

Advancing Gamification Research and Practice with Three Underexplored Ideas in Self-Determination Theory

Abstract

Gamification possesses a great potential to shape human behaviors and performance. However, the mixed results in gamification research suggest the need to develop a thorough understanding of the mechanistic underpinnings of gamification. Although self-determination theory (SDT) provides a solid theoretical framework to achieve such purposes, it has been mostly applied superficially, limiting its potential to significantly impact gamification research and practice. This paper suggests that SDT, particularly three ideas in SDT – a continuum of motivation, the mutually supportive nature of basic psychological needs, and the functional significance of an event – have not been fully explored in gamification research and practice. Attention to the three ideas and relevant SDT literature will advance gamification research and practice in the following ways. First, the idea of continuum of motivation can serve as a powerful framework to conceptualize gamification. Second, the ideas of mutually supportive nature of basic psychological needs and the functional significance of an event can help us develop a nuanced instead of simplistic approach to gamification design. Finally, the three ideas suggest important research directions that have yet to be fully explored in current gamification research.

Keywords

autonomy, basic psychological needs, competence, gamification, relatedness, self-determination theory

Introduction

Gamification is the application of game elements in non-game context for purposes other than entertainment (Deterding, Dixon, Khaled, & Nacke, 2011). It leverages the motivational pull of games to engage people in activities that might otherwise be seen as mundane or challenging. For instance, the language learning app Duolingo (<https://www.duolingo.com/>) employs a gamified system using game elements such as points, streaks, and rewards, to make the process of learning a new language engaging and addictive. Another example is Kahoot! (<https://kahoot.com/>), which gamifies quizzes with points, leaderboards and motivates learners through competition and achievement. There is growing evidence that incorporating game elements into learning, training or other activities has potentials to positively impact users' motivation and behaviors (Bai, Hew, & Huang, 2020; Zainuddin, Chu, Shujahat, & Perera, 2020). However, strong critiques to gamification have co-existed with the enthusiasm of adoption since the very beginning (e.g., Bogost, 2014; Robertson, 2010). Consistently, there have been studies showing no effects or negative effects of gamification (e.g., Attig & Franke, 2019; De-Marcos, Dominguez, Saenz-De-Navarrete, & Pages, 2014; Nicholson, 2013; Ronimus, Kujala, Tolvanen, & Lyytinen, 2014; van Roy & Zaman, 2017). The mixed results of gamification research indicate the complexity of the effectiveness and impact of gamification interventions and highlight the importance of

understanding the underlying mechanisms and contextual factors that influence the effectiveness of such interventions.

Self-determination theory (SDT) is particularly well-suited to guide the examination of when and how gamification works by revealing the underlying psychological and motivational processes. A genuine and thorough understanding of SDT is essential for deciphering the complexities and determining the effectiveness of gamification, enabling researchers to design interventions that effectively motivate and engage users. However, although SDT is one of the most widely cited theories in gamification research (Krath, Schürmann, & von Korflesch, 2021), it has often been applied in gamification research superficially (Tyack & Mekler, 2020; van Roy & Zaman, 2019). According to Tyack and Mekler (2020), most of the papers they reviewed on SDT, games, and gamification lacked explicit references to SDT mini-theories. Instead, these papers offered descriptive accounts of the theory, using SDT as a preliminary step to delve into the main topics of study. Additionally, some papers contained questionable claims about how specific game elements align with SDT concepts, often without proper citation. Furthermore, even in cases where SDT concepts were measured, the theory was seldom utilized to directly shape hypotheses, research questions, or analyze results. Indeed, there have been only a limited number of gamification studies that were grounded in a thorough understanding of SDT (e.g., Jahn et al., 2021; Mekler, Brühlmann, Tuch, & Opwis, 2017; Sailer, Hense, Mayr, & Mandl, 2017; van Roy, Deterding, & Zaman, 2019). The superficial understanding and application of SDT has limited the potential of SDT to advance gamification research and practice. Particularly, three important ideas in SDT – a continuum of motivation, the mutually supportive nature of basic psychological needs, and the functional significance of an event – that may have a significant impact on gamification research and practice have not been extensively studied. To address this gap, this conceptual paper delves deeply into these three ideas drawing on pertinent SDT research. It posits how these ideas could be adopted to form a comprehensive framework for conceptualizing gamification, facilitate a nuanced approach to gamification design, and propose directions for further unexplored research.

