Using Gamification in Athletic Training Education: Foundational Concepts

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Context: Gamification integrates game elements outside of a game context. In an education setting, instructors can use gamification with goals ranging from brain breaks to critical appraisal of course content. Understanding the various elements can help decrease frustration and improve intended results, benefiting both the educator and the student.

Objective: To provide an overview of gamification in education, outline a gamification framework, and introduce a planning cycle that athletic training educators can use in course development.

Background: The use of game concepts in pedagogy goes back for decades, with recent interest increasing with technological advancements. Gamification, adopted on a large scale in 2010, uses game constructs in various platforms, ranging from no-tech to high fidelity.

Description: Athletic training educators can use gamification concepts for simple or complex game constructs with diverse educational materials. The flexibility within these concepts provides ample opportunity for instructor creativity.

Educational Advantage(s): Gamification can give the student and the educator what they are looking for—an engaging environment and meaningful connections with course content. Gamification techniques can strengthen the delivery of course content beyond being used for basic test review, meeting course objectives, and student learning outcomes.

Conclusion(s): With intentional use, gamification in athletic training coursework can increase student engagement and meet instructor goals.

Key Words: Engaged learning, game-based learning, instructional methods

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KEY POINTS

- Gamification involves integrating game elements into nongame contexts to enhance student engagement and facilitate meaningful connections with course content.
- Although gamification can increase motivation and positive attitudes toward learning, it may also lead to competition that detracts from the educational focus if not carefully managed.
- A structured planning cycle involves defining goals, identifying obstacles, developing gamification solutions, and reflecting for continuous improvement of the learning experience.

INTRODUCTION

The widespread definition of gamification, attributed to Deterding et al, includes using game concepts outside the context of games-namely, borrowing game elements but not creating a game.¹ However, Deterding et al went on to state that it would be a disservice to narrowly define gamification "to specific usage contexts, purposes, or scenarios, while noting that joy of use, engagement, or more generally improving the user experience currently serve as popular usage contexts."¹ The evolution of gamification has branched into multiple realms, including the development of serious games, which are noted to be "designed for an educational rather than an enter-taining purpose."² However, the widespread definition of serious games includes a digital or technology component, often aligned with video game structures.^{2–10} Creating a serious game has a high demand in the IT realm and is often costly. However, the complex nature of serious games could be why there are multiple articles regarding design, constructs, and structure.^{5,7,8,11–15} For the purpose of this article the term gamification, rather than serious game, will be used, as it most closely aligns with the authors' intent.

Robson et al expand relevant terminology that is helpful when considering gamification.¹⁶ These terms include gamification mechanics, gamification dynamics, and gamification emotions. Gamification mechanics include the rules of the experience, which can range from determining how to win to outlining boundaries of allowable actions. These are often hard to change after the gamification experience begins and must be intentionally crafted.¹⁶ Gamification dynamics refers to behaviors demonstrated during play such as bragging or bluffing, among others. Gamification emotions, such as excitement or confusion, are demonstrated by the players during the gamification encounter. Poorly constructed game mechanics can lead to undesired dynamics (eg, cheating), detrimental emotions (eg, frustration), and an overall poor outcome for teachers and learners alike.¹⁶ Therefore, building a gamification solution that has the intended outcome(s) takes a systematic and well-defined approach. In the following sections, the authors will walk the reader through a framework, a planning cycle, and an example to provide direction on how to build a gamification solution.

GAMIFICATION FRAMEWORK

All relevant components must be considered when crafting the learning outcomes for the gamification experience. Components to consider include the teacher, the curriculum, the instructional support, and the learner.⁵ Lameras et al denote multiple potential roles that the teacher can fulfill.⁵ These include designer, player, facilitator, motivator, and evaluator. It is important to determine the teacher's role in the planning stages.

Curricular design, course content, and the learning goal will often dictate how gamification is constructed and used. It is vital to consider the curricular standards published by the Commission for Accreditation of Athletic Training Education and Bloom's taxonomies when designing the gamification experience. Determining if the goal is to remember, to analyze, or to create will greatly impact the design process, and a mismatch may result in unnecessary frustration.

