

Gameful Learning: Leveraging the Learning Sciences to Improve the "Game of Learning"

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Primers

Gameful Learning: Leveraging the Learning Sciences to Improve the “Game of Learning”

How can gameful learning foster greater student engagement?

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Abstract

Well-designed games provide a generative model for learning environments that support motivation, resilience, and the development of expertise. We consider how traditional schooling can be seen as a “bad game,” and how cognitive and motivational theories can serve as a guide to making experiences in which learners want to engage.

Keywords

Learning environments, motivation, games

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Overview

The use of games for learning has long been popular in education with increased interest in the last few decades catalyzed by scholars like James Gee (2003). The ideas in this Rapid Community Report, however, are not about *literal* game-playing in school, but rather about what we call *gameful learning*, which is a pedagogical design philosophy inspired by scholarship on how well-designed games support engagement, resilience, and learning (Hayward & Fishman 2020). We aim both to inform instructors who seek to design more engaging courses using key principles from successful games and researchers who create and study learning environments designed to foster greater engagement.

We begin with a definition of games from Katie Salen and Eric Zimmerman: “A game is a system in which players engage in an artificial conflict, defined by rules, which results in a quantifiable outcome” (Salen & Zimmerman, 2003, p. 80). What’s interesting about this definition is that it works equally well if you replace the word “game” with the word “school.” But not all games are good. Games can be coercive, confusing, boring, or worse. School, as commonly experienced, may feel to students like a “bad game” where the incentives to engage are misaligned with learning. This dynamic is most prominent in the way schooling typically approaches *grading* and assessment, which produce a maladaptive response in students, leading them to focus more on their “score” than on learning. Well-designed games—many sports are good examples—promote engagement and effort even in the face of challenge or adversity. How can we leverage the collective knowledge of the Learning Sciences to improve the game of school and enhance engagement in learning?

Gameful learning is a designed response to behaviors and outcomes observed in learners that we hypothesize are a product of the current educational system: Students focus on grades over learning, on “checking boxes” towards course or degree completion as opposed to expressing their own creativity. Learners who earn the highest grades are often the ones best at following the rules and executing explicit instructions, but at the same time are the least resilient in the face of uncertainty or challenge. Given the challenging and ill-defined nature of many pressing societal issues, this is a poor state of affairs for schools. By emphasizing learner autonomy, productive struggle, and even productive failure, gameful learning provides one pathway for redressing these systemic shortcomings in order to produce more engaged learners and more positive outcomes.

Gameful learning should not be confused with “gamification,” which depends on game-like elements such as badges, leaderboards, or rewards to create controlling forms of extrinsic motivation. Though gameful environments may incorporate some of those features, the goal is to create more meaningful or deeper engagement by fostering intrinsic motivation and autonomous forms of extrinsic motivation (van Roy & Zaman, 2017) which are associated with greater engagement and resilience (Davidson & Beck, 2019).

Gameful learning creates a productive and generative context for bringing together different strands of Learning Sciences (LS) scholarship—such as research on cognition, social constructivism, and design-based research—and integrating it with scholarship from educational psychology and learner motivation. Design-based research approaches are crucial for developing new variations on gameful learning that are both contextualized and adaptable or scalable to new instructors and settings. A core focus of gameful pedagogy is on the design of the assessment or grading systems within the learning environment because the approach to assessment is such a powerful force in shaping student engagement.

Key Lessons



Gameful learning isn't any single activity or intervention. Rather, it is a framework for the practice of assessment to reshape how learners engage with the content and activities of a course or other learning experience. It is important to recognize that two learning environments could differ in many specifics and yet still be considered "gameful."

Ten design principles for gameful learning

We have devised a set of ten principles to guide the design of gameful courses (represented in **bold** text below). Many of these principles are consistent with what LS and education research has generally identified as "good" teaching practices. It is the use of these ideas in combination that helps change students' relationships to the classroom experience.