A Brief Overview of SDT

SDT is among the most influential models in contemporary behavioral science and is considered one of the most complete and practical motivation theories in social sciences (Proulx, 2017). SDT plays a significant role in gamification research and practice because (a) it is a comprehensive theory that covers a spectrum of motivations from extrinsic to intrinsic (Richter, Raban, & Rafaeli, 2015), and (b) it has been applied to many recreational contexts to understand the underlying psychological and motivational processes and is particularly apt for investigating gaming motivation (Ryan, Rigby, & Przybylski, 2006).

SDT suggests that for individuals to grow and thrive, they need to fulfill three basic psychological needs: autonomy, competence, and relatedness. Autonomy is about feeling that one's actions are self-chosen and self-endorsed (Deci & Ryan, 2004). According to SDT, when individuals find themselves in rigidly structured environments, their intrinsic motivation can be undermined due to the diminished autonomy (Ryan & Deci, 2000). In contrast, choice and opportunities for self-direction enhance intrinsic

motivation by allowing for a greater sense of autonomy (Ryan & Deci, 2000). Competence refers to the feeling of being capable and effective and having the opportunities to exercise one's capacities (Deci & Ryan, 2004). It occurs when people seek challenges that are optimal for their capacities and strive to maintain and enhance their capacities. Competence wanes in contexts in which "challenges are too difficult, negative feedback is pervasive, or feelings of mastery and effectiveness are diminished or undermined by interpersonal factors such as person-focused criticism and social comparison" (Ryan & Deci, 2017, p. 11). Relatedness is present when people feel cared for by others, when they give to others, and when they feel that they are an integral part of broader social organizations (Ryan & Deci, 2017). What is often not given enough attention is the idea that the satisfaction of the basic psychological needs is **mutually supportive**. It suggests that in situations where the needs conflict with each other, even the prioritized need cannot be satisfied in an optimal way (Ryan & Moller, 2016). For instance, in a learning environment designed to promote students' sense of autonomy, if the tasks assigned are excessively challenging, it could undermine the learners' perception of their competence. This changing perception can, subsequently, negatively impact their sense of autonomy, because they may no longer feel in control of their success. Therefore, it is essential to address the fulfillment of these needs in a balanced and integrated manner to foster optimal motivational outcomes.

Deci and Ryan (2017) proposed **a continuum of motivation**, ranging from no motivation to controlled motivation to autonomous motivation (See Figure 1). Motivation with different forms of regulatory styles can be placed on a continuum based on the extent to which they represent controlled versus autonomous motivation. External regulation and introjected regulation are considered as more controlled motivation, while identified regulation, integrated regulation and intrinsic regulation are considered as more autonomous motivation, which is conducive to engagement and optimal learning (Manganelli et al., 2019; Niemiec & Ryan, 2009).

	Amotivation	Extrinsic Motivation				Intrinsic Motivation
Regulatory style	No Regulation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	Intrinsic Regulation
Regulatory Process	Nonintentional, Nonvaluing, Incompetence, Lack of Control	Compliance, External Rewards and Punishment	Self-Control, Ego-Involvement, Contingent Self-Esteem	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis of Identifications	Interest, Enjoyment, Inherent Satisfaction
	No Motivation	Controlled Motivation		Autonomous Motivation		

Figure 1. A Continuum of Motivation (Adapted from Ryan & Deci, 2017, p. 193)

SDT suggests that when individuals are solely motivated by controlled motivation, the desired behavior change may occur in the short term, but in the long run, individuals are likely to show more negative emotions, process information in a shallower way, and are less likely to be persistent in a given task or activity. In contrast, when individuals are more autonomously motivated, they have more positive emotions, process information more deeply, are more creative, engaged, and persistent, and can achieve higher quality performance (Ryan & Moller, 2016; Vansteenkiste & Ryan, 2013).

