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A Playful Affordances Approach to the Design of Gameful Learning*

ROBERT W. SONGER
Department of Global Information and Management, Kanazawa Technical College, 2-270 Hisayasu, Kanazawa, Ishikawa 921-8601, Japan. E-mail: rsonger@neptune.kanazawa-it.ac.jp

KAZUNORI MIYATA
School of Knowledge Science, Japan Advanced Institute of Science and Technology, 1-1 Asahidai, Nomi, Ishikawa 923-1292, Japan. E-mail: miyata@jaist.ac.jp

Typical applications of gamification in education use either game mechanics to encourage positive engagement behaviors or full games to deliver educational content; however, both approaches raise some concerns. Game mechanics can distract from the intrinsic enjoyment of activities while full games construct learning contexts that may be significantly different from the real-world contexts of the targeted subject matter. This paper aims to highlight issues of behavioral conditioning and knowledge transfer in instructional design that uses gamification by examining foundational theories and recent studies. We propose a design approach called "gameful learning" that focuses on integrating intrinsically rewarding, playful aspects of game-like experiences into authentic learning activities. Authentic learning activities relate real-world contexts to classroom learning while the desired motivational outcomes of playful experiences are shown to be more fulfilling than extrinsic rewards. We then investigate playful experiences in a game-based learning activity integrated into a business English class at a Japanese technical college. In the activity, mixed teams of Japanese and Singaporean students (N = 47) competed at negotiating for resources required to establish businesses within the specified time limits. The results of our analysis show the experiences of arousal, contest, and discovery were the most prevalent in the game. Levels of arousal and thrill showed the strongest positive correlations to enjoyment, implying the students had approached the activity with a playful attitude rather than a serious one. The Japanese students' reported levels of engagement in the contest and experiences of achievement correlated strongly with their sense of challenge. These results and their implications for the development of a playful affordances model as a tool for the design of gamification and game-based learning activities are the focus of this paper.

Keywords: gamification; gameful design; play; game-based learning

1. Introduction

Various attempts at defining gamification specify a goal of engaging users in problem-solving, or motivating brand loyalty (for example, [1–3]). While the intended outcome often varies depending on the source, gamification is most generally understood as the integration of game elements into contexts not usually associated with games. The promise of gamification has been praised despite the state of research on the subject showing little conclusive evidence regarding its effectiveness. For example, a review of empirical studies related to gamification examines various external sources of motivation such as points, goals and feedback; however, the conclusion is that the results depend heavily on the context and the user [4]. Alternatively, identifying the intrinsically appealing, or autotelic, aspects of gamification instead of disparate external influences may lead to more revealing conclusions about its effectiveness. The literature suggests that engagement in a game's design is driven by qualities deeply inherent to the nature of human motivation, which we discuss throughout this paper in terms of the autotelic experiences of gameplay.

Within the domain of education and training, game-based learning research has advanced the claim that games promote learning for a variety of reasons (see [5]). For educators who seek to gamify the classroom without using fully self-contained games, we propose an approach to instructional design based on game-based learning research that integrates motivating game-like experiences. We call learning activities designed in this way "gameful learning", where the word "gameful" comes from Jane McGonigal's concept of gamefulness as an indicator of the experiential qualities associated with gaming [6]. In the background discussion that follows, we assert that the experiential qualities of gaming are misrepresented and often lost when there is an emphasis on superficial behavioral modification. The design of gameful learning should be aware of these consequences and aim to promote playful interaction with the subject material in a non-game context that employs principles from game-based learning research.

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This paper has two primary objectives. First, section 2 takes a critical look at the discussion of gamification and highlights the relevant theories and misconceptions pertaining to motivation and learning. Second, section 3 proposes an approach based on the literature review for the design of game-like experiences in non-game activities. This proposal is supported in section 4 with the evaluation of a game-based learning experience in which aspects of play are measured for their interrelations, and correlations to the total enjoyment of the activity. The discussion of gamification, motivation and learning in section 2 is further divided into detailed analyses of the theories that are intrinsically tied to the popular conceptualizations of gamification. Section 2.1 reasons that common approaches to gamification for enhancing motivation are misguided, but that game design principles related to active engagement and training are justifiable with regards to psychological theory. Section 2.2 portrays an understanding of the relationship between play and games as a foundation for the design of game-like experiences. Game design and learning are then reviewed in section 2.3 where the use of game metrics is contrasted with the design of playful experience and a proposal is made for gameful learning. After establishing this theoretical background, a concrete example is given for evaluating the contributions of playful aspects in the design of a game-based learning experience.

2. Background

2.1 Gamification

The concept of gamification is one that is heavily debated. Early proponents of gamification have taken visual elements of accomplishment from electronic games (e.g., points, badges, and leaderboards) and encouraged their use for enhancing engagement in other contexts. Critics underline the assumptions about motivation reflected by this approach as being insufficient. One argument is that the focus on game metaphors and extrinsic regulation exploits the user through manipulative rhetoric [7]. Another interprets this approach as one that seeks to influence user behavior with the promise of virtual awards which independently fail to represent the powerful experience of games as a whole [8].

