Think Games on the Fly, Not Gamify: Issues in Game-Based Learning Research

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From *Space Invaders* to *Call of Duty*, from *Super Mario Bros.* to *Grand Theft Auto*, video games have come a long way since the early 1970s. Still, educators continue to struggle to identify the beneficial properties of games that might engage and motivate students at all levels, from K-12 students and college undergraduates to medical students and residents. To better understand the pedagogic value of video games, we must first differentiate terms like "game" versus "simulation," and we must be clear how instructional design principles commonly associated with "gamification" are related to well-known principles of behaviorism (eg, reinforcement, reward, contingency schedules). Four decades after *Pong*'s debut, much of the potential of learning from playing video games remains overlooked, and educators will not be able to make use of that potential until the secrets of great game design are unlocked. In this perspective we seek to give educators the key to game-based learning in hopes that they might see how contemporary theories of thinking and learning, games and play, can inform the reenvisioning of instructional practices in graduate medical education.

Up to this point, reviews of research on educational video games have suggested a mixed impact of gaming on common instructional variables, such as engagement (ie, time-on-task), achievement (eg, in science, math, languages), and interest.[1–3] Such reviews have also highlighted gaps and confusion within the scholarly community concerning games. Many game researchers argue that the video games they study—often created explicitly for their research—are capable of influencing learning, but more often than not, their classic "controlled experimental approaches" may mask what is really happening in the dynamic interactions of players within video games.[2–4] This is not a trivial issue. Although game mechanics can be extremely effective in shaping approaches to instruction, their primary purpose in commercial video games is to teach players how to the play the game and to keep them playing—and paying—rather than extracting value from the game's narrative or delivering educational subject matter. This is true even when educational aspects manifestly exist, such as the economics of in-game businesses, auctions, or crafting skills like leatherworking, blacksmithing, and alchemy in popular recreational games like *World of Warcraft* and *Elder Scrolls V: Skyrim*. What is often missing from educational game design is a clear alignment of game and course objectives as well as the fundamental understanding that playing a game is not a fixed experience. Gameplay must be understood as emerging "on the fly" as players play with varying goals. Medical game-based learning researchers should avoid oversimplifications about players, games, and common instructional variables, and instead focus their energy on studying the rich *interactions* of particular individuals (eg, medical students and residents) using particular games under particular conditions—something that educational psychologists refer to as a *situated* perspective.[5]

To frame this underlying rationale, we need only look at the way simulations and games have been vaguely defined in existing game-based learning literature. The phrases "educational game," "role playing," "social simulation," and "simulation game" were first conflated with "simulation" during the 1970s,[6] and scholars have done little to generate consensus about these terms since that time. On the contrary, definitions have typically grown to satisfy the conceptual needs of the individual studies in which they apply.[7–9] We argue that games and simulations are not the same, are not direct subsets of one another, and are not synonyms for the increasingly common phrase "gamification." Both games and simulations require users to interact with an environment—virtual or real world, individually or as a group—but the manipulation of a simulation is deliberately designed to be more realistic than a game. Games, on the other hand, are a less narrow grouping of opportunities for interaction in which the user is directed toward playfulness. This means that both are goal driven, but simulations are a special case in which play is attenuated for the purposes of representing real processes, situations, phenomena, and environments as accurately as possible.

Another complication is the conceptual framing of subjective factors like interest, play, and fun. "Fun," especially, is regularly misused in game-based learning literature because of a lack of consistency in what the word means and implies about particular games. Although Koster[10] suggested that fun originates from the basic

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function of play, Young et al[3] countered that it is too personal to be of any significant use to those studying game-based learning. More precisely:

> It is . . . possible to put contextual constraints on a situation such that activities that would normally be fun must be done at a certain time and place, rendering them less enjoyable activities. An example of this might be a teacher who requires her class to play 40 hours of [*World of Warcraft*, WoW] as homework, with students not doing so receiving a failing grade. Some students who may normally enjoy playing WoW might now find the exact same activity onerous, raising important questions about context and intentionality and bringing the conversation to how educational gaming can both be regularly engaging and feel less like work.[3(p64)]

Drawing from Young et al,[3] the way educators discuss fun, play, simulations, and games generally perpetuates more misconception than it puts to rest. Instead of focusing on fun, play, or engagement, per se, it would be more beneficial to identify and categorize game mechanics that facilitate gameplay, particularly when game objectives and course objectives are directly aligned.