It is possible for individuals to move between the two orientations. The satisfaction or negligence of three basic psychological needs in social environments can facilitate or forestall autonomous types of motivation (Deci & Ryan, 2004). When these needs are satisfied, it is possible for controlled motivation to be internalized, as in the case of integrated regulation, and result in more autonomous motivation. In contrast, when these needs are neglected, pre-existing autonomous motivation can be undermined and shifted to more controlled motivation. An individual may initially engage in an activity to receive a reward (external regulation) but later develop a genuine interest in the activity (intrinsic regulation) when the external pressure is not too high. Conversely, an individual who resonates with the value of an activity (identified regulation) could shift toward external regulation if they are under a controlling mentor (Chemolli & Gagné, 2014). For example, imagine a student, Jane, who starts learning violin because her parents promise her a reward for each practice (external regulation). However, as she continues, she may discover a love for music and start to enjoy the challenge of mastering difficult pieces (intrinsic regulation). On the flip side, another student, Jake, who initially chooses to learn the violin because he appreciates the beauty of the instrument and the music (identified regulation). However, with a violin teacher who is overly controlling and putting too much focus on precision and frequent assessments, Jake might begin to see his violin practice as a chore and practice only to meet the teacher's expectations (external regulation), potentially causing him to give up on it once external pressures are removed.

Finally, according to Cognitive Evaluation Theory (CET), SDT's first mini-theory, individuals' intrinsic motivation is not affected by external events per se, but by their interpretations of a given event, in particular its **functional significance**, that is, "how the event impacts experiences of autonomy and competence" (Ryan & Deci, 2017, p.129). When events support perceptions of autonomy and competence, intrinsic motivation will be enhanced. When events negatively affect perceptions of autonomy and competence, intrinsic motivation will diminish. It's crucial to recognize that the same event can hold vastly different functional significance to different individuals. For instance, consider the varied responses of learners to identical feedback: Learner A, viewing the feedback as a chance to enhance performance, may feel empowered, experiencing a boost in autonomy and competence. In contrast, Learner B, who is more sensitive to criticism and prone to take feedback personally, will feel controlled and doubted with a decreased sense of autonomy and competence. Likewise, a learning activity that offers multiple choices might satisfy one student's need for autonomy, allowing them to thrive, while simultaneously causing anxiety for another student who feels overwhelmed by the necessity to make a decision, thereby undermining their sense of autonomy and competence.

In this paper, we will discuss how SDT, particularly, the *three key ideas* (i.e., a continuum of motivation, mutually supportive nature of basic psychological needs, and the functional significance of an event) that have not been examined thoroughly in gamification research, may help advance current gamification research and practice by: (1) offering a framework to conceptualize gamification; (2) suggesting a nuanced approach to gamification design; and (3) informing important directions for gamification research.

Implications for Conceptualizing Gamification

One of the important areas for gamification research is to explore how to conceptualize and categorize different types of gamification design configurations (Schöbel et al., 2020), and some researchers have attempted to identify the types of gamification. For example, rooted in behaviorism, self-determination theory, and Mezirow's model of transformative learning, Nicholson (2015) proposed two types of gamification: One is *reward-based gamification*, which creates immediate, short-term behavior changes by providing external rewards for desired behaviors. The other is *meaningful gamification*, which aims at creating long-term change by making aspects of the underlying activity meaningful to the user through providing a narrative, freedom to choose paths to explore, playful activities, and opportunities to reflect. For another example, van Roy and Zaman (2018) created the term of need-supporting gamification, which refers to gamification "that is designed to foster learners' basic psychological needs satisfaction" (p.284).

The above-mentioned conceptualizations are useful but are not comprehensive enough to capture gamification systems designed to promote multiple types of motivation. SDT's discussion of a *continuum of motivation* (See Figure 1) offers an ideal framework to conceptualize gamification types based on its motivation types and regulatory styles. Gamification, therefore, can be conceptualized as a continuum first by whether it promotes more controlled motivation or more autonomous motivation and then by the specific regulatory styles it promotes (i.e., external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic regulation). According to Ryan and Deci (2017), these regulatory styles can "be coexistent within a behavioral domain, and often several will be operative as motivations even within a single activity" (p.184). Similarly, a gamification system may be designed to promote multiple motivation types with overlapping or interlinking regulatory styles. A gamification system, for example, that uses rewards to encourage value adoption may be considered as a more controlled-motivation-oriented gamification focusing on external regulation (rewards) and introjected regulation (value adoption).