The need for instructional and/or technical support will vary based on the goal(s) being met and the platform being used. Constructing a physical board game would likely not need as much support as crafting a virtual board game to be accessed by multiple students using individual devices. There are multiple free and paid platforms available for use if an instructor wants an online gamification experience. Partnering with instructional support can help shorten the learning curve and facilitate a more efficient process. Robson et al proposed that learners should be viewed on 2 interrelated spectrums: competitiveness (high or low) and orientation (self or others).¹⁶ The intersection of these items creates 4 potential groups: high competitive, self-focused; high competitive, others focused; low competitive, self-focused; and low competitive, others focused. To simplify these concepts, consideration needs to be given to the student who wants to win as compared with the student who wants to learn. Additionally, the level of individual versus team effort can be viewed as socialization. Efforts vary from person to person and can pose unique challenges in an online or hybrid environment.

Finally, the social, cognitive, affect, motivation, and progress areas should be considered.⁵ These areas, outlined by Lameras et al, have been adapted to the broader context of gamification.⁵ In the *social* construct, the teacher needs to determine if the goal is collaboration or individual effort. Cognitive relates to the tasks or challenges built into the game. Leaning on curricular goals as well as Bloom's taxonomy is helpful when working through this construct. At the very foundation, determining question structure is essential. Table 1 provides some examples of different question structures spanning both the athletic training content domains and the levels of Bloom's taxonomy. *Affect* relates to the feedback or choices provided in the game. A determination needs to be made whether these will be preset and triggered by a component of the gamification mechanics or provided by the teacher fulfilling the role of evaluator to provide real-time input. Motivation pertains to learning versus winning. If the gamification experience is designed as a brain break, a competitive experience may be beneficial. But if the goal is the integration of

Table 1. Question Alignment with Bloom's Taxonomy

Level	Question
Remember Understand	Using electrical stimulation to push medication through the skin is a description of what therapy? Which of the following accurately describes the influence of patient age on wrist injuries?
Apply	A patient suffering from patellar tendinitis would be a good candidate for which of the following exercises?
Analyze	A 16-year-old patient presents with fever, extreme lethargy, pharyngitis, and lymphadenopathy that began 3 days ago. Which of the following conditions should be included in the differential diagnosis?
Evaluate	After gathering a history and developing a differential diagnosis, you need to evaluate the various clinical orthopaedic tests available to determine which ones you will complete to confirm your diagnosis. Which of the following special tests is considered to be the most reliable?
Create	What is an appropriate risk reduction strategy to address the rise in stress fractures reported in your patient population?

content, the learner may be too focused on winning and not meaningfully engage in the content. Lastly, *progress* relates to game constructs or rules outlining a learner's progress through the experience. As with feedback, consider if this will be built into the gamification mechanics or if the teacher as a facilitator will indicate progress through the event. Table 2 includes some questions for instructors to consider as they work through how to apply the construct areas. Expanding the work of others and from experiences with educating students, the authors introduce a 5-stage circular planning cycle for instructors to use when implementing a gamification strategy.

PLANNING CYCLE

The 5-stage circular planning cycle includes the following components: goal, frustration, obstacle, solution, and reflection. Regardless of where one enters the planning cycle, progress must be guided by curiosity (Figure 1). For the sake of explanation, we indicate *goal* as stage 1 and *reflection* as stage 5.

Stage 1: Goal

In this process, a *goal* is defined as a desired result.¹⁷ An individual goal or group of goals needs to be tied to a student learning outcome or course objective. To a certain extent creation of goals is also connected to instructional philosophy and clinical philosophy. For example, a course may have a learning goal of applying a special test. This could be influenced by an educational philosophy of creating a collaborative learning environment. Further influence could be a clinical philosophy of treating each patient as an individual.

Stage 2: Frustration

The definition of *frustration* includes being dissatisfied due to lack of achievement, unfilled needs, or inability to evoke change.¹⁷ Frustrations arising from what is desired and what is occurring can often be deflected by instructors and students alike. Common excuses may include changing societal norms or differences in generational tendencies. In this stage, it is imperative to work past dismissive deflections, identify the foundational component of the frustration, and work through the frustration in order to evoke change.

Stage 3: Obstacle

An *obstacle* is defined as a barrier or something preventing the student from engaging in the content and/or learning the material. Specifying an obstacle often helps bridge the gap between the goal and frustration. For example, students can't apply the material (goal) as demonstrated by the inaccurate selection of a special test when presented with a patient scenario. This could result in a perceived notion that the student isn't studying/retaining the material taught (frustration). An excuse could be that the student is lazy, has never learned how to study, or has never been held accountable. But with curiosity-infused reflection, the instructor may realize that it is because the students don't understand the connection between the material (obstacle) and therefore can't select the appropriate special test in a patient scenario.

