

A Conceptual Analysis of Motivational Elements of Gamification as Viewed Through the Six Sub-theories of Self-Determination Theory

自己決定理論の6つの下位理論を通して見た
ゲーミフィケーションの動機づけ要素の概念的分析

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Abstract: This literature based conceptual study seeks to build upon previous work into the relationship between educational gamification and motivation, as explicated by the principles of Self-Determination Theory (Deci & Ryan, 2000). Key published works on gamification have been examined, by situating them within the framework of the six sub-theories of Self-determination Theory, with the aim of providing insight into the factors of gamification which significantly impact learner motivation. Brief summaries of the six sub-theories (Causality Orientations Theory, Cognitive Evaluation Theory, Basic Psychological Needs Theory, Organismic Integration Theory, Goal Contents Theory, and Relationships Motivation Theory) are offered, followed by a discussion of studies which address specific aspects of each model.

Keywords: gamification, motivation, intrinsic, extrinsic

要旨: 本稿は文献に基づく概念研究であり、自己決定理論 (Deci & Ryan, 2000) の原則によって説明される教育用ゲーミフィケーションとモチベーションの関係をめぐる既存の研究を発展させることを目的とする。ゲーミフィケーションに関する主要な論文を、自己決定理論の6つの下位理論の枠組みの中に位置づけながら検討し、学習者のモチベーションに大きな影響を与えるゲーミフィケーションの要因を明らかにしようとした。6つの下位理論 (因果性志向理論、認知評価理論、基本的心理的欲求理論、組織的統合理論、目標内容理論、関係性動機づけ理論) を短く要約した上で、各モデルの特定の側面を対象とした諸研究について考察している。

キーワード: ゲーミフィケーション、モチベーション、内因性、外因性

1. Introduction

Gamification is often described as the introduction of game-like elements into situations which would not ordinarily call for them (Deterding et al., 2011) and it has been used both successfully and unsuccessfully in educational settings, with a broad spectrum

of research, reporting a wide variety of results. This literature based conceptual study seeks to interrogate the effects of gamification on learner motivation by viewing various key studies through the lens of the six sub-theories of Self-Determination Theory, as developed by Deci & Ryan (2000).

2. Cognitive Evaluation Theory

Cognitive Evaluation Theory (CET) describes the relationship between external events and intrinsic motivation, and was one of the first sub-theories of Self-Determination Theory to be developed by Edward Deci (Deci, 1971). Figure 1 shows that an external event can be either *controlling* (seeking to control the behaviour of an individual) or *informational* (providing feedback about the competence of an individual). An example of a controlling event is a reward promised to a learner, contingent on performance. Such a reward constitutes an extrinsic motivating factor, externalising the perceived locus of causality (Ryan & Connell, 1989) and leading to a decrease in intrinsic motivation. Conversely, a reward not predicated on performance and not compromising autonomy would be less likely to trigger a shift in the perceived locus of causality and as such would not negatively impact intrinsic motivation. Figure 1 also shows that informational events which encourage autonomy can lead to an increase in intrinsic motivation. One of the most commonly cited examples of a positive informational event is sincere praise given to a learner, leading to an improvement in the learner's own estimation of their competence and a subsequent increase in intrinsic motivation. However, an informational event which leads to a negative self-estimation of competence would have the opposite effect and would most likely trigger decreased intrinsic motivation (see Fig. 1).

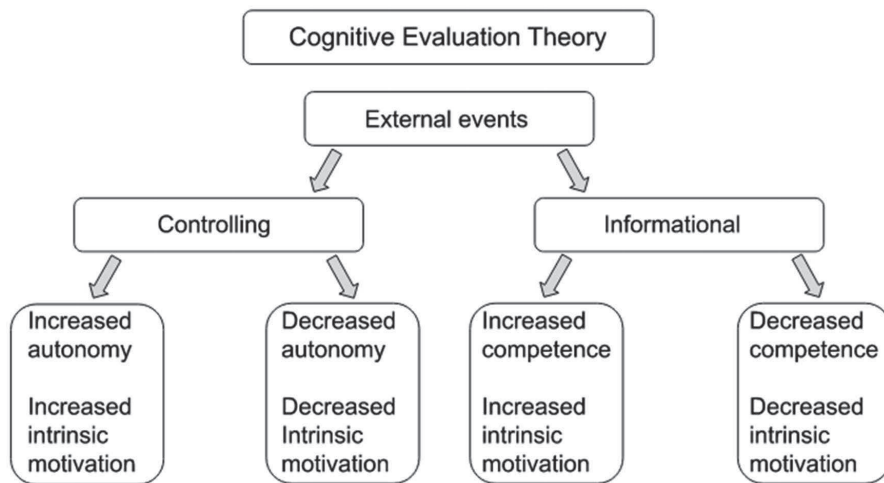


Fig. 1 (Based on Ryan & Deci, 2002)