In light of these criticisms, Deterding et al. have formulated a definition of gamification that provides a neutral ground from which to view both sides, defining it as "the use of game design elements in non-game contexts" [9]. This non-prescriptive definition further describes "game design elements" at varying levels of abstraction related to the design of games. These can be anything from superficial interface elements to complicated design activities. According to Deterding et al., gamification focuses on the strategy of using such elements without any explicit intent or purpose. In contrast, the term "gameful design" is a related approach that focuses instead on game-like experiences as the intended result or final product.

While research on the efficacy of gamification and its applications is limited [4], its theoretical background draws heavily from behavioral psychology. Rewards are commonly regarded as an effective means of guiding human behavior; however, a meta-analytic review reveals such carrot-and-stick tactics to be obstructive to self-regulation and harmful for well-being [10]. Self-determination theory states that self-sufficiency thrives on the feelings of autonomy, competency and relatedness [11]. Furthermore, goals that are not motivated by the desire to satisfy intrinsic psychological needs must be driven by some extrinsic source. To this extent, rewards are considered to be extrinsic regulators and may include anything from material goods to intangible feelings of praise or social status.

Studies into the motivations of gamers support self-determination theory. Popularly cited among such studies is the categorization of play styles known as Bartle's Player Types [12] and the multiple factor analysis performed by Yee [13]. Both approaches focus on specific characteristics designed into massive multiplayer online role-playing games to make conclusions about demographics and play habits. While the factors identified by Yee include subcomponents of achievement, socialization and immersion, which may be present in other game styles and contexts, Ryan et al. demonstrate that the psychological needs identified by self-determination theory remain at the core of player motivations [14].

Another study examines gamer motivations regardless of game type as it relates to passion and the phenomenon of optimal experience known as flow. Wang et al. defined gamer profiles according to the degree in which their passion for games affects other aspects of their lives [15]. All resulting profiles shared high scores of dispositional flow and autonomous/intrinsic regulation irrespective of whether their drive was harmonious or obsessive. The measures of flow examined in this study were those described by Csikszentmihalyi [16] as the balance of challenge and skill, merging of actions and awareness, clear goals, unambiguous feedback, concentration on the task at-hand, a sense of control, loss of self-consciousness, transformation of time, and autotelic experience. Extrinsic regulations such as rewards shared the lowest scores across all profiles.

Given that extrinsic rewards tend to be a cornerstone of existing gamification practices, overreliance on such game metrics has likely been an unwise start to the gamification movement. Nevertheless, electronic games continue to be wildly popular on various platforms despite their uninhibited use of similar tactics. Tulloch argues that the game industry enjoys its success due to a long history of refining reward programs that support the player by signifying achievements and quantifying progress [17]. Video games are often highly complicated systems that require a certain level of onboarding before the player can feel comfortable. Progressing through the system and discovering advanced or emergent gameplay often requires incentives for players to push their own limits and break their habitual styles of play [18]. Although games may possess incremental levels of systemic complexity created by rules, they are inherently objects of entertainment and operate under the premise that the player must be engaged. From this observation, Tulloch offers an interpretation of gamification as "a form of training built upon the techniques used in, and heritage of, games rather than traditional pedagogy" [17, p. 326]. While traditional pedagogy motivates students by awarding grades and credits, good games use rewards with endogenous value within the context of play. When implemented appropriately, such rewards can contribute to the intrinsic motivations of players through enhanced social interactions, self-reflection, fun, and experiences of flow [19].

While much hype surrounds gamification as a panacea for problems of engagement, the strategy itself must take into careful consideration the nuances of human motivation to satisfy this intent. Practical examples have been criticized for adopting a superficial layer of conditioning elements while overlooking experiences at the core of games. Such elements used to reward player behavior can provide structure in games, but studies show that associating them with gamer motivation is cursory at best. The experiential qualities of games identified by the dimensions of flow appear to be the likeliest of candidates for motivational game elements. Looking at the whole of gaming contexts and what it means to play therein can give us a further appreciation of the gaming experience.

2.2 Play and games

Understanding game-like experience requires some clarity of the terms "game" and "play" which are notoriously ambiguous in informal contexts. Cultural theorist Johan Huizinga dedicated his frequently referenced work *Homo Ludens* [20] to the task of illuminating play as an aspect of human nature from which culture has emerged. His depiction of the "consecrated spot" in which play happens has been a focal point of much discussion in game studies as it depicts the physical and psychological separation of play from unconcerned aspects of "ordinary life". This "magic circle", as it has come to be called, is an unspoken social contract among the individual players as a means of creating a sense of order and excusing the otherwise superfluous activities that happen within.

