

MOTIVATED LEARNING THROUGH GAMIFICATION

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ABSTRACT

Various high profile industry initiatives have shown that gamification can provide strong drivers for motivating employees to develop desired attitudes and behaviors in support of important business principles that are often difficult to achieve through other methods.

Click Armor commissioned this research project to gather and objectively analyze how the motivational factors of gamification can be used to improve employee learning, knowledge retention and behaviors in areas such as general employee cybersecurity awareness within business organizations.

The term “motivated learning” is defined and used in this paper as a distinct approach to delivering training in areas where individuals may not fully appreciate or understand the importance of certain skills needed by all members of a business organization. The assumption made is that individuals who are not engaged are not likely to learn or to retain knowledge.

This paper analyzes and validates this assumption through numerous references, showing that a delivery mechanism that can consistently engage individuals through various gamification techniques, applied in appropriate ways at various learning stages, can be expected to result in higher knowledge retention, and ability for the individual to take desired actions when faced with situations they may not otherwise be prepared for. This is especially important in situations where risks to an organization are dependent on the ability of individuals to spot and avoid dangerous situations that can affect other stakeholders.

INTRODUCTION

The nature of work environments is changing at a fast pace; so too is the way employees learn in the workplace. Organizations must find new and innovative ways to cope with change and find training solutions that meet the complex needs of employees in a rapidly evolving technological era. The objectives of this paper are to highlight current academic research on motivated learning through gamification and to share information with stakeholders who are considering the use of gamification as an element of corporate training strategy.

It is a commonly-held belief that workplace learning and training programs are critical to the economic success and growth of organizations and have a significant impact on organizational performance. As an added gain, workplace training has also been shown to enhance individual capabilities, improve team effectiveness and reduce employee errors.

“Much is now known about training individuals, teams, groups, units and collectives. Applied research links effective training to improving performance, reducing errors, saving lives and enhancing safety.”

Salas et al. (2012)

HOW DOES LEARNING OCCUR IN A TRAINING SITUATION/CONTEXT?

There is well-established research on the *science* of training, and it differs from the science of learning. The science of training refers to best practices and design solutions used to develop and implement organizational training and is rooted in learning psychology and strong empirical research on learning (Salas & Canon-Bowers). Learning in a training situation is a complex cognitive process. In this context, learning occurs through a change in the learner’s knowledge by means of a series of mental processes that follow a sequence: a) selecting and attending to relevant material, b) organizing material into a mental representation, and then c) integrating newly learned material with existing knowledge from long-term memory.

In short, newly learned information must be actively processed to become meaningful, to be stored, and to eventually be retrieved from long term memory (Mayer). This can be achieved both **cognitively** - connecting new knowledge with existing knowledge, or **behaviorally** - through practice and simulation (Kraiger and Mattingly). Effective training aims to boost trainee motivation to learn, thoughtfully considers how to maintain engagement, provides opportunities for practice and feedback, and removes obstacles from the transfer of learning (Salas et al).

Based on the most current cognitive and neural science research in the field of learning, Kraiger and Mattingly have developed a summary of key strategies for designing and delivering effective learning and training environments. In asking a central question, “how can we make training more engaging, meaningful, and effortful to maximize learning outcomes?” Kraiger and Mattingly have devised an essential summary of strategies and actions that can be used to develop an optimal training program. While an extensive summary exists, key strategies and actions from their research are listed below in the table.

TABLE 1

Strategy	Action
Make training engaging	This is the extent to which the learner is immersed and active in the learning experience
Replicate the transfer domain	Effective training has learning occur in a context similar to the work environment, or replicates the workplace environment
Make training meaningful	Training content is more likely to transfer to long-term memory when it builds upon previously known information
Provide meaningful examples	Use relevant examples to the learner and their context
Provide Feedback	Learners are provided with a clear direction to improve later performance, which in turn enhances learner motivation
Incorporate visuals	Integrate simple yet informative graphics to convey relevant information
Make training effortful	Encourage learners to make effortful cognitive and behavioral connections between training content to prior knowledge and future applications
Provide opportunity for practice	Promote both recall and application of the learned knowledge and skills to real-world tasks as this enhances long-term retention
Use practice variability	Require learners to engage in a variety of iterations of a practice activity, varying conditions across trials
Test learners' knowledge of content	Testing learners will increase their retention and retrieval of the training content, thus improving overall learning
Personalize content	Use collaborative learning platforms, first- and second-person narratives and personable language
Reduce cognitive load	Learners can focus more on the most relevant training content as opposed to being distracted by unimportant stimuli

