

EMPIRES: Trade Goats, Grow Grain, Master your Empire. And Pre-Algebra

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Short Game Description: *Empires*: A compelling story takes learning deeper. And preparing for goat uprisings is just plain fun. Trading goats and researching metallurgy, entwined with a youthful love story amidst the creation of civilization in Ancient Mesopotamia is not the formula one would expect to see when a middle school math teacher sets out to raise the dismal track record of U.S. students in international math tests. Why does it work? Because goats, or metallurgy, or wherever else a civilization story can take you, helps math make sense.

The Power of Story-Based Pedagogy

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Story-based games are an extension of pretend play, one of the oldest, most powerful methods of human learning (Steen & Owens, 2001) making the dynamic structure of educational games a powerful and accessible solution for educators (Takeuchi & Vaala, 2014). Yet, when it comes to math games, almost none do more than overlay a textbook problem on to a computer graphic, using points or badges as extrinsic motivators. While research clearly shows that students will learn more and play longer when math problems are more fully integrated in the game-play experience (Habgood & Ainsworth, 2011), not a single one of the leading math games for schools truly veers from a drill-and-rewards format, driving memorization-based learning instead of developing problem-solving skills. Conspicuously absent is any sense of greater purpose, much less a justification as to why math has relevance; the math is relegated to a very low-level purpose within the context of the game. Furthermore, this format breaks the “flow” of the game experience, putting math in a position that interrupts the very mechanism that makes games so fun, engaging and addictive (Engeser & Rheinberg 2008).

But math is not disconnected from story. Math can be part of the story, just as math underlies and is involved in so many aspects of everyday life. Math teacher Scott Laidlaw, Ed.D. realized that using math as a key element that moves story along, as problems unfold, was crucial to creating engaged students, eager to learn through the story-based games he developed and used in his classroom. And he wondered if could reach more students, and maybe just help the US improve its dismal track record in math, by engaging middle school math students in compelling online games where math is used, in context and with purpose, to move the story along.

Empires: Release The Attack Goats! Solve That Equation!

Empires (Figure 1) is an online game for middle-school students, using innovative pedagogy and connected play that is aligned to the Common Core State Standards for 7th grade math. Developed with support from the US Dept. of Education’s IES-SBIR program, MidSchoolMath hosted a beta release of *Empires* on February 28, 2015, will conclude IES-SBIR Research in the spring of 2015 and is already prepared for commercial use of *Empires* by schools in the 2015-2016 school year.

Set in Ancient Mesopotamia during the Neolithic Era, at the brink of the agricultural revolution and the beginning of trade economies, *Empires* (Figure 1) invites students into an epic civilization story, with characters, a rich plot and individual empires run by each student Provident. Students manage their empire, tallying assets, investing and distributing resources as they choose across a vast array of options that appeal to boys and girls, from goats to metallurgy, from armies to agriculture, and from caring for children and communities. As each activity unfolds, opportunities for deep learning of math—and repetitive practice—appear, woven into the context of the game. Math uniquely comes to life within *Empires* (Figure 2). Ratios and proportional relationships are explored as resources are invested in projects; students learn about and practice percentages as they calculate the odds of an attack goat rising; the Pythagorean Theorem serves as a tool that allows the measurement of distance and time between a neighboring empire to complete a trade. Peer-to-peer interactions are encouraged, in the classroom and in the socially-networked game as story plays out, creating rich opportunities for furthering educational understanding.



Figure 1: Overview of a student's Empires.

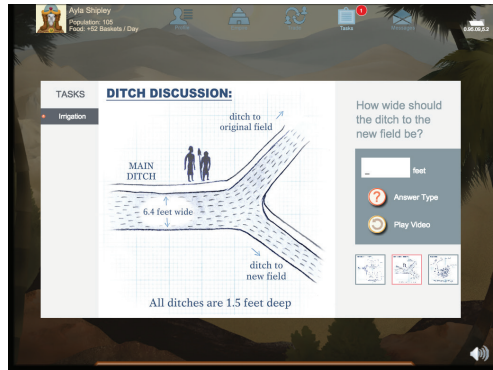


Figure 2: Artwork and interface for student problem.

Empires is a modular game, ideally suited for use in class increments of 40 to 60 minutes. The game offers the critical ability to save mid-game, even if the student has not yet solved a math problem in its entirety. Teachers can monitor student progress, identify strengths and weak points and link performance data to real-time assessment within the teacher dashboard and learning management system. Story-based, strategic and collaborative, *Empires* is a first-of-its kind math game, setting an entirely new standard in educational gaming, using math within the context of a rich and robust story, and truly leveraging the power and fun of educational games to transform math education. We feel that *Empires* may just be the game that turns the tide of math education through genuine student engagement and mathematical skill building, while supporting true mathematical understanding.

A demonstration video of *Empires* can be viewed at <https://vimeo.com/110586214>. Access to beta accounts for testing and game play available upon request.

References

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