It is also important to acknowledge that the distinction between controlled and autonomous motivation is not always clear-cut, as controlled motivation can become internalized and evolve into more autonomous motivation when basic psychological needs are met. Conversely, autonomous motivation can shift towards controlled motivation when these needs are thwarted. As a result, a gamification system can be designed to support evolving motivational goals, such as initially emphasizing the promotion of controlled motivation and then progressively fostering an increase in autonomous motivation.

Table 1 presents a summary of different features in controlled- and autonomous-motivation gamification. Although these two types of gamifications have different mechanisms and outcomes, both can be powerful and meaningful depending on one's goals and can be interchangeable on certain conditions.

Table 1

Controlled-Motivation Gamification and Autonomous-Motivation Gamification

	Controlled-Motivation Gamification	Autonomous-Motivation Gamification
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Motivation Types	external regulation, introjected regulation,	identified regulation, integrated regulation, intrinsic regulation
Goal	Achieving immediate, short-term change	Achieving deep and sustained engagement and long-term change
Mechanism	Promoting controlled motivation, specifically external regulation	Promoting autonomous motivation and self-regulation
Role of Game Elements	Game elements are used to condition or control behaviors	Game elements are used to meet intrinsic needs
Role of Participants	Participants reactively respond to the system to obtain external rewards or avoid punishments	Participants purposefully respond to the system with increased competence and autonomy
Impact on Behaviors	Behaviors continue when incentives are present or increased	Behaviors continue even after the gamification intervention ends

Implications for Gamification Design

SDT suggests the critical role of satisfying basic psychological needs to spark and sustain deep engagement (Ryan & Rigby, 2020; Ryan et al., 2006). It is expected that gamification designs that satisfy the basic psychological needs for autonomy, competence and relatedness are more likely to promote autonomous motivation, facilitate the internalization of controlled motivation, and thus lead to deep and sustained engagement (Rigby, 2014) and other desirable outcomes. Researchers have identified game elements that may be used to support these basic psychological needs (e.g., Ryan & Rigby, 2020; Sailer, Hense, Mandl, & Klevers, 2013; Sailer et al., 2017), which are summarized in Table 2.

Table 2

A Summary of Game Elements with the Potential to Support Basic Psychological Needs

Psychological Need	Mechanism	Typical Game Element
Competence	Optimal challenges	Missions/Goals Obstacles Levels/Content unlocking Difficulty adaptation
	Feedback	Points/Badges/Leaderboards Progress bar Performance tables/graphs
	Rewards	Points/Badges Game currencies Gifts
	Scaffolding	Hints
Autonomy	Meaningful choices	Choice of avatars Choice of missions/quests Choice of goals/challenges Choice of strategies/tools Choice of exploration/discovery
	Meaningful rationales	Storyline
Relatedness	Interdependence Common goals	Role-play Team

		Cooperation Competition
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However, simply adopting the game elements in Table 2 does not always guarantee the desired results (e.g., Attig & Franke, 2019; De-Marcos et al., 2014; Nicholson, 2013; Ronimus et al., 2014; van Roy & Zaman, 2017). Two ideas in SDT, the mutually supportive nature of basic psychological needs and the functional significance of an event, can deepen our understanding of the psychological and motivational processes involved, thereby enabling a more nuanced approach to gamification design.

Mutually Supportive Needs

SDT suggests that the satisfaction of the basic psychological needs should be mutually supportive. This is particularly true for competence and autonomy needs. Consequently, gamification systems designed to satisfy one need without considering the other will not lead to the desired outcomes.

According to SDT, competence is necessary but not sufficient for high-quality motivation, and perceptions of competence will increase intrinsic motivation only when it is accompanied by a certain degree of perceived autonomy (Ryan & Moller, 2016). For example, although SDT suggests that optimal challenges and positive feedback support the competence need, if these elements are used to make participants feel coerced into doing something, participants' need for autonomy will be thwarted and they are unlikely to develop a sense of interest, involvement and flow (Ryan & Deci, 2017). The implication is that when setting up challenges or providing feedback, it is important to ensure that the activity does not interfere with participants' sense of perceived autonomy, so they "feels at least some degree of personal autonomy with respect to the behavior and its outcome" (Ryan & Deci, 2017, p. 155).