Table 1: Adapted from Kraiger & Mattingly

NEW DIRECTIONS IN TRAINING

In conjunction with what we now know about how to create optimal conditions for learning in a training environment, new and innovative training strategies are what is needed to maintain trainee engagement, improve motivation, address learning retention and avoid common issues such as training fatigue and information overload. Employee motivation has been identified as a key challenge in workplace training and low participation rates (Baron).

Fortunately, educational technology solutions have become increasingly recognized as a viable method to improve training and is backed by empirical research. A report by the Association for Talent Development has noted that in recent years, organizations have been moving towards technology-based forms of training

and away from conventional training methods. This shift towards technology-based training has resulted in a more learner-centered approach, and as such, trainees have experienced greater control over their learning (Noe).

Today's growing access to virtual reality tools, mobile devices, gamified learning tools, simulations and synthetic learning environments (Salas) are used in conjunction with solid instructional content to provide unique and engaging training programs. Technological solutions such as these enable learners to allow opportunities for practice and receive detailed feedback in engaging and immersive environments (Salas, Wildman, & Piccolo).

MOTIVATED LEARNING THROUGH GAMIFICATION

As was stated earlier, *motivation to learn* and *engagement* are key challenges for workplace training programs and trainee learning. In recent years, gamification, or gamified learning, has emerged as a leading solution towards the improvement of workplace learning and is meeting a multitude of training needs. While traditional training offers a formally structured environment to transfer a body of knowledge, gamification goes far beyond, offering opportunities to practice in simulated environments safely in immersive, relevant conditions. This is especially important in areas where students may not fully appreciate or understand the need for them to acquire the knowledge and skills being taught.

Not surprisingly, Baxter et al.'s recent study revealed that employees favored gamified learning over lecture-based or non-gamified forms of online learning. Already, there is a substantial body of research that suggests game elements increase intrinsic motivation. Furthermore, it is widely addressed and acknowledged in educational research that games are an effective tool for motivation in classroom settings (Krause, Mogalle, Pohl, & Williams.). *Gamification* takes game-based learning further, using game elements as a unique approach to motivate learners in a variety of contexts (Sailer).

WHAT IS GAMIFICATION?

Broadly defined, gamification can be described as “use of game design elements in non-game contexts” (Deterding). Gamification employs universal game characteristics, or elements. Typical game elements often include goals, rules, conflict, competition, cooperation, time, reward structures, feedback, levels, storytelling, curve of interest and aesthetics (Kapp). According to Kapp, it is the *interplay* of game elements that lead to effective gamification learning experiences.

It is helpful to note that gamification researchers point out that there are a number of game design elements at play, as there are many types of gamification applications, and many of these offer different affordances for learners (Sailer).

“Gamification of learning is defined as the use of game elements, including action language, assessment, conflict/challenge, control, environment, game fiction, human interaction, immersion, and rules/goals, to facilitate learning and related outcomes”

(Landers)

