Game-based Learning
Teaching May Require Fun

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Abstract: This manuscript advocates for using game-based learning in the classroom. Some topics are difficult to teach because they require an entirely different mindset. Studies show that game-based learning can provide a new structure of learning to teach these new skills. Research from around the world demonstrates that using games in the classroom allows students to stretch to a new kind of thinking that improves their performance on assessments and their ability to think at higher levels. Particular attention must paid to game selection, which should focus on learning objectives. When no pre-made game fits the lesson, teachers can design their own games. Another focus must be the post-game discussion, in which the teacher can connect the activity to the core material.

The Object of the Game

Teaching the colonization of the Americas, I asked my 8th grade social studies class which continent was dominated by the French and English, expecting the answer of "North America." Instead, the class shouted, "America!" I sighed. "Not the country, the continent." I was met with blank stares. One student hesitantly ventured, "The United States of America?" This wasn't the first time I was disappointed in eighth graders' knowledge of geography, nor was it the last. It didn't seem to matter how many maps littered the room or how many Google images were imbedded in my slide shows, to my students, geography was an abstract concept.

Every content area has topics that are difficult to cover with conventional methods. In my social studies experience, geography and economics make my students' head spin. In English, it could be Elizabethan language or dreaded grammar rules. These are the areas that require an entirely new skill set to grasp, or which might seem to have the least connection to students' lives. These are the ideas that grind your curriculum to a halt. These are the questions that students meet with blank stares. Teachers who are tired of giving students lists to memorize, of nations or vocabulary words, need new methods to approach these challenging concepts and topics.

One of the most exciting new methods is game-based learning. GBL uses games in the classroom to teach new concepts or inspire deeper level thinking. Instead of reading a section in a textbook about the Land Ordinance of 1785, students became prospectors in an auction trying to buy the best plot of land for their needs, subdividing them for profit, and swinging wild trades. Just as in any game, the players are given goals to pursue and a set of rules that restrict how they pursue them. As they create strategies and change tactics, they have to analyze the subject matter in a deep and fundamental way. Some games are set in specific time periods and others may use fantasy to focus on a skill set. What all GBL activities have in common is a demand to make decisions and find novel ways to attain goals.

When you change gears in this way to approach one of these topics, you also change student attitudes to that topic. You switch from a traditional classroom to a game night. Multiple studies show that students love learning through games. In one experiment using games in the classroom, almost 95% of the 290 students said they enjoyed game-based learning and thought they learned a great deal (Jančič & Hus, 2017). A method that raises the level of engagement so high will be a welcome addition to any classroom. The students are happier. The teacher is less stressed. For this reason alone, every teacher should employ game-based learning in their curriculum.

Of course, the primary purpose of education is not for the students to have fun. Engagement without learning is recess, not education. Methods are best selected based on whether or not they help students learn. Thankfully, game-based learning is not only fun, but is also very effective at fostering learning.

For example, after just two months of playing a math video game, Dimension M, students showed improvement in confidence and motivation, but also on tests (Foster, Shah & Barany, 2017). Eighth grade classes that learned the French and Indian War through a strategy game showed a 5% improvement in test scores over those that did not-- even when re-tested six months later (Cicchino, 2015). Perhaps the most remarkable results were in a group of fifth and sixth graders who played Civilization III weekly in an afterschool program. Every student who played "earned an A in social studies, and their parents reported that their grades had gone up across all subjects" (Squire, DeVane, & Durga, 2008, p. 248). Every single student. Game-based learning gets results.

Many teachers are already using games without realizing it. No physics class is complete without a bridge building contest. Using popsicle sticks and glue, students build bridges, applying the information they've learned about weight distribution and force. They compete to build the bridge that holds the most weight. By turning this activity into a game, it becomes something memorable for students. (I came in second place in the eleventh grade in 1996 and I will never forget.)

Getting Started

So, let's get started! Just grab Monopoly to teach economics, Balderdash to teach vocabulary, and Portal to teach logic! This is going to be fun!

Not so fast. Picking games off the shelf can be very tricky. The advantage of game-based learning is that it forces students "to make decisions without traditional instruction" (Lasley, 2017, p.40). This helps promote critical thinking, raising essay scores by more than 50% in one study (Chee, Mehrotra & Liu, 2013). However, when selecting games you need to be careful to be sure that the majority of the decisions students make reflect your learning objectives. For instance, Assassin's Creed has often been praised for its attempts to replicate period architecture, clothing, and characters. However, the majority of players' decisions involve what route to use to approach enemies and how to flee. This is very effective in teaching architectural history, but will teach very little about everyday life in the time period (McCall, 2016). (Conceivably, it also could be useful in a school for assassins.) While it is possible to use already popular games, this should only be done if they effectively align with your learning objectives.