The first principle is to **define clear learning goals**. Just as no one would start to play a game without a clear idea of its goal, no one should be asked to do so in a learning context. Though this is too often the case, for instance, when we tell someone that they are learning something because it will be important later in life, without clearly explaining why or how. The second principle is related to academic motivation in general, emphasizing the need to **employ a balance of both intrinsic and extrinsic motivational elements** in one's course design. The general thinking is that intrinsic motivation is "good" and extrinsic is "bad," but in practice, it is nearly impossible to design formal learning experiences without some measure of extrinsic motivation, since for most the point of being in school is for some future goal external to school itself. But there are different forms of extrinsic motivation, and our next set of principles helps to create contexts for more productive forms of motivation.

The next three principles focus on **giving learners meaningful choices** about the work they do, **enabling multiple pathways to success**, and **fostering a sense of purpose and mutual respect**. These principles come from Self-Determination Theory (Ryan & Deci, 2000), a core motivation theory focused on supporting basic human needs for autonomy, belonging, and competence. Ideally, each of these needs is supported in a gameful classroom. Choices and

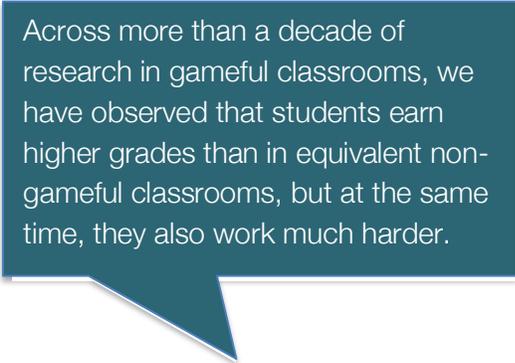
pathways support both autonomy and competence, allowing learners to select routes to success that match their current interests and abilities. Other ways to support competence include creating opportunities for early success and providing visible evidence of progress (even through struggle, see below). Along these lines, many gameful grading systems start learners off at zero, and as students accomplish learning goals they “level up.” This is in contrast to traditional grading systems that start at “100%,” which students inevitably *lose*, even when they do well on an assignment. Instead of staying focused on “maintaining an average,” students in gameful environments focus on making progress. Belonging can be supported through curricular strategies like group projects, in-class collaborative exercises, and semester-long team competitions. When the three elements of Self-Determination Theory are productively supported in a classroom, intrinsic and autonomous extrinsic motivation are fostered. When these elements are absent—or actively thwarted—controlling forms of extrinsic motivation (such as more common applications of gamification) are needed to keep learners engaged.

Providing support for *productive failure* is the sixth principle of gameful learning. Failure-driven learning or productive failure are a focus of some recent LS scholarship (e.g., Kapur, 2016), and as Jim Gee (2003) pointed out, is always a feature of well-designed games. If a game is too easy such that you can win on your first try, it will likely also be boring and you won’t play it. You expect to “fail” as you play a game. But if you can’t learn and improve from each attempt, the game might be too frustrating, leading you to give up. Gameful experiences eliminate high-stakes points of failure, such as a midterm or final exam worth a majority of one’s final grade. High achievers in school often never receive a poor grade or do poorly on a test. Were they ever sufficiently challenged? Will they persist when faced with a real challenge?

Our seventh, eighth, and ninth principles also are inspired by Gee’s (2003) work: **encouraging exploration, fostering identity play**, and **providing many opportunities for practice and reinforcement of learning**. These principles depend in part on earlier principles. For instance, when one lowers the cost or risk of failure as discussed above, you enable students to explore the environment with a focus on understanding its underlying system, as opposed to simply trying to provide the correct answer or response to an assignment prompt. Well-designed games encourage one to try on various identities or characters. Well-designed learning environments do the same, whether we’re thinking about learning to think like a historian instead of focusing only on the “facts” of history, or encouraging learning through enculturation or communities of practice. And because you are encouraged to explore and because it is safe to try things out in a low-stakes environment, well-designed games encourage practice in order to master key components of tasks before attempting more complex challenges consisting of those components.