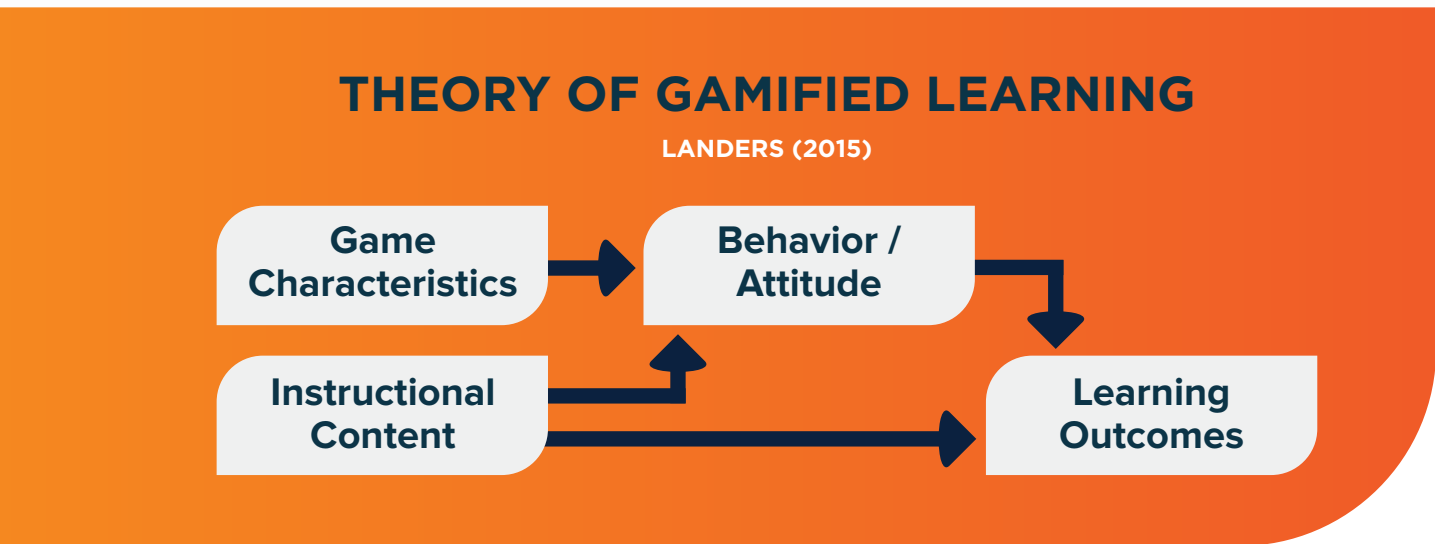
GAMIFICATION AND LEARNING OUTCOMES

Most business-oriented training programs aim to teach employees the tasks and common skills necessary to complete their job functions. As such, the application of Bloom’s Taxonomy can often result in meaningful outcomes that are inherently understood by employees. However, for learning objectives related to corporate awareness programs, there is a particular challenge in this area. Traditional training programs may not be able to engage the students’ attention long enough for them to absorb the basic reasoning for why they are taking the training and what behaviors they need to learn and practice.

To date, there has been little academic research into the use of Bloom’s Taxonomy in an “awareness training” context, where the study of the motivational effects of gamification could be most valuable. However, there could be a working hypothesis, asserting that corporate awareness programs tend to overly generalize learning objectives, resulting in only aiming to convey “knowledge and understanding” rather than more behavioral capabilities at more complex levels of the taxonomy. This “low bar”, combined with a lack of engagement lead to early disengagement by students. This is where gamification and learning may be closely related.

The fundamental objective of gamification in learning environments is to improve learning outcomes through engagement. Gamification practitioners achieve this *indirectly*, and that is through altering learner’s **behavior** and **attitude**, which ultimately affects learning. The *theory of gamified learning* (Lander) is the prevailing framework in the field of educational research that best illustrates the educational impact of gamification (see diagram below). Game characteristics differ in each context and refer to game elements used (such as goals, rules, conflict, competition, cooperation, rewards, feedback, levels, storytelling etc.).

FIGURE 1



Theory of Gamified Learning (Landers)

Based on this theory, Landers proposes that 1) instructional content influences learning outcomes and behaviors, 2) behaviors/attitudes influence learning, 3) game characteristics influence changes in behavior/attitudes, 4) game elements affect behaviors/attitudes that moderate instructional effectiveness and finally, 5) the relationship between game elements and learning outcomes is mediated by behaviors/attitudes. For example, by incorporating a storyline (A Game Characteristic), student engagement (an Attitude) should increase, and strengthen the relationship between Instructional Content and Learning Outcomes.

Sailer and Homner recently authored the most thorough meta-analysis to date on the gamification of learning. In their analysis, they reviewed almost 1000 published studies on gamification and selected the 38 most eligible studies reporting on gamification (eligibility was based on rigour of research methods, and some studies were inconclusive). Their meta-analysis looked at the effects of gamification on cognitive, motivational and behavioral learning outcomes. They focused on a range of key moderating factors that were most relevant to the diverse gamification research. Two key factors across the research were the inclusion of game fiction and social interaction. These are defined below:

GAME FICTION

Game fiction is the use of narrative characteristics such as meaningful stories, avatars, a game world and story features to immerse and situate learnings in a particular context. Game fiction has been shown to positively affect behavioral learning outcomes, as learners tend to invest more effort (Armstrong & Landers).