In their longitudinal study into game mechanics in a learning context, Hanus & Fox (2015) tested the effects of educational games which employed leader boards and badges, and which encouraged competition between learners. The study found that these extrinsic rewards led to a decrease in intrinsic motivation, empowerment and satisfaction, which in turn produced poorer performance. This is in keeping with the principles of CET in that an external event, such as the awarding of badges or being ranked on a leader board, is seen by learners as controlling and depriving them of autonomy, which also triggers a decrease in intrinsic motivation.

It is worth noting however, that in a later study Cruz, Hanus & Fox (2017) conducted research into extrinsic reward systems in games and specifically focussed on badges and their impact on player motivation. They found that a subset of gamers known as completionists (players who want to collect all available in-game rewards and beat the game entirely) were highly motivated by what they perceived to be performance indicating rewards. Completionists viewed the acquisition of in-game badges as being an assessment of their competence, and the ability to use these reward systems for various forms of social comparison within the gaming community gave them added incentive to complete the game. Cruz, Hanus & Fox (2017) interpret this as enhancing their enjoyment of the game and increasing their intrinsic motivation to continue playing. This is in sharp contrast to earlier findings by Hanus & Fox (2015), and may be due to the specific subset of gamers (completionists) that the 2017 study refers to.

3. Organismic Integration Theory

Organismic Integration Theory (OIT) explains the ways in which extrinsic motivation impacts the process of internalisation, along a continuum ranging from external regulation to integrated regulation (see Fig. 2). A wide range of advantages are associated with increased levels of internalisation such as “more volitional persistence, better relationships in one’s social groups, more effective performance, and greater health and well-being” (Ryan & Deci, 2002, p.19).

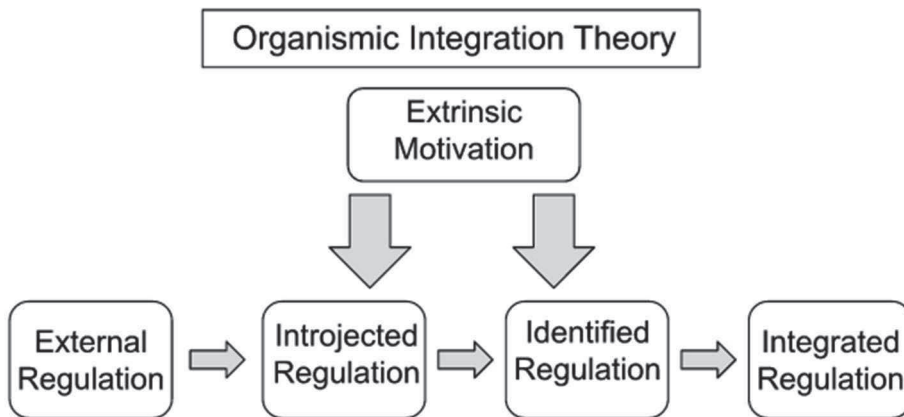


Fig. 2 (Based on Ryan & Deci, 2002)

Buckley & Doyle (2016), in their study into the impact of gamification on students who exhibit various different kinds of motivation, found that learners showed a statistically meaningful increase in their understanding of lesson content with the introduction of game-like interventions. More specifically, they concluded that students who exhibit traits of intrinsic motivation are more likely to participate in gamified classroom activities, and the study suggests that this may be due to the enjoyment of competition and the stimulation provided by uncertainty and risk. Learners who were motivated by identified regulation were also more likely to take part in recommended activities, and this was explained as the students responding positively to the teacher suggesting that by participating in gamified activities they would be more effective students. Buckley & Doyle (2016) observed that participants who were motivated by external regulation or introjected regulation did not exhibit statistically significant increases in content engagement, even with gamified intervention.