When it comes to autonomy, although the positive effects of choice on autonomy need satisfaction and intrinsic motivation is strongly supported empirically (Patall, Cooper, & Robinson, 2008), it is important to recognize that not all choices are autonomy supportive. "(W)hen choice is separated from other aspects of autonomy support and self-realization (e.g., interest, values, volition, and goals)" (Katz & Assor, 2007, p. 432, p.432), it may no longer be experienced as autonomy supportive. In addition, the provision of choice should not interfere with individual's need for competence. Patall, Sylvester, and Han (2014) found that choices enhanced individuals' motivation only when their perceived competence was high (Patall, Sylvester, & Han, 2014). This has important implications for gamification design. When providing choices in gamification systems, we should make sure that individuals are presented with tasks matched with their competence levels (Katz & Assor, 2007). Designers should also avoid using complex choices or too many choices (Katz & Assor, 2007), which may lead to a decreased sense of competence in making decisions.

Functional Significance

According to SDT, it is not the actual event but the functional significance of the event that has an impact on individual's motivation. This means that whether a game element promotes or inhibits users' autonomous motivation is not determined by the intention of designers, but by the perceived experience of users. The incorporation of a

game element may have different psychological meanings depending on the context and individual characteristics.

For example, although choices are generally considered as autonomy supportive, it is important to recognize that it is the sense of autonomy not the choice per se that is needed, and, in some cases, a sense of choice instead of real choice is sufficient to support the sense of autonomy. That explains why illusional, irrelevant, or seemingly trivial choices can sometimes have a positive impact (e.g., Cordova & Lepper, 1996; Schneider, Nebel, Beege, & Rey, 2018). In fact, Patall and colleagues (2008) found that instructionally irrelevant choices had more positive effects on intrinsic motivation than instructionally relevant choices, possibly because the process of making those superficial choices is easier, involves less ego-depletion, but still supports a sense of autonomy. Moreover, as long as individuals perceive their behavior as self-initiated and have “a sense of unpressured willingness to engage in the activity” (Deci, Ryan, & Williams, 1996, p. 165, p. 165), the perceived sense of autonomy will not be negatively impacted even when the individual is not given a choice.

Reward is another example. Rewards can be perceived as either informational (i.e., providing people with information about their competence) or controlling (i.e. bringing the participant’s behavior under control). In general, it is believed that tangible rewards, are often perceived to be controlling and, as such decrease individuals’ intrinsic motivation for completing interesting tasks, and have neither negative nor positive effects for uninteresting tasks (Deci, Ryan, & Koestner, 2001). While Deci and colleagues (2001) have cautioned educators about the risk of using rewards as a motivational strategy, they also suggested that, under limited circumstances, rewards might have a positive effect on intrinsic motivation. In such cases, it is important to make the informational aspect of rewards salient and minimize the control aspect (Deci, Nezlek, & Sheinman, 1981).

It is also important to recognize that although the functional significance of certain events is universal to most people, individuals may have different interpretations of some events due to individual differences. This point is well illustrated by van Roy, Deterding, and Zaman’s (2019) study, where researchers found that people experienced the functional significance of badges in different ways, which in turn shaped their motivations and behaviors differently. It suggests that effective gamification design needs to take individual differences into consideration.

Implications for Gamification Research

SDT and its ideas on a continuum of motivation, the satisfaction of mutually supportive basic psychological needs, and the functional significance of an event provides important directions to move gamification research forward in the following ways.

First, by conceptualizing gamification based on a continuum of motivation, researchers can investigate how different gamification features influence user motivation across the spectrum. This is crucial because it allows for a more precise matching of gamification elements with intended motivational outcomes. For example, researchers can distinguish controlled-motivation gamification from autonomous-motivation gamification and study them separately. When the goal is to provide individuals sufficient motivation to achieve short-term goals, controlled-motivation

gamification may be considered as a potentially effective intervention, and gamification features that encourage external regulation and/or introjected regulation may be adopted. However, if the goal is to foster motivation that supports sustained engagement, gamification should be designed to help individuals develop autonomous motivation, so individual will continue the desired behaviors even when the gamification intervention is removed, which is the ultimate goal of autonomous-motivation gamification.