I'm proposing a different solution. This is one you need to be sitting down for. I want you to design your own games for your classroom. It is work. It will take time. But it can be wildly effective for the topics you need a change of pace for. Don't worry. I've done it myself and you can too.

The Rules

In order to design your game, you need to make sure you know the basic criteria of games, as well as of game-based learning. Games have objectives, whether it is to score points, make money, or physically take down your opponent. Games have rules. Players agree to restrict their actions to within certain bounds. Game-based learning requires players to make lots of decisions: what card to play, which property to buy, which territory to invade. GBL involves socialization. Players need to work together or against each other, or, at the least, be discussing their games. Lastly, GBL requires reflection. The time spent talking about the game is when the education happens.

An effective game needs an objective. In popular games, these are very familiar. In boxing, the goal is to knock your opponent down. "Effective GBL environments are designed with learning outcomes in mind" (Cicchino, 2015, p. 3-4), so choose your goal based on your learning objectives. One classroom introducing students to Shakespeare had an Elizabethan insult contest. The goal was to deliver a better "burn" against your opponent. The learning objective was to make students more comfortable with Elizabethan terms, and it built on the idea that teenagers are very comfortable insulting each other. In teaching geography, I challenged students to plan the fastest route from New York to Toledo in the year 1800. My learning objective was for my students to understand how geographic barriers kept southerners in the South and northerners in the North during westward expansion. In both of these games, meeting the objective of the game requires meeting the objective of the lesson. Picking a goal that aligns precisely with your learning objectives is the most important step.

Every game has rules. Rules are what separate games from real life. If the goal in boxing is to knock down your opponent, the easiest way might be to hit them with a chair, but boxing requires you do it with your fists. If you use a chair, then it becomes professional wrestling. As philosopher Suits (2014) wrote, "Playing a game is the voluntary attempt to overcome unnecessary obstacles" (p. 41). For some reason, in games, obstacles are what makes them interesting and fun. Perhaps because in games, success boils down to guile, aplomb, and moxie-- all words that will help you win at Scrabble.

In most games, the obstacles are arbitrary. In game-based learning, the obstacles should also be in line with the content you want to teach. In my geography challenge, students were restricted to traveling by boat, horse, or foot because there were the methods available in 1800. Because jets were not used in westward expansion, I did not allow them in this game. The restrictions you place on your students should either represent the restrictions of the history you are teaching or should push your students toward the kind of thinking you want to encourage. Choose your rules carefully.

Your game must be constructed to maximize decisions. These are the moments when students think. This is not a rule in actual gaming. The Game of Life is very successful in spite of players making five decisions the entire game—to go to college or not, which job to pick, and of three forks in the path to take. However, and consequently, it teaches almost nothing about real life in which we are faced with a myriad of decisions. In game-based learning, students "probe and experience the possible situations which may occur after making some decisions" (Hwang, Chiu & Chen, 2015, p. 15). Students consider the available information and create options, then as best they can, they evaluate which option will yield a better result. Finally, they act, and compare the results to their predictions. For example, in the Civilization series of computer games, players make multiple decisions each turn about whether to focus each city or unit on gathering resources, generating culture, or building armies. Making more decisions gives students more opportunities to try out and apply the skills you are teaching.

Game-based learning is most successful when it has a social aspect. Having students watch each other make decisions enables students to work together in what Vygotsky called their zones of proximal development (Lasley, 2017). Teams are an obvious, but not necessary, way to create socialization. The most common form of interaction in games comes through competition, which is also not necessary.

Some games step outside the box entirely. One successful activity had students create artistic representations of economic problems using a prescribed collection of recycled materials. The socialization came in presenting their projects and commenting on them (Rule, et al., 2012). So long as students can observe and learn from one another's decisions, game-based learning is taking place.

In fact, these moments of reflection, in which students reflect on whether their actions have led to successful outcomes, and considered why they have or have not, are essential to the success of education through games. "Eighty percent of the value of gaming lies in the postgame discussion" (Dorn, 1989, p. 11). Think about every game you've played. Picture the conversation afterward about who won and how. This conversation can be a lot of fun, but it also helps players understand what strategies work and why. I'm still frustrated by a game of Scotland Yard from March that I lost on the second to last turn. I expected my opponent to maintain the same strategy from the middle of the game into the endgame. I won't make that mistake again.