4. Causality Orientations Theory

Causality Orientations Theory (COT) examines the ways in which people position themselves relative to the regulation and initiation of behaviour. It describes three categories of orientation: *autonomy*, *controlled* and *impersonal* (see Fig. 3). Autonomy orientation, roughly analogous to an internal perceived locus of causality, stems from fulfilment of the three basic psychological needs of autonomy, competence and relatedness (Newman & Newman, 2020). Autonomy oriented individuals are drawn to events which foster volition, are likely to view rewards as informational rather than controlling and are more likely to exhibit identified or integrated forms of regulation (Hagger & Hamilton, 2021). Controlled orientation (partly external perceived locus of causality) is associated with the satisfaction of competence and relatedness, but not autonomy (Newman & Newman, 2020), and is dominated by external events such as rewards or punishments. As such, controlled orientation often results in limited integration, and external or introjected regulation (Ryan & Deci, 2017). Impersonal orientation, correlated with the frustration of all three basic psychological needs, manifests as a lack of volition, feelings of social anxiety and low mastery (Hagger & Hamilton, 2021).

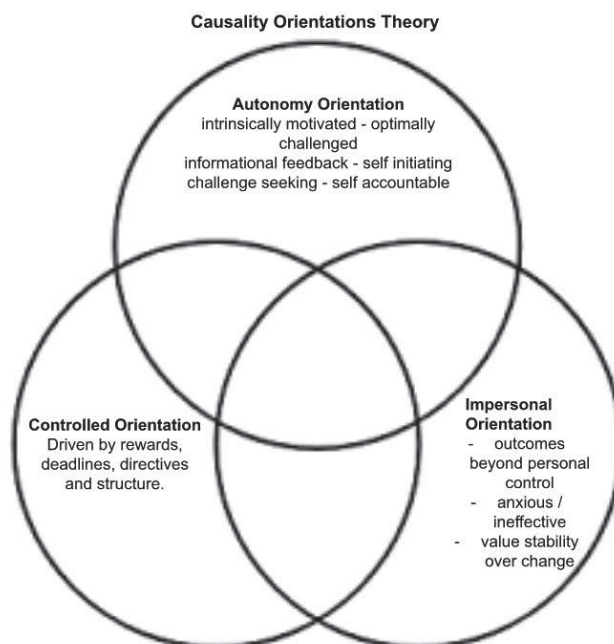


Fig. 3 (Based on “General Causality Orientations Scale (GCOS)”, n.d.)

Most individuals tend to exhibit varying degrees of each orientation (autonomy, controlled and impersonal) and the General Causality Orientations Scale was developed by Deci & Ryan (1985) to accurately measure the level of each motivational orientation in individual subjects. The theoretical underpinnings of this scale have been successfully borne out by numerous studies and the scale has demonstrated “Cronbach alphas of about 0.75 and a test- retest coefficient of 0.74 over two months” (“General Causality Orientations Scale (GCOS)”, n.d.).

McGillicuddy (2020) in her study into how the effectiveness of learning games could be impacted by causality orientation, gave participants pre-test and post-test tasks to perform, which were designed to measure individual differences in goal and causality orientation. McGillicuddy hypothesised that autonomy-oriented students would show little difference in engagement in pre and post-testing due to them being intrinsically motivated and self-initialising, and indeed this was borne out in the results. The study also theorised that the control-oriented participants would respond positively to in-game rewards, time constraints and structure provided by the game, and this was also found to be the case. McGillicuddy predicted that impersonal orientation participants would not display statistically significant differences in pre and post-testing due to their indifferent attitude toward the tasks at hand and to the manipulations performed by the study. For the most part this hypothesis was proven to be correct except that the impersonal orientation subjects showed a slight increase in task engagement when awarded performance points in a gamified environment.

5. Basic Psychological Needs Theory

Basic Psychological Needs Theory (BPNT) was developed to investigate the relationships between the three basic psychological needs of competence, autonomy and relatedness, and physical and mental wellbeing (see Fig. 4). Central to BPNT is the idea that need support promotes general wellbeing, while need thwarting has the opposite effect, and also that this holds true for “all levels of human development and across cultural backdrops and settings” (Ryan & Deci, 2017, p.21). The mechanisms by which need support and thwarting impact mental health, physical wellbeing and affect have been examined by multilevel modelling studies which were able to document both within-person and between-person fluctuations (Reis et al., 2018). Other BPNT studies have used vitality as a key metric of wellness to establish causal links between basic psychological need thwarting or satisfaction, and reported changes in mental and

physical states (Martela, DeHaan, & Ryan, 2016).