An important question is, if individuals are not initially autonomously motivated, how we can provide gradually reduced dose of gamification to help individuals develop the autonomous motivation needed for sustained engagement. Based on SDT, it is important to cultivate individuals' internal propensity and sensitivity in response to the rewards, feedbacks and values that are intrinsic and inherent within the activity, so they will gradually develop intrinsic love of the activity and/or identify with the value of the activity. This will help individuals find the needs satisfaction from doing the activity itself and reduce their reliance on gamification. As Nicholson (2015) put it, "As the player gets more involved in the system, he or she should be spending more time engaged directly with the real world and less time engaged with the gamification system" (p. 19). To do so, designers and researchers should first identify the elements that are intrinsically satisfying and valuable in an activity. Then, designers and researchers may employ gamification features to heighten users' awareness and appreciation of these elements and amplify the rewarding experiences. As users gradually develop the sensitivity to these elements, they will start appreciating the intrinsic fun and value of the activity more. In the meanwhile, the intensity of the gamification can be reduced until gamification is no longer needed. Future research on how to design such gradually reduced gamification scaffolds is urgently needed in gamification research.

Second, SDT suggests the need to examine gamification features in terms of how those features satisfy or frustrate the mutually supportive basic psychological needs. Some implications for research on satisfying the mutually supportive needs in gamification are discussed below.

When it comes to competence support, it is evident that there is a need for adaptive gamification systems that adjust the difficulty level of the tasks in a timely manner based on individuals' growing competence. What has rarely been discussed, however, is what we should do when adaptivity is not an option. An understanding of the mutually supportive basic psychological needs suggests that alternative approaches may be taken by supporting users' other aspects of competence or users' other basic psychological needs. For example, a promising line of research shows that when a task is perceived as difficult (i.e., the competence need is thwarted), increasing participants' autonomy support by giving them a task-related choice may reduce the negative effects of high perceived task difficulty (Schneider, Nebel, Meyer, & Rey, 2022).

With regard to autonomy support, research has suggested the positive effects of offering choices (e.g., Peng, Lin, Pfeiffer, & Winn, 2012; Sailer et al., 2017), but studies examining when and how to provide choices are still limited. Since the process of making choices can be challenging, particularly for those who are less competent, exploring ways to support the competence need in the choice-making process and ensure participants make appropriate learning decisions without feeling overwhelmed is an important area for future research. Another promising direction is to study how to

help individuals develop internal motivation and willingness to complete tasks when choices are simply not available by supporting other aspects of their autonomy, competence, and relatedness needs.

Research on relatedness may focus on how the need for relatedness interacts with the needs for competence and autonomy. For example, current research suggests that competition with collaboration in the form of group competition may potentially be an effective approach (Morschheuser, Hamari, & Maedche, 2019; Sailer & Homner, 2020), although competition alone may lead to decreased intrinsic motivation when the competence need is thwarted (Reeve & Deci, 1996). Future studies examining how other relatedness-supporting strategies interact with the needs for competence and autonomy to either promote or decrease intrinsic motivation are needed.

Third, SDT reveals the motivational dynamics occurring within individuals' subjective experience (Rigby, 2014) and suggests the importance to study the functional significance of an event in order to understand users' motivation and performance. In current gamification research, few studies focus on capturing the subjective experience of the users (Rapp, 2015). To answer the questions of when and how a gamification design works, we need to better understand how individuals' subjective experience is shaped by the interaction of individual characteristics, contexts, and gamification design. It calls for descriptive studies that shed lights on the functional significance of game elements under different contexts with different individuals. Since the inclusion of multiple game elements typically confounds the results, it is recommended that researchers start by studying the functional significance of a single game element and its impact on motivation and behaviors (e.g., van Roy et al., 2019) so as to isolate its effects from other game elements (e.g., Landers, Collmus, & Williams, 2019). We need to understand not only what events are likely to have a functional significance that is universal to most people in most contexts, but also what events are likely to have a functional significance that is highly sensitive to individual differences or contexts. The knowledge gained from such efforts will lead to future research on personalizing and optimizing individuals' gamification experiences.