The last step in the reflection process is to connect it back to the core material. "It is all too easy to immerse oneself in play without reflection, especially reflection about connections between the game and history" (McCall, 2016, p.534). Students will be energetic and excited. They'll want to go home and talk about how awesome class was today. They'll call you their favorite teacher. But unless you explain, or the class discusses, how the game applies to the content, students will rarely make the connection on their own.

Making these connections can be easier than you might think. In my geography game, in every class, the winners rode a horse from Albany to Buffalo. Students discussed the fact that there was no better way to get west of the Appalachians except in the extreme South. This allowed me to segue easily into an exploration of the construction of the Erie Canal, and to link to the eighth grade standard that students understand how westward expansion contributed to sectionalism. The

English class observed that the most effective Elizabethan insults in their contest involved sexual euphemisms, which was a perfect introduction to Romeo and Juliet, which is filled wall-to-wall with sexual humor. During the post-game discussion, let the students find these connections organically. Then make sure that those connections become explicit to the entire class. One study earlier showed improvements in math when students played Dimension M. In that same study, they also played Physicus, but showed no improvement in physics. The biggest difference in the study was that the math teachers regularly discussed the game and how it connected to the subject matter and the physics teachers did not (Foster, Shah & Barany, 2017). Focus your planning on making connections.

These connections lead directly to higher achievement. A civics class of 15 year olds was divided into one group that used conventional methods and another that learned through playing Statecraft X. This game allows players to become the governors of a medieval village, weighing priorities and varying cooperation with each other. Afterwards, players debated when cooperating with other players was more successful (versus competing with them), as well as which priorities yielded the best results, and when it made sense to change tactics. Both groups were then asked to write an essay evaluating the effectiveness of their current national government. The group who played Statecraft X scored on average 50% higher than those who did not, with particularly high scores on analyzing multiple viewpoints and using supporting evidence (Chee, Mehrotra & Liu, 2013). In that case, playing a game that fulfilled the components of game-based learning led to very impressive results.

The Playing Pieces

Creating your game does not need to be overly complicated. An Elizabethan insult contest requires a Shakespearean vocabulary list. For my geography game, I provided students with two maps, a ruler, and a list of travel speeds (see Appendix). The bridge building lab requires popsicle sticks and glue. None of these are particularly more complicated than what you'd create for your average lesson.

Feel free to use pieces from existing games. Any game using money can borrow bills from Monopoly. For a game about how scarcity affects economics, use the resource cards from Settlers of Catan. Probability games might use dice, playing cards, or coins. Those with inspiration and money to burn can buy random game pieces online at The Game Crafter. Using different materials helps make the activity feel different to students, so find new something to introduce.

Winning the Game

The eighth graders at my school have been taking the same unit end test for seven years. There are two questions requiring students to read maps and one about geography. In most years, these questions are answered correctly by about 80% of the eighth grade. After playing my geography game, nearly 95% of the students answered them correctly. It's not a scientific study, but I knew it was a successful lesson when other teachers asked to use it.

Game-based learning improves student outcomes. In particular, it is suited to teaching the application of skills and evaluation of ideas, rather than the mastery of

facts to recall. This is especially important for teaching skills that don't fit neatly into your lesson plans. With a few simple rules, it's easier to design games for the classroom than many teachers think. It is likely that many teachers are using a smaller form of game-based learning without realizing it. And it's a lot of fun. Given all of this, every teacher should be designing games for the classroom.

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Appendix

1800 Travel Times

Your group is planning to move from New York City to Toledo. You need to figure out the fastest way to get there. Use the River Map, the Topographic Map, and the charts below to figure out how long it will take to get from New York to Toledo in 1800. Whichever group gets the closest to the fastest time (accurately) wins a prize.
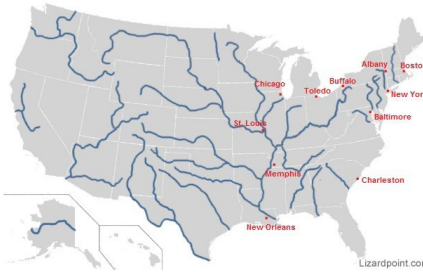
Travel Speeds

Method of Travel	Numbre of Miles Traveled Per Day
By Horse	16*
By Boat	45
By Carriage	12*
By Foot	10*

*Land speeds halved when traveling through mountains.

NewYork to Baltimore (By Land)

Step	From	To	Distance	Travel Method	Miles per Day	# of Days

New York to Baltimore (By Water)

Step	From	To	Distance	Travel Method	Miles per Day	# of Days

Planning Your Journey

Step	From	To	Distance	Travel Method	Miles per Day	# of Days