Understanding how and why games can help certain players learn is no simple task. To date, Gee[11] and others have identified some of the attributes of commercial video games that are of potential value to instructional designers—for instance, risk-taking opportunities, customization (eg, creating a personalized avatar), agency (eg, choosing sides between warring factions in the game), meta-game social networking (eg, using game-related forums and wikis), and pleasant frustration (ie, tackling challenges that provide a deep sense of accomplishment when completed). However, applying individual pieces of the entire game experience to gamify coursework may distort the potential impact of games.

In fact, the techniques underlying gamification tend toward the application of well-known Skinnerian behavioral principles: Students, like video game players, are provided with tokens—including points, badges, play money, or publicly visible credits—contingent on exhibiting skills or completing tasks. Behavioral reinforcements like this have been leveraged across educational, corporate, and other environments for decades, with common applications flourishing in special education, pet training, and weight control programs. Positive behavioral intervention and support, for example, has become a thriving part of K-12 institutions across the United States.[12,13] Similarly, social networking tools like the step-counting device FitBit now allow users to compete with friends for clocking the most steps in a day or other fitness achievements. This is not to say that behavioral skill building along graded difficulty (in education called the *spiral curriculum*) is without its scholastic benefits—in fact, in video gaming it proves advantageous for teaching how to play a game, and we should certainly consider applying token economies like this in course design. We just need to be aware of the fact that behaviorism and its application in medical education are instructionally useful only to a point, and contemporary learning theory has pressed educators to approach thinking and learning as more than a simple system of controlling actions through external reinforcement.

This leaves us in a position where significant extrapolation from game learning to classroom learning can only come from the merging of more recent theories from cognitive and learning sciences with course design. Learning is not solely under the control of the environment, as Skinner suggested, but it exists as an inherently social process driven by cognitive factors like our experiences and prior knowledge (ie, information we already understand). Learners interact with the world in personalized, complex, and dynamic exchanges—likewise, gamers engage in multiple social interactions outside of the games they play (eg, online help forums, strategy guides, cheat websites—a "meta-game"). Games regularly change to sustain player interest, with patches adding new dimensions and enriching the overarching game narrative, and they explore, expand, and build upon existing storylines (eg, *Lord of the Rings*, *Star Wars*) to take advantage of players' prior experiences. If course designers were to incorporate these principles (eg, building from established narratives; encouraging the use of social, meta-game–like resources), it might be possible to make supportive learning environments extremely effective because they would extend beyond the behaviorist token economies instantiated as gamification.

Literature addressing anchored instruction,[14–17] situated apprenticeship,[18] and simulations[19–21] suggests that powerful learning comes with dynamic immersion amid complex, realistic, and inherently social situations that produce opportunities for legitimate peripheral participation in professional practices and create a "time for telling" about curricular content. Without taking these factors into consideration, we only encourage students to develop isolated, unrelated skills for external rewards under the vague hope they will transfer them into fluent, on-the-job performance at a later time. The story of richly authentic education will only advance if the academic community expands its focus beyond the behaviorist theories of the 1970s to include social, cognitive, and situated learning.[3,5,14] The hands-on nature of medicine and health care professions makes it 1 of the few fields where educators

have the opportunity to demonstrate how this can be done. Having imparted the key to game-based learning, we hope graduate medical educators will take full advantage of that chance to help change the world of graduate medical education.

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