Gregory Bateson further characterizes the space of play as existing simultaneously within and apart from normalized social environments [21]. Play creates meaning through internal and implicit communication among participants, encouraging further play and engagement with its autotelic nature. Bateson asserts that play is a manner of framing an activity rather than the activity itself. Once the frame of mind has been established, then play becomes an exploration of possibilities available within the determined space. Csikszentmihalyi & Bennett express a similar perspective when they define play as "a state of experience in which the actor's ability to act matches the requirements for action in his environment" [22, p. 45]. Here play is compared to anxiety, in which the degree of possibility is overwhelming, and boredom, in which the possibilities for action are too limited. Apter expands on these notions by discussing anxiety and boredom in terms of their associated mindsets [23]. A mindset that is "telic", or serious, will experience anxiety in states of high arousal whereas a mindset that is "paratelic", or playful, will experience excitement in similar situations. In summary, we can see the act of play as one that establishes physical and social contextual spaces within which players adopt a playful psychological state to explore potential actions and their consequences.

From this perspective of play, we can now examine the concept of a game with respect how games and play relate. An anthropological review of play illustrates an ambiguity when distinguishing play and games [24]. Informal notions of games do not always acknowledge a difference between play as an activity and play as a mode of experience. As an activity, play is recognized entirely by its form with little to no consideration for the attitude of the player. The mode of play, however, can be characterized by a readiness to improvise and seek creative order within an indeterminate scale of possibility—a psychological state of curious enthusiasm. Without assuming this state, engagement with a game system becomes mere operation even though the activity may be described as play. In such a case, the psychological context for play is not satisfied and the player's experience may not necessarily be one of enjoyment.

Classic definitions of games have consistently overlooked the question of a playful mindset. Out of the numerous attempts at a definition, only a few address a player's interaction with the game, and they do so in terms of goals or conflict [25]. In contrast to these definitions, game designer Jesse Schell defines a game as "a problem-solving experience approached with a playful attitude" [26, p. 37] where "problem-solving" covers the formal elements of games like clear goals and boundaries, methods of solving, and the ultimate consequence of overcoming the problem or surrendering to its challenge. This definition is significant in its recognition that the inextricable relationship between the game artifact and the disposition of the player is essential to the experience of a game.

Further evidence that games are characterized by the experience they provide comes from game design practice. Hunicke et al. propose an abstraction of games known as the MDA framework [27], named after the three layers composing a game: Mechanics, Dynamics, and Aesthetics. This framework stresses the point that developers and players approach a game system from different perspectives. While the developer builds the game from its most basic elements (the mechanics), the player is engrossed by the emotional responses it elicits (the aesthetics). Deterding et al. acknowledge these aspects of game design by including game experiences in their taxonomy of game design elements for gamification [9].

We have thus far identified play as an exploratory act performed in established contexts and carried out by individuals in a pleasure-seeking frame of mind. By providing clear rules and boundaries that give meaning to the actions of players, systems create the holistic experience that makes up a game. Furthermore, consecutive transgressions into the state of playing (i.e., enjoying free-form activity) and then into the state of gaming (i.e., engaging with a game system) can be distinguished from the mundane state [28]. After performing these transgressions, the player must then balance between the mode of play, where the goal is to maintain a pleasurable state, and the mode of the game, where finer goals are defined by rules and structure. Without this balance, the autotelic qualities of the experience may be undermined by the rigidity of the game, or the importance of the goals may be diminished by the frivolity of play. For these reasons we see the encouragement of play as equally important as the use of metaphorical rule structures in the design of game-like experiences.

2.3 Gameful learning

The idea that game-like metrics and feedback can enhance activities and stimulate engagement is especially appealing in education. Video games technologies have evolved to the point where they can significantly emulate real-world environments and enable players to take complex, meaningful actions within the game context. For this reason, games are often thought to illuminate the correlations between play and learning. Nevertheless, gameful learning environments hoping to benefit from game design techniques should take care to avoid common pitfalls that lead to superficial, reward-oriented, organization-centric, or pattern-bound solutions [29]. Additionally, the difficulty of balancing enjoyment and academic intensity is a common thread in game-based learning research.

Numerous accounts advocate specific qualities of games that provide educational benefits (e.g., [30, 5]). One particular account elaborates specific mechanisms from game design that may be beneficial for science education [31]. Selected on the criteria of contribution to the acquisition of content knowledge, process skills, or an understanding of the nature of science, these mechanisms are classified into three levels of scaffolding: motivational, cognitive, and metacognitive. A similar approach focuses on the idea of conceptual play spaces as a means of creating meaningful contexts for learning [32]. Students project themselves into a fictional problem context where their ability to achieve the learning outcomes shows immediate effects in the environment. Example systems illustrate how scaffolds can be used to provide a perceptual environment, contextual details, rules and metrics to regulate activity, and engagement through interaction with other students.