Stage 4: Solution

Once an obstacle is identified a *solution* can be constructed. This is where the gamification framework can be applied to

Table 2.	Construct Area Questions to Consider	

Construct	Questions to Consider	
Social	Are learners expected to work as a team?	
	Do the gamification mechanics rely equally on each learner's effort or can one person "carry the team"?	
Cognitive	What level of Bloom's taxonomy is being targeted?	
	What task or challenge is being presented?	
Affect	What choices will be provided to the learner?	
	What mechanism will be used to provide feedback on selections/choices?	
Motivation	What is the purpose?	
	Should students be focused on learning or winning?	
Progress	Is this a timed event?	
	Is there a main goal that once achieved signals the end of the experience?	



produce a gamification solution. Not knowing what game design to use or what platform is available can impair implementation. As a starting point, a list of resources is provided in Table 3 for both online platforms and low-tech game concepts.

Stage 5: Reflection

Reflection is the process of serious thought or consideration.¹⁸ Continual and active reflection during and after implementation is needed to determine what items weren't clear, what constructs hindered the implementation, if the identified obstacle/frustration was met, or if a new frustration arose. The process of reflection encourages a dynamic approach toward improvement of the experience for both the students and the instructor.

Regardless of where the cycle is started, the purpose of the cycle is to continue with the steps. Frustration is often the starting point of the cycle, as it is typically an easy stage to identify. However, it can be difficult to figure out the obstacle without first going back to identify the goal that is not being met.

EVALUATION AND DIAGNOSIS EXAMPLE

It is important for students to practice skills in courses such as evaluation and diagnosis. In a traditional approach, instruction often includes the instructor demonstrating the technique and moving about the room providing individual feedback or further instruction. When the traditional approach does not result in the intended outcome, the instructor applies the planning cycle to implement a gamification solution (Figure 2).

This example is from an evaluation and diagnosis course offered in the first semester of a master of athletic training program. It was an in-person combined lecture and lab course. When using the planning cycle, the goal was for students to gain mastery of clinical skills as an integral step to the concurrent goal of being able to conduct an evaluation. Frustration arose when additional practice time eroded into nonproductive social time. The obstacle identified was a lack of focus. A points-based practice was created and offered a solution, bringing the group together to practice a specific skill (meeting the goal) with motivation to engage in the material in order to gain points and "win," which provided focus (overcoming the obstacle). The 18 students were divided into 6 groups of 3 and instructed to come up with a team name. Creating a name allowed the students to build comradery and often demonstrated keen wit. To facilitate gameplay, the instructor used an online randomized picker platform (eg, Picker Wheel). The targeted skills were loaded into the platform and the category was announced to the students. The online picker provided the students an overview of all items, which allowed for mental preparation. The option to "hide" the item after it was selected ensured that an item wasn't selected more than once.

This gamification solution has been used with the following categories: special tests, range of motion, manual muscle testing, splinting, and applying an appropriate intervention (taping, wrapping). For this example, we used special tests as the category. A sample list of skills loaded into the online randomized picker has been provided in Table 4. These were selected from the provided lab skills sheet that each student was responsible for learning in the course. When considering Bloom's taxonomy, this gamification solution required students to remember, understand, and apply the special tests. The following game mechanics were created and used for this example:

1. Roles were created for a clinician, a patient, and a scribe in each group. The clinician performed the special test, the patient was the model during the special test, and the

Websites	Low-Tech Game Concepts
TriviaMaker (https://triviamaker.com/)	Deal or No Deal
Kahoot! (https://kahoot.com/)	Headbands
Quizlet (https://quizlet.com/)	Chutes & Ladders
Blooket (https://www.blooket.com/)	Trashcan basketball
GamesbyTim (https://www.gamesbytim.com/)	Matching
Picker Wheel (https://www.gamesbytim.com/)	People Puzzler
Mentimeter (https://pickerwheel.com/)	Who Wants to Be a Millionaire
Curikki Studio (https://www.currikistudio.org/)	30 Words or Less
Connections Swellgarfo (https://connections.swellgarfo.com/)	Apples to Apples

Table 3. Gamification Resources

Figure 2. Planning cycle example.



scribe wrote down what would constitute a positive test and implications.