Figure 2 presents how gamification affects human motivation and behaviors under the SDT framework. It shows that whether a gamified experience successfully supports intrinsic motivation for deep and sustained engagement depends on its functional significance. In turn, its functional significance is influenced by individual characteristics (e.g., gender, age, goal orientation, self-efficacy), context characteristics (e.g., content, activity, environment, culture), and gamification design characteristics.

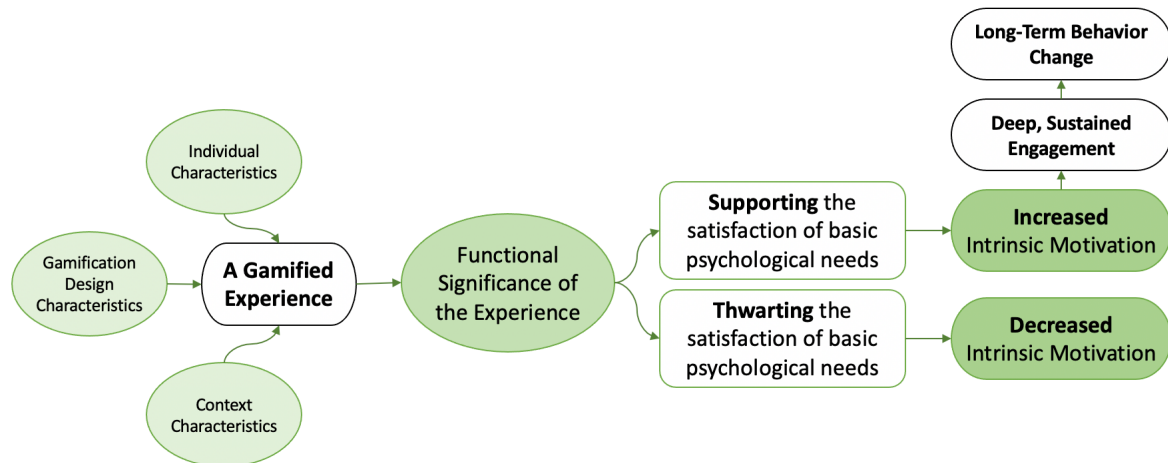


Figure 2. How Gamification Affects Intrinsic Motivation, Engagement and Behaviors under SDT Framework

Finally, it is worth noting that the growing body of research on SDT provides new research tools and methods that can be directly applied to gamification research. To start with, SDT provides a valuable and rich set of research tools. The Intrinsic Motivation Inventory (IMI) has already been widely used in gamification research to measure individuals' intrinsic motivation. There are other research tools that are valuable but have yet to be fully employed in gamification research. For example, the Basic Psychological Need Satisfaction and Frustration Scales (BPNSFS) (Chen et al., 2015) is a set of questionnaires that assess the degree to which people feel satisfaction or frustration of the three basic psychological needs and can be an invaluable tool to study how well the gamification design meets individuals' basic psychological needs. The Player Experience of Need Satisfaction (PENS) scales (Rigby & Ryan, 2011; Ryan et al., 2006), originally designed for game research, could be adapted to evaluate not only the degree of needs satisfaction but also the levels of physical presence, emotional presence, narrative presence, and intuitive control in gamified systems. In addition to providing research tools, the ongoing SDT research suggests new research methods that could be adopted to inform gamification research. SDT researchers have been applying new psychometric approaches in order to assess motivations and perceived need supports in a more nuanced way (Ryan & Deci, 2020). Examples of such approaches are bi-factor analysis (e.g., Litalien et al., 2017; Mills & Allen, 2020), multidimensional scaling (e.g., Sheldon, Osin, Gordeeva, Suchkov, & Sychev, 2017), and latent profiling (e.g., Howard, Gagné, Morin, & Van den Broeck, 2016). Neuropsychological and biological measurement methods have also been adopted in SDT research to objectively capture “moment-to-moment” changes in the user's brain activity and motivational states using neuroscience methods such as fMRI and EEG (Di Domenico & Ryan, 2017; Reeve & Lee, 2019). It is expected that some of these approaches and techniques will be adopted in gamification research to enhance knowledge in the field of gamification.