Game-based learning research investigates the learning that happens within a game with the intent to recreate the phenomenon with educational content. One such model proposes a cycle of user judgments, behavior, and feedback that may be employed to achieve desirable learning outcomes [33]. The basis for this model is a specific type of gameplay which appears to be less effective than intended when viewed from an ecological perspective. Linderoth challenges the basic assumption that the way in which these cycles enable a player to progress is evidence of learning [34]. If implemented correctly, the signals and affordances within a game environment enable players to navigate increasingly complex situations once their individual meanings can be recognized. Linderoth states that observation of such behavior has led to the assumption that games inherently direct continual learning. Studies in situated cognition suggest that this is actually a fundamental aspect of acquiring literacy in specialized contexts such as technology [35]. Nevertheless, Linderoth's point is that the cues in video games may be designed to be understood quickly and used liberally within the game environment so that little learning (as a product of frustration) is required of the player.

The issue of contextual significance in a learning activity is another concern for game-based learning. Games and gameplay rely on the setting of the magic circle which is composed of physical, social, and psychological dimensions [36]. The psychological dimension provides a frame of reference for the interpretation of game actions, effectively bounding the space in which game-based learning happens. This can be problematic when the fictional and imaginative nature of the game's narrative differs significantly from the authentic context in which the learning is meant to be applied. It has been shown that different physical and social contexts surrounding two given tasks influence the ability of students to transfer learning [37]. Games used to teach real-world skills then lose their potential effectiveness unless they are accompanied by pre- and post-activities that scaffold and debrief the students (as advocated in [33]), thus ensuring that what they learn in the game can be applied to other areas.

Here we can see potential for the gameful design of learning activities to benefit from the various merits of learning in games while also addressing the problem of transfer. The domain of an educational topic can be dissected into overlapping physical and social contexts similar to those of play. The physical dimension includes spatial and temporal boundaries surrounding the activity as well as the artifacts involved. The social dimension establishes social borders agreed upon by all participants which, in terms of a game, allows for the playful mindset to be shed during times of serious play. Whereas a typical educational game would produce its own artifacts symbolic of the target domain, gamification might instead incorporate real artifacts from the target domain into a gameful activity. Similarly, the social boundaries of the game can be expanded to include actions and protocols typically used in the target domain. This proposal draws on concepts from alternate reality games and pervasive games, which actively explore the fusion of games with the real world [38, 39]. Furthermore, a recent study shows evidence that the framing of an activity as a game (essentially establishing the psychological context of play) is equally as engaging as a full game experience [40]. This supports our proposed route for gameful learning as constructing a psychological context for play around a set of physical and social elements from the target domain, and encouraging playful interaction within said context.

3. The playful affordances model

In order to investigate the contributions of playful experiences in the pursuit of motivation and learning, we elected to evaluate a game-based learning activity using the playful affordances model from [41]. The model embodies several concepts from the above discussion such as transgressing into the psychological context of play and promoting the autotelic qualities of game-like experiences. Empirical evidence suggests autotelic experience not only emerges from flow state but is also a condition for achieving flow [42]. Other elements identified as conditions for flow include the balance of challenge and skill, control, clear goals, and feedback. While these elements can be achieved through the rules and structure afforded by games, autotelic experience emerges from aesthetic design choices. The playful affordances model supports such design by connecting the attitude, activities and emotional states of play. Granted, the model itself is not an exhaustive representation of playful experiences; however, the relationships it proposes pose an opportunity to evaluate our theoretical background.

The playful affordances model draws from the philosophy of play, the design of interactive artworks, and the analysis of video games. A "pleasure framework" by Costello and Edmonds details 13 categories of pleasure determined by a literature review and proved through application [43]. The result is a one-dimensional list of terms used to describe the various forms of pleasurable, playful experiences. The PLEX framework extends this list to cover the range of experiences specifically afforded by video games [44]. It was developed by analyzing engagement with video game systems and so follows the assumption of play as a form of activity, including experiences such as "suffering" or "completion" as types of playful experience. Such experiences may be enjoyable when a playful mindset is adopted; however, the frustrating activities included in the PLEX framework will likely be less pleasurable in non-game contexts.

In contrast to the previous frameworks, the playful affordances model forms a multi-dimensional categorization of autotelic experiences identified from existing literature. At the most abstract level, the four play categories of agon, alea, mimicry, and ilinx, which loosely translate into contest, chance, imagination, and vertigo, are adopted from philosopher Roger Caillios [45]. These categories became themes for exploring terms from existing frameworks and grouping them based on similarity. A look at the resulting groups revealed two types of terms in each category: those expressing action and those expressing state. Both types were then generalized and matched as action-state pairs representing each of the four categories. Table 1 shows this categorization of terms as unordered lists under their respective themes. The bottom row shows the pairings of play behaviors and experiential states proposed as the representative concepts in each category.