The final principle of gameful learning is to **embed assessment** wherever possible. In games, we don’t stop the action to give an exam. The proof of accomplishment is embedded in the act of finishing the game (especially if you have won the game). This can be one of the more difficult principles to enact in most classrooms, but when you think of the overall learning environment as the game, it is less challenging. In a gameful environment, learners should view assessments as part of their progress, not as high-stakes assessments that represent the end of their effort.

Findings from research on gameful learning



Across more than a decade of research in gameful classrooms, we have observed that students earn higher grades than in equivalent non-gameful classrooms, but at the same time, they also work much harder.

One of our earliest observations about gameful learning was that the existing structures that support traditional grading make it difficult to implement (see “Gameful learning presents an infrastructure challenge” below). Students expect percentage-based grading, and existing tools like gradebooks make it hard to do anything that violates this expectation. In response, we built a custom learning management tool named *GradeCraft* that aligns classroom feedback and progress-tracking mechanisms with the theory (Aguilar et al., 2013). One doesn’t need to use *GradeCraft* in particular to support gameful learning, but it is important to provide learners with a feedback mechanism that aligns with the assessment system.

Across more than a decade of research in gameful classrooms, we have observed that students earn higher grades than in equivalent non-gameful classrooms, but at the same time, they also work much harder (this data comes from student self-report, from instructor reports, and from our own observations of assignments attempted). We initially attempted to use Goal Theory from motivation research to explore behaviors in gameful classrooms. Goal theory describes learners as either “mastery oriented” with a focus on learning, or “performance oriented” with a focus on either demonstrating adequate performance or avoiding inadequate performance. In most cases, a mastery orientation is associated with better learning outcomes (Linnenbrink & Pintrich, 2000). We found that the relationship between mastery- versus performance-orientation and achievement that typically exists in college classrooms did not hold in gameful classrooms. One of our colleagues who studies motivation suggested that we might have “broken the system.” In other words, typical theories of academic motivation presume typical classroom arrangements, and gameful classrooms “break” those arrangements. From a Learning Sciences perspective, this is an example of putting theory in harm’s way (Cobb et al., 2003). Classroom design experiments can help us better understand how theory and structure interact to produce new outcomes.

We have found that the more autonomy learners perceive, the more engaged they are, which is consistent with more general findings from Self-Determination Theory. However, we have also found that autonomy needs support; lots of choice without proper support can lead to confusion, similar to the “paradox of choice” explored in motivation and marketing theory (Schwartz & Ward, 2004). We have observed that the Grade Predictor, a tool built into *GradeCraft* to help students navigate assignment choice with respect to their goals for course outcomes, helps increase feelings of autonomy support (Holman et al., 2013). Of course, tools like the Grade Predictor can also be used by students to substitute a percentage-focus with a point-focus (see “infrastructure challenge” below). To reduce this tendency, we encourage instructors to make assignments even

more challenging than they normally would, so that students do not expect to earn “full points.” Instead, the focus is directed back towards steady progress towards ambitious learning goals. We also note that instructor satisfaction with gameful learning is high, and few who start teaching gamefully revert to earlier approaches. Finally, though our investigation of data related to this is still underway, during the rapid transition to remote learning at the beginning of the Covid-19 pandemic, instructors and students in courses using *GradeCraft* reported an easier transition and an easier time staying engaged with the course.

Issues



Gameful learning is ultimately focused on the improvement of learning through changes to how we conceptualize assessment and learning in classrooms and other learning spaces. In implementing gameful learning, it is crucial to recognize how deeply embedded the current framing of assessment is in most formal learning settings for both teachers and learners. Below we explore the challenges this presents to implementing gameful learning, and also introduce some key areas for ongoing research.