SOCIAL INTERACTION

Much like game fiction, social interaction in gamified learning affects behavioral outcomes. Social interaction has been shown to satisfy a need for *fun* and *relatedness* (feeling connection and kinship), which can be a result of competitive and/or collaborative approaches. Social interaction is also a key driver in motivation. Features such as a leaderboard can offer a sense of constructive competition; they are understood to be good-natured, and everyone's skills improve (Rigby and Ryan).

One caveat that should be considered is that competition can be problematic when a wide difference in skill level exists in social learning contexts, and when success may be unattainable for learners with lower skill levels (Slavin).

Based on their rigorous meta-analysis on learning outcomes through gamification, Sailer and Homner have concluded that gamification has positive effects on cognitive, motivational, and behavioral learning outcomes, and emphasized that game fiction, through features such as fictional game world and avatars, held promise to foster learning. Notably, their findings are in line with Lander's theory of gamified learning.

It should be noted that across all research, there are not enough longitudinal studies to address long term knowledge or learning retention.

“Evoking social interactions via gamification in the form of combinations of collaboration and competition was most promising for behavioral learning outcomes”

Sailor and Homner, 2019

LEADING GAMIFICATION FRAMEWORKS AND TAXONOMIES

While a range of theoretical frameworks for gamification do exist, there are inconsistencies between them as this nascent field continues to evolve. This section looks at selected authoritative frameworks and taxonomies for gamification that are currently in wide use and have gained significant traction amongst gamification designers, developers and education experts.

The first is a comprehensive taxonomy of game attributes developed by Bedwell, Pavlas, Heyne, Lazzara and Salas. Their game attribute taxonomy aims to not only address game attributes to learning outcomes, but to work towards the development of a stable, integrated model of learning in gamification contexts.

TABLE 2

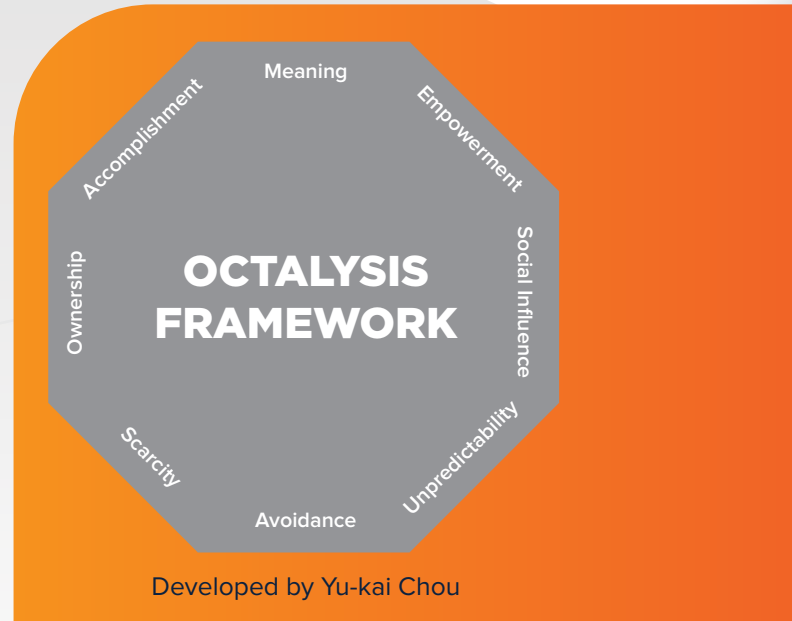
Attribute category	Definition
Action language	The method and interface by which communication occurs between a player and the game itself (eg: an online simulation).
Assessment	The method by which accomplishment and game progress are tracked (eg: points system, leaderboard).
Conflict/ challenge	The problems faced by players, including both the nature and difficulty of those problems (eg: storyline with conflict).
Control	The degree to which players are able to alter the game, and the degree to which the game alters itself in response (eg: opportunities to replay for improvement).
Environment	The representation of the physical surroundings of the player (eg: 3D virtual world).
Game fiction	The fictional game world and story (lecture or discussions are renamed quests or adventures).
Human interaction	The degree to which players interact with other players in both space and time (competition, collaboration, participation).
Immersion	The affective and perceptual experience of a game (eg: a simulation of a real event).
Rules/goals	Clearly defined rules, goals, and information on progress toward those goals, provided to the player (progress bar, illustration of tasks to complete).