Table 1. Play terms mapped to pairs of behavioral and experiential states

Agon	Alea	Mimicry	Ilinx
Challenge	Discovery	Fantasy	Sensation
Competition	Curiosity	Narrative	Simulation
Difficulty	Exploration	Fiction	Danger
Control	Risk	Creation	Sensory
Achievement & Completion	Beauty & Immersion	Cognitive Synergy	Physical Activity
Contest & Challenge	**Exploration & Discovery**	**Imagination & Creativity**	**Sensation & Arousal**

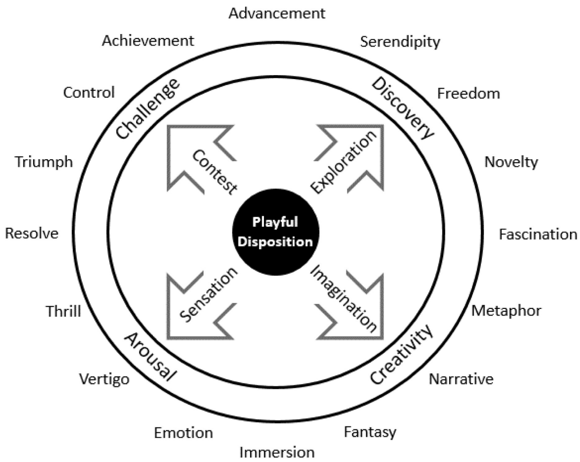

Fig. 1. The playful affordances model.

When likened to the concept of design affordances, pairs of employable actions and resulting states illuminate a way to achieve desired experiences by designing opportunities for certain playful actions. The representative pairs from the categories above are proposed as "playful affordances" and form the basic components of the model. In addition, the precondition of a playful disposition is included to fully capture the act of transgressing into a state of play. As shown in Fig. 1, the playful disposition is at the center of the experience with forms of activity branching out in a radial pattern to support the experiential states along the rim. Activities relating to contest, exploration, imagination, and sensation afford the expansion of playful experience when approached with a playful attitude. The resulting experiences are then generalized as challenge, discovery, creativity, or arousal. Along the outermost edge of the model are additional descriptors that provide examples of where similar experiences may lie on the spectrum.

4. Evaluation

Based on the playful affordances model, we sought to evaluate an experience of play in an educational context. The opportunity for this study came during an exchange program between a polytechnic school in Singapore and a technical college in Japan when the Singaporean students participated in a technical English class at the Japanese school. The planned activity was to play a team-based business negotiations game, called The Shosha[1], in which players must trade cash, resources, and project cards in order to gather the requirements for establishing businesses. Each round consisted of a planning phase, in which players could only talk amongst their teams, and an action phase for making deals with other teams and completing sets. At the end of each round, the teams reported their score as the sum of cash on hand and the fixed assets of their established businesses. The winning team was determined according to the highest score after three rounds. In this instance, the game was played in English with mixed teams of Singaporean and Japanese students. An explanation was given at the start of the game and a reflection period followed its completion.

4.1 Method

The playful experiences in the business negotiations game were captured by a survey of the players conducted after the game had completed. The survey consisted of 18 Likert items in total: one for anticipated enjoyment before play; one for overall enjoyment after play; eight for behaviors engaged in during play; and eight for experiences of fun. The behavioral items reflected the action terms in the playful affordances model—contest, exploration, imagination, and sensation. Each of the four behavioral items had a positively worded item and a negatively worded item as shown in Table 2, and each solicited a response on a scale from 0 (completely disagree) to 5 (completely agree). The experiential items were simple one-word descriptors chosen from the outer edge of the model to which respondents rated intensity experienced during play on the scale of 0 (not at all) to 5 (a great amount). Two terms were chosen from each of the four dimensions for a complete list of achievement, arousal, challenge, creativity, curiosity, discovery, fantasy, and thrill. The two items for expected and actual enjoyment used scales similar to the previous items, ranging from 0 (no enjoyment at all) to 5 (greatly enjoyable).

[1] http://www.projectdesign.co.jp/the-shosha (Japanese).

Table 2. Positively and negatively worded survey items and their corresponding behavioral terms

Survey Item	Behavioral Term
I put a lot of effort into performing as best I could in the game.	Contest
The game was too easy.	Contest
I was excited to make deals/establish businesses/work towards a high score.	Sensation
The game was too slow or boring for me.	Sensation
I tried various different ways to make deals/operate in my team.	Exploration
I did not change my tactics during the game.	Exploration
I do not care for the business theme in the game.	Imagination
I could imagine what it must be like to form a business/be a businessman.	Imagination

In this instance, the Singaporean students had no previous experience with the game while the Japanese students were playing it for their fourth time. The previous three times were done in the same class over the course of two months before the Singaporean students arrived. The first play was done in Japanese so the students could get accustomed to the rules. The second and third times were done in English with translation sheets of common negotiation phrases. In between the second and third time, the students participated in a focused scenario activity for practicing specific language used to make deals.