- 2. The roles were rotated each time so that everyone was exposed to each component, which helped ensure individual learning rather than one person "carrying the team."
- 3. The team could not begin until the instructor released them with a predetermined signal to ensure fairness.
- 4. No notes or technology could be used, forcing the students to rely on recall. Students could have paper and pen to take notes during the activity.
- 5. The scribe had to finish writing to be eligible to be judged.
- 6. The group raised a hand to indicate that they were ready to be judged. Judging order was assigned by the instructor, and each group went in numerical order. Assigning numerical order as hands were raised allowed the instructor to keep watching until all groups were finished before starting the judging process.
- 7. When judging commenced, the instructor went to each group and viewed the demonstrated skill and written response.
- 8. Groups were judged on the performance of the special test (accuracy, effectiveness) and the accuracy of what would constitute a positive test and implications.
- 9. A total of 3 points were eligible for each round. Teams could earn 1 point for first to finish AND demonstrate accurately, 1 point for positive test, and 1 point for implication.
- 10. If the first team to finish was accurate in demonstrating the special test, outlining the positive test, and indicating the implication, they were awarded 3 points. If the first group performed the test correctly, but the written information was inaccurate, the team to finish next with a correct written response could earn those points. If the group finished first but performed the test incorrectly, the group was not eligible for any points.
- 11. All teams were judged before any points were awarded, which increased the suspense and enhanced the gamification experience.

Table 4. Sample Random Picker List

Body region	Special test
Wrist, hand, and fingers	Interphalangeal valgus test Interphalangeal varus test Thumb collateral ligament testing Wrist valgus test Wrist varus test Watson test Phalen test Finkelstein test Tinel sign Murphy sign TFCC (Triangular Fibrocartilage Complex) load test Ulnocarpal stress test

- 12. When points were awarded, the instructor gave basic feedback to each group to enhance learning and provide some explanation on point allocation. Students benefited from watching each group perform and hearing all feedback. Prior knowledge was reinforced, with areas needing further work identified.
- 13. The game concluded when all items in the category were completed or the predetermined amount of time for the gamification experience was fulfilled.

Reflection included "reading the room" during the experience and making mental notes on what was and was not going well. This occurred over the course of instruction to craft the gamification solution as well as during the gamification solution. Formal and informal student feedback was also used in reflecting. The feedback provided the instructor with knowledge about how the gaming solution mechanics could be adjusted for the next iteration, as well as if the gaming solution was effective in meeting the goal, eliminated the frustration and obstacle, and translated into the intended outcome. For example, an informal debrief asking students "what worked well and what could be adjusted" was conducted after implementation, which guided gaming mechanics changes. Written reflection assignments were used as formal feedback and gave the instructor insight into whether the goals were being met.

GAMIFICATION SOLUTION CONSIDERATIONS

When using a gamification solution, it is imperative to outline the game mechanics before initiating the gamification solution. For example, the option to hide an item after it has been selected can be changed if the instructor does want to allow for repeat practice. Determining this ahead of time will make the gamification solution more effective. Additionally, categories loaded into the online randomized picker can be predetermined or created in real time based on the cohort's identified area of need. The area of need can be determined from the instructor's perspective, the students' perspective, or a combination of both.

In the most recent application of this gamification solution, a gaming mechanic of all technology being put away (game mechanic 4) was implemented to defuse allegations of cheating. Table 5 includes a sample of previous reflections and adjustments that have been implemented with various cohorts. Instructor judgment must be used to determine if adjustments are best

Table 5. Gamification Reflection and Adjustment

Reflection	Adjustment	Earliest Timing
Students are not getting enough hands-on practice	Divide the class into pairs instead of groups of 3 Remove the role of the scribe	Next game cycle
The pace is too slow	Implement timer 1–2 minutes for each skill	During gameplay
The scribe role is cumbersome	Limit content to a narrower focus Reduce points from 3 to 2 to account for less content	Next game cycle
The team is relying on one person	Implement a no-collaboration game mechanic Each team member must complete their portion independently	Next game cycle
One team is dominating	Shuffle the teams	Next game cycle

implemented during gameplay, between game cycles, or in the next course offering.

The authors have successfully used the framework and planning cycle to apply game elements outside of a game (such as the example given), to implement technology-based game structure, and to create games more along the tradition of puzzles, board games, or card games. These concepts have been used in introductory athletic training coursework, evaluation and diagnosis content, therapeutic intervention courses, and content related to Board of Certification review with material covering all domains. Regardless of the type of course (in person, hybrid, online) or type of content (eg, theory, application), flexibility of thought is paramount to this process. When a gamification solution has not gone as the authors intended, it is typically not due to content but rather a mismatch with one of the components of the planning cycle, framework, or a faulty game mechanic. As students are encouraged to learn from failure, instructors must also embrace the same uncertainty. Starting small in a lowstakes environment is helpful with the goal of building on the efforts within the course and/or over the years.

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