Adapted from Bedwell, taxonomy illustrating examples of gamification of learning by attribute category.

THE OCTALYSIS FRAMEWORK

The human-centered **Octalysis framework** is one of the leading design frameworks in the field of gamification developed by Yu-kai Chou. Based on 10 years of extensive research and study, Chou’s framework has not only become a popular design methodology, it is also beginning to see use by researchers to analyze the effectiveness of gamification in educational contexts. It is comprised of eight core drives that serve primarily to motivate and engage users. Chou contends that good gamification does not necessarily need to include all of the core drives, but it should be very good at the ones it does include. They are briefly described below:

1. **Epic Meaning & Calling:** This core drive is a ‘call to action’ where the player believes they are being asked to do something greater than themselves (eg: beginner’s luck, narrative, humanity hero).
2. **Development and Accomplishment:** This internal drive satisfies the desire to overcome challenges, make progress and develop skills. The ‘challenge’ aspect of this drive is significant, and efforts can be acknowledgement in a variety of ways (points, badges, leaderboards or progress bar).
3. **Empowerment of Creativity and Feedback:** This drive addresses the need to express creativity through a creative process, and to receive feedback. This can be an iterative progress of creatively solving problems (eg: milestone unlocks, instant feedback, real-time control).
4. **Ownership and Possession:** A sense of ownership and/or possession increases user’s motivation and investment in a game. This can be through the customization of a profile, or the accumulation of virtual goods, for example.
5. **Social Influence and Relatedness:** Social influence can be driven through mentorship, acceptance, competition, social responses, companionship and even envy (eg: friending, group quests, brag button or water cooler).
6. **Scarcity and Impatience:** Chou defines this drive as “wanting something because you can’t have it. When a user is not immediately gratified, they are motivated to think about what it is they want (eg: prize pacing, dangling, count down timer).
7. **Unpredictability and Curiosity:** This drive addresses the need to find out what is going to happen next (eg: visual storytelling, easter eggs, random rewards, oracle effect).
8. **Loss and Avoidance:** This drive recognizes the user’s impulse to avoidance negative occurrence. This drive also addresses the feeling of lost opportunity due to inaction (eg: FOMO punch, sunk cost prison, status quo sloth).



As a practical approach to analyzing the gamification attributes of training program, the Octalysis Framework can be used to identify opportunities to use gamification to improve the expectations and attitudes of students, as well as the outcomes for business organizations that need to address gaps. The framework addresses many of the published academic models and approaches, and appears to be easy to apply.

CONCLUSION

The challenges for any business training program that requires “motivated learning” will be in determining the scope of training content that can be addressed within a given project budget, while ensuring that resources expended on engagement techniques through gamification can be re-used in future course evolutions and expanded training programs. This suggests that any training program that requires supplementary motivation to engage students should use a software architecture that incorporates scalable, built-in gamification elements that can provide alignment with all of the proven behavioral drivers for motivated learning.

RECOMMENDATIONS FROM CLICK ARMOR

With increasing levels of automation and outsourcing of routine business tasks, Click Armor believes that the importance of employee risk decisions is becoming increasingly important. Organizations that value their employees’ ability to identify and avoid risks in their work environment must evaluate and understand how a gamified learning platform can be critical to developing and maintaining the defensive awareness and response skills required in new fields such as cybersecurity awareness.

ABOUT CLICK ARMOR

Click Armor is the only fully gamified CyberSecurity Awareness Platform that allows organizations to arm their employees with the skills they need to continuously identify and avoid threats such as ransomware, phishing and social engineering attacks.

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Alison is a doctoral candidate in the Curriculum, Teaching and Learning Department at the Ontario Institute for Studies in Education (OISE) at the university of Toronto. Her current research work looks at how restructuring pedagogical practices to promote communication and collaboration in increasingly diverse global online learning environments may improve student engagement and meaningful student interactions.

Alison's professional background includes over 20 years of teaching experience at both K-12 and undergraduate levels in face-to-face, blended, and fully online classroom environments. Her research interests extend to critical pedagogy, critical media literacy, online learning management systems, the use of instructor videos for online courses and gamification in learning contexts. Alison is also interested in pedagogical role of instructor videos in online learning environments.

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