After the play finished, the students participated in a reflection activity in which they discussed the qualities of other players they had recognized as good business partners. The survey was distributed after the reflection activity completed, and it was collected again within the same day. All students responded to items written in their native language. The responses were then analyzed in clusters defined by nationality as well as self-reported anticipation of enjoyment.

4.2 Results

We calculated correlation values between reported actual enjoyment and playful experiences, corresponding behavioral and experiential items from the playful affordances model, and experiential items within each of the model's four dimensions. Out of the 43 respondents, 7 were discarded due to acquiescence bias on positively and negatively worded behavioral items. Subsets included Singaporean students (n = 12) and Japanese students (n = 24), as well as cohorts determined by anticipated enjoyment of the game. Students reporting low anticipated enjoyment formed cohort 1 (n = 9), medium anticipated enjoyment formed cohort 2 (n = 17), and high anticipated enjoyment formed cohort 3 (n = 10). This distinction was made to examine the dispositions of students with low, medium, and high apparent interest in the activity at the start of play. Compared to their reported actual enjoyment, the majority of students enjoyed the game either as much or more than they had anticipated (Fig. 2). Students experiencing the game

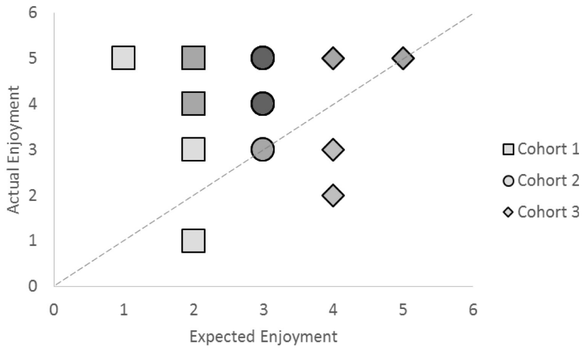

Fig. 2. Student self-reports of enjoyment. Darker shading represents more respondents. Cohorts are determined by expected enjoyment values.

for the first time made up 44% of cohort 1, 35% of cohort 2, and 20% of cohort 3. The difference in reported values for anticipated and actual enjoyment is significant ($M_1 = 3.083$, $SD_1 = 0.937$; $M_2 = 4.111$, $SD_2 = 1.063$; $p < 0.001$). Anticipated enjoyment values, which were reported retrospectively on the post-game survey due to time constraints, were not related to either overall enjoyment of the game ($r = 0.048$) or playful experiences (all eight of which satisfied $r < 0.250$).

Survey responses reveal that playful experiences correspond with overall enjoyment of the activity. Correlation values for each of the subsets are shown in Table 3 with cohort 3 having the highest values. Out of the eight experiential items measured, arousal and thrill had the strongest correlation with enjoyment for all the students. Similarly, arousal was the strongest predictor of enjoyment for the Japanese students, cohort 1, and cohort 3 while thrill was the strongest for Singaporean students. Cohorts 1 and 3 both showed strong correlations for arousal, thrill, and discovery while cohort 3 also had strong correlation for achievement. The four significant correlations for cohort 2 were moderate across all items, although their actual enjoyment was the highest among the cohorts ($M_{C1} = 4.000$, $SD_{C1} = 1.323$; $M_{C2} = 4.235$, $SD_{C2} = 0.752$; $M_{C3} = 4.000$, $SD_{C3} = 1.333$). No conclusive data was given for fantasy among any of the subsets, and challenge was a significant indicator only for the Japanese students and population as a whole.

Table 3. Correlation values for playful experiences compared to overall enjoyment. Strong relationships are bolded ($r > 0.700$). Clusters are: Singaporean students (SG), Japanese students (JP), cohort 1 (C1), cohort 2 (C2), cohort 3 (C3), and the whole population (P)

r	SG	JP	C1	C2	C3	P
Challenge	0.639	0.474*	0.299	0.098	0.168	0.387*
Discovery	0.657*	0.620*	**0.714***	0.535*	**0.857***	0.640*
Creativity	0.015	0.587*	0.098	0.594*	0.267	0.498*
Arousal	0.689*	**0.719***	**0.849***	0.236	**0.878***	**0.704***
Achievement	0.664*	0.594*	0.206	0.055	**0.802***	0.599*
Curiosity	0.321	0.573*	0.668*	0.504*	0.668*	0.525*
Fantasy	0.516	0.401	0.643	0.309	0.529	0.443*
Thrill	**0.818***	0.664*	**0.783***	0.584*	**0.787***	**0.721***

* Significant values ($p < 0.05$).

