant feedback by tracking student progress. The dashboard, which works with all student game accounts that are tied to an educator's account, charts each student's individual level progression and what standards they've been exposed to at each level. The teacher dashboard not only identifies at what point students are introduced to key concepts, but also is useful in identifying students who may be struggling so that an educator can provide just-in-time support.

Game, Curriculum, and Teacher Dashboard Access

To access *Backyard Engineers*, the full curriculum, and view an example of the teacher dashboard, please do the following:

1. Go to www.filamentgames.com/user/login
2. Log in with username: glsdemo@filamentgames.com and password: GLSdemo2015
3. You should now be at a page titled "My Library"
4. To play the game, click the red button that says "Play Now!"

5. To view demonstration students on your account, click “My Sections” in the blue header.
6. To view an example of the teacher dashboard, click “My Reports” in the blue header.

If you have any questions during this process, please email Elle Jacobson at ejacobson@filamentgames.com.

Further Resources

(1) Standards Map: http://bit.ly/1FEswdz

(2) Product Page: http://bit.ly/19CDqqp

(3) Game Trailer: http://bit.ly/1JUNdIL

References

Wouters, P., van Nimwegen, C., van Oostendorp, H., & van der Spek, E. D. (2013, February 4). A Meta-Analysis of the Cognitive and Motivational Effects of Serious Games. *Journal of Educational Psychology*.

Acknowledgements

The full credits can be viewed here: http://bit.ly/185YKTP