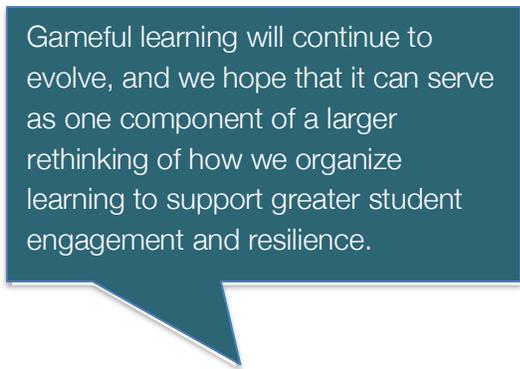
Gameful learning presents an infrastructure challenge

One of the biggest challenges to implementing gameful learning is working around the numerous assumptions about grading that are built into the current education system and the tools built to support those assumptions. Sociologist Susan Leigh Star helped us understand how *infrastructure* consists of the interplay of systems, practices, and norms (Star & Ruhleder, 1996). Creating change requires that one address all of these elements. For instance, most Learning Management Systems (LMS) use grading books that presume grades are calculated out of 100%, with assignments weighted accordingly. In turn, administrators may be expecting to see a certain distribution of grades in a course, viewing this (erroneously in our opinion) as a measure of rigor. These kinds of expectations may be reinforced by the kinds of data displays we are used to seeing about grades and averages, which encourage comparison of students against other students instead of against learning goals. These kinds of structures and attitudes then, in turn, shape what we consider to be “normal” grading practices. Changing that norm requires rethinking the *structures* and *systems* that shape practice, something that has long been a focus of the learning sciences. That’s why we created *GradeCraft*, as one example of a designed response to these structures. A growing movement in support of mastery grading is another (see for example <https://mastery.org/>).

Gameful experiences come in many different forms

We opened our discussion of “Key Lessons” by clarifying that gameful courses can differ widely from one another depending on how the core principles are addressed. Students make assumptions about how their grades in a course are determined, or even how a course is conducted. For learners who are used to the “standard” form of learning, this can be a challenge because they have to attend to the particularities of each course to make sure they understand the “rules of the game.” This might add to learners’ cognitive load and possibly lead to confusion if the instructor isn’t clear enough about their learning goals and how they are met through different assignments. This might also be viewed as a positive feature of gameful courses, as we might prefer learners to attend closely to the structure of a course from the start, as opposed to simply operating on autopilot. Instructors need to be creative in terms of how they focus students on the particulars of *their* course.

Areas for future research and exploration



Gameful learning will continue to evolve, and we hope that it can serve as one component of a larger rethinking of how we organize learning to support greater student engagement and resilience.

As with any pedagogical approach, gameful learning will continue to evolve, and we hope that it can serve as one component of a larger rethinking of how we organize learning to support greater student engagement and resilience. Because there are so many different ways to implement gameful learning, a key area for future research is the development of templates or example course assignment structures that work well with different types of content or subject areas. Ongoing research into different combinations of

gameful elements and how they relate to learner engagement or motivation is also needed, recognizing that there will also likely be variations between learners. And finally, we hope to see development towards various forms of mastery-based learning. A long-term goal for education may be to do away with current ranking- and sorting-based systems of grading. LMSs and other tools (like *GradeCraft*) will also need to evolve and develop new types of planning and visualization tools to help learners chart their paths to learning and to help instructors and schools support learners along those paths.

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Resources

Gameful Pedagogy Overview with course examples

<https://www.gamefulpedagogy.com/>

The GradeCraft learning management system

<https://gradecraft.com/>

Wad-Ja-Get? The Grading Game in American Education 50th Anniversary Edition

A broader discussion of the problematic nature of typical school grading practices.

<https://doi.org/10.3998/mpub.11900733>

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EdX MOOC on gameful learning, designed primarily for K-12 teachers with instructors Barry Fishman and Rachel Niemer: Leading Change: Go beyond gamification with gameful learning.

<https://www.edx.org/course/leading-change-go-beyond-gamification-with-gameful?index=product&queryID=00625c5d9099749b0049a0c5042c511d&position=1>

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