Table 4. Correlation values comparing items within the same dimensions of the playful affordances model. Strong relationships are bolded ($r > 0.700$). Clusters are: Singaporean students (SG), Japanese students (JP), cohort 1 (C1), cohort 2 (C2), cohort 3 (C3), and the whole population (P)

r	SG	JP	C1	C2	C3	P
Challenge/Achievement	–0.581*	**0.705***	**0.811***	0.468	0.600	0.541*
Challenge/Contest	0.000	**0.759***	–0.117	0.505*	0.643*	0.439*
Discovery/Curiosity	0.446	0.566*	0.267	0.612*	**0.814***	0.560*
Discovery/Exploration	–0.150	0.096	–0.077	0.418	–0.269	0.122
Creativity/Fantasy	0.395	0.600*	0.153	0.659*	0.445	0.488*
Creativity/Imagination	–0.014	0.224	–0.102	0.112	**0.854***	0.265
Arousal/Thrill	**0.892***	**0.805***	**0.733***	0.663*	**0.973***	**0.808***
Arousal/Sensation	0.665*	**0.858***	**0.840***	**0.747***	**0.775***	**0.779***

* Significant values ($p < 0.05$).

Table 5. Ratings for behavioral terms with correlations between corresponding positively and negatively worded survey items

	Positive Item		**Negative Item**			
Behavioral Term	**M**	**SD**	**M**	**SD**	*r*	**Final Rating**
Contest	4.083	0.841	3.770	1.314	0.158	3.770
Sensation	3.571	1.441	3.563	1.206	–0.268	3.563
Exploration	3.472	0.971	3.111	1.296	–0.165	3.111
Imagination	2.944	1.433	3.042	1.355	–0.004	3.042

The correlations between items within each dimension of the model are shown in Table 4. Arousal had the strongest correlations to thrill and sensation across all subsets as well as the whole of the participants. Arousal and thrill were very strongly related for students with high expectations of enjoyment. No correlations could be found between exploration and discovery, or imagination and creativity, except for the latter pair which strongly correlated for cohort 3. As for discovery, its relationship to curiosity proved to be strongest among students with high expectations. Challenge and achievement had a high positive correlation for Japanese students and students with low expectations but a moderate negative correlation was found with the Singaporean students.

Given the radial nature of the playful affordances model, it has been suggested that descriptors be used as dimensions of a radar chart in the holistic evaluation of playful activities [41]. In the case of the business negotiations game, correlation values between behavioral and experiential items did not justify aggregating their ratings into the same dimensions. For this reason, we opted instead to represent the eight primary terms separately. Aggregated means for the behavioral items assumed equal weights on positively worded item scores and their corresponding negatively worded item scores (reversed); although, there was no significant correlation between these scores for any of the four behavioral terms (Table 5). For the experiential terms, the mean scores of items chosen from the

Table 6. Ratings for experiential terms from the four dimensions of the playful affordance model

Experiential Term	**M**	**SD**	**Final Rating**
Challenge & Achievement	3.556 3.528	1.027 1.207	3.542
Discovery & Curiosity	3.778 3.750	1.045 1.025	3.764
Creativity & Fantasy	3.750 3.028	1.079 1.207	3.389
Arousal & Thrill	3.806 3.583	1.327 1.628	3.694

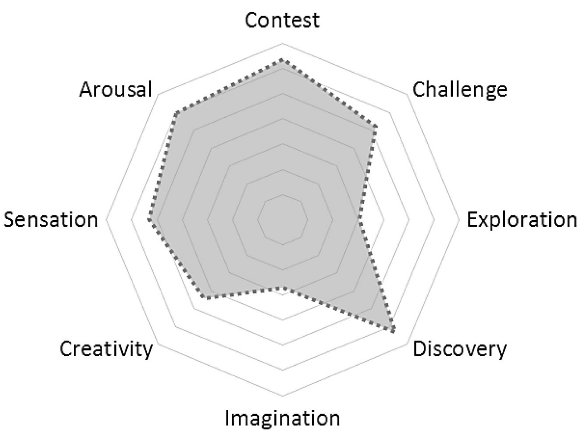

Fig. 3. Overall student ratings of behavioral and experiential qualities in the business negotiation game.

same dimensions of the model were aggregated with equal weights (Table 6). As reported previously in Table 4, the scores for each of these descriptor pairs showed significant correlation. The results reveal that contest, discovery, and arousal were the strongest elements of play (Fig. 3).