Conclusion

Research that explains the mechanisms of gamification is still in its infancy (Jahn et al., 2021). Based on their recent meta-analysis, Sailer and Homner (2020) called for more theory-guided empirical research to build a comprehensive framework that “describes precise mechanisms by which gamification can affect specific learning processes and outcomes” (p. 106-107). SDT addresses this need by providing “a systematic, practical, critical, and open framework” (Ryan & Deci, 2020, p. 8) to understand how factors such as rewards, feedback, choice, and competition affect individuals’ motivation and guide the research and development of gamification systems. SDT stands out among motivational theories for its comprehensiveness. While behaviorism emphasizes the role of external rewards and punishments in shaping behavior, flow theory highlights the significance of intrinsic motivations by matching challenges with the individual’s skill level, and social comparison theory suggests individuals’ motivations can be influenced by comparing themselves to their peers, SDT integrates these aspects. By providing a holistic view that encompasses the spectrum of motivational factors addressed in different theories, SDT offers a comprehensive perspective on how different types of motivations coexist and interact in diverse contexts.

Realizing SDT’s potential and its current limited application in gamification research, the author focused on three underexplored ideas in SDT and discussed its implications for gamification research and practice. Here is a summary of the major implications discussed in the paper. First, SDT’s perspective on how different motivation types and regulatory styles are interconnected and transformable to one another as a continuum of motivation allows us to develop a more sophisticated view of gamification. It suggests that gamification systems can have multiple, distinctive, and changing goals. It also suggests that controlled-motivation gamification and autonomous-motivation gamification should be developed by employing game elements in significantly different ways. Second, SDT’s emphasis on the mutually supportive nature of basic psychological needs raises our awareness of the need to simultaneously attend to multiple needs in gamification design and research. Instead of simply adopting a game element to satisfy a specific basic need, we should ask how this approach affects the satisfaction of other needs. Conversely, when a need is undermined unavoidably at a certain point, we should consider what we can do to minimize the negative impact by promoting other types or aspects of need satisfaction. Third, SDT’s argument on the functional significance of an event highlights the important impact of individual characteristics and contexts on the effectiveness of gamification. It helps the gamification designers and researchers understand that a same gamification approach may lead to different outcomes due to differences in individuals and contexts. As a result, it is important for us to gain better understandings of the functional significance of different gamification design and develop individualized gamification systems.

This paper has a few limitations. First, despite there is a continuum of gamification types, the paper mainly discussed the two types at the two ends of the continuum: controlled-motivation gamification and autonomous-motivation gamification. This is because a clear comparison and contrast of these two is the prerequisite to understand more complicated cases in gamification. In reality, most gamification systems can be conceptualized as a combination of both motivation types with features designed to support multiple regulatory styles. Second, by focusing on three specific

SDT ideas in this paper, other ideas in SDT and their implications for gamification research are not discussed in this paper. There is no doubt that many additional insights can be drawn from the SDT literature, which is beyond the scope of this paper. It is important for us to continue learning the existing SDT literature as well as pay attention to the future development of SDT to inform gamification research and practice. Third, this paper only focuses on SDT and its implication for gamification. Admittedly, to understand the complexity of gamification, it is necessary to draw from a variety of theoretical approaches (Rapp et al., 2019). Accordingly, researchers have been creating theoretical frameworks for gamification grounded in both SDT and other theories (e.g., Hassan, 2017). Discussions of such work and its implications are not included in this paper. It is clear though whether SDT is adopted as the single theoretical framework or part of an integrated framework for gamification design and research, a deep understanding of SDT will help conceptualize gamification design, reveal the underlying mechanisms of gamification, inform the design of gamification systems, assist the diagnosis of potential problems in gamification, and have a profound impact on future directions of gamification research.

Declarations

Funding and/or Conflicts of interests/Competing interests

This work is supported by National Science Foundation [Grant #: IUSE-2142608]

The author declares no conflict of interest related to this publication.

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