5. Discussion

The differences between the Singaporean students and Japanese students have implications for the effects of novelty, academic intensity, and cultural differences in this game-based learning activity. The Singaporean students were playing the game for the first time, which may have influenced their higher overall enjoyment despite having low expectations in the beginning. By comparison, the Japanese students, who were playing for their fourth time, made up the majority of students in cohort 3 with high anticipated enjoyment, indicating that the game activity is a genuinely pleasurable one. Since the game was carried out in English and relied heavily on communication between participants, we assumed the Japanese students would experience more difficulty compared to the Singaporean students who could speak English fluently. Although the Japanese students reported moderate challenge on average, our analysis shows that challenge was associated with their overall enjoyment, and strongly related to both the contest of their abilities as well as their sense of achievement. This may reflect levels of self-confidence in their ability to communicate with other players, which was a crucial element in the game's design. Here we should note some nuance in the meaning of the Japanese word chosen for the translation of "challenge". The word is associated less with difficulty and more with actively pushing one's limits. In this sense it has a near similar meaning to contest, for which there was a strong correlation with challenge among the Japanese students.

The correlation values between arousal, sensation, and thrill indicate that the sensation/arousal dimension of the playful affordances model was the strongest in the design of this activity. This may be attributed to limited resources and time constraints that created a sense of urgency among players. If sensation is interpreted as sheer stimulation in the gaming environment, then its strong correlations to arousal and thrill as well as the positive correlation to enjoyment of all three suggest the students had achieved a playful state of mind, as described in Apter's reversal theory [46].

The design of the survey was a limitation in this study with regards to the design of the game. The original game designers were not available to comment explicitly on elements from the playful affordances model. As such, the questions we chose for measuring behavioral items may not have been accurately paired to playful actions. For example, exploration was measured by asking about trial-and-error practices in the development of player tactics, although it might have been more suitable to instead ask about seeking out new people with whom to make deals. The data relies heavily on player self-report and interpretation of the terminology used. Responses were measured on a Likert scale which additionally relies on the interpretation of interval levels. Finally, the differences in samples were limited by selection criteria. The Singaporean students had been vetted for the study abroad program whereas the group of Japanese students included everyone within the 4th year of the program. Valid responses were received from 100% of Singaporean students but only 69% of Japanese students.

Despite the above limitations, our data has some implications for the design of game-like activities. First, it is worth pointing out the significant correlations of playful experiences to levels of enjoyment reported by the students. The game was designed with minimal reward mechanics—sets of cards and a team score. Other mechanics such as time limits, limited resources, and competitive/cooperative dynamics are likely tied to experiences of arousal, thrill, contest, and discovery, which were most prevalent during gameplay. Students who anticipated a moderate amount of enjoyment appeared less sensitive to the experiences of play than those who anticipated either a great amount or a little amount. However, students participating in a properly stimulating game activity should be able to achieve a playful mindset regardless of their degree of expected enjoyment.

6. Conclusion

In this paper, we first presented a discussion about the limited interpretations of gamification and claims for its applicability to educational contexts. Compared to game-based learning, which has a potential issue with knowledge transfer between contexts, gameful learning is proposed as an approach to learning in authentic contexts that are structured in a way that encourages playful experiences. We introduced the evaluation of the autotelic qualities of game-like experiences as hypothesized sources of intrinsic motivation based on the playful affordances model. Finally, we reported the results of a game-based learning activity evaluated for its autotelic qualities and found predictors of enjoyment to be the experiences of arousal, thrill, and discovery designed into the game. Correlations between items within the same dimensions of the model proved to be the strongest for sensation/arousal and contest/challenge but weakest for exploration/discovery and imagination/creativity. Further work should examine other types of games to determine if these results are attributed specifically to the design of the chosen game, or if behavioral items in the model do not generally correspond with the given experiences. Nevertheless, we offer this study as an example of measuring game-like experiences for autotelic qualities that pertain to learner motivations.

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Robert W. Songer graduated in 2008 with a B.Sc. in Software Engineering from the Rochester Institute of Technology in Rochester, NY, USA. In 2009 he joined Kanazawa Technical College where he has been an Assistant Professor in the department of Global Information and Management (formerly Global Information Technology) since 2012. His active projects involve educational programs such as Collaborative Learning in Engineering and English, and the CDIO Initiative. He elected to join the School of Knowledge Science in the Japan Advanced Institute of Science and Technology in 2012 with a research focus on the application of gamification in education. His research interests include engineering education reform, motivation in learning, and applied game design. He is a member of the ACM and its special interest groups for computer-human interaction (SIGCHI) and information technology education (SIGITE).

Kazunori Miyata has been a Professor in the School of Knowledge Science at the Japan Advanced Institute of Science and Technology (JAIST) since 2002. He has worked as a researcher at IBM Research Tokyo Research Laboratory, from 1986 to 1998. He was an Associate Professor in the Department of Imaging Art at the Tokyo Institute of Polytechnics, from 1998 to 2002. He received his B.Sc. degree from Tohoku University in 1984, and his M.Sc. and Ph.D. from the Tokyo Institute of Technology in 1986 and 1997. His research mainly focuses on procedural modeling, texture generation, fun computing, and multimedia applications. He was awarded with ACM Recognition of Service Award in 2010. He is a member of ACM and IEEE.