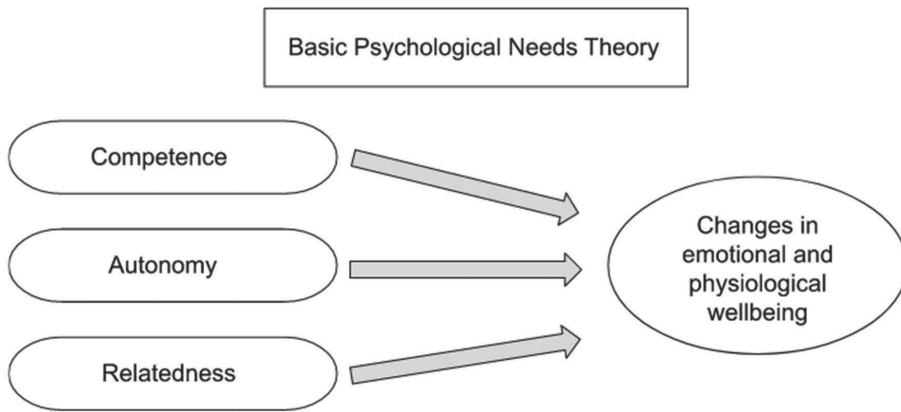


Fig. 4 (Based on Ryan & Deci, 2017)

Sailer et al. (2017) conducted a study into elements of gamification and psychological needs, where participants were divided into three groups, the first being the control, the second group were given gamified activities involving meaningful narrative, teams and opportunities for interaction, and the third were given learning activities with points, badges, leaderboards and performance graphs. The study initially theorised that the need for competence would be provisioned by performance feedback given through points, badges, leaderboards and graphs in the third group, and that the need for relatedness would be satisfied through the high degree of interaction and team spirit engendered by the activities in the second group. This was proven to be the case by the data collected during the study, however it is worth noting that although the study had hoped to provide autonomy through “decision freedom” and “task meaningfulness” the psychological need for autonomy was not found to be satisfied by any of the game-like learning activities applied to either groups two or three.

6. Goal Contents Theory

In their study into internalisation, integration, motivation regulatory styles and goal setting, Ryan, Sheldon, Kasser, & Deci (1996) outline several categories of extrinsic goals (money, fame and self-image) and intrinsic goals (personal growth, meaningful relationships, giving to community and health) and examine the ways in which psychological needs satisfaction is impacted by these goals (see Fig. 5). The study

found that people who were more extrinsically focussed in their goals reported poorer states of wellbeing and vitality and exhibited a higher prevalence of symptoms such as anxiety and depression. The inverse was observed for individuals who valued intrinsic goals more highly, resulting in greater reported states of mental and physical wellbeing. These results were subsequently replicated in cross cultural studies (Grouzet et al., 2005) where a large number of subjects across many different countries and cultures also reported that intrinsic goal setting resulted in an increased incidence of satisfaction of basic psychological needs and improved intrinsic motivation.

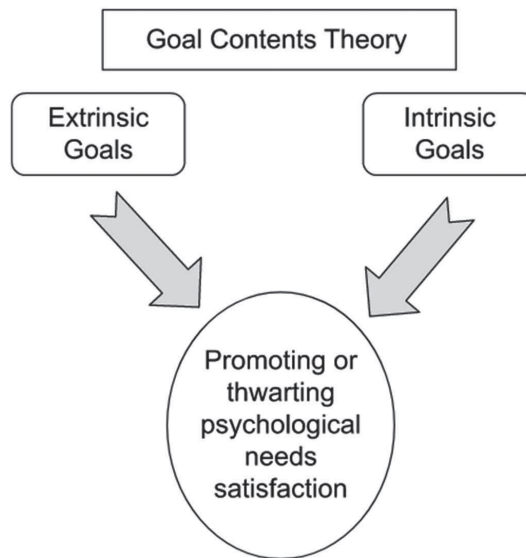


Fig. 5 (Based on Ryan & Deci, 2017)

Krath, Schürmann & Von Korflesch (2021) in their review of gamification theory studies, conclude that the setting of clearly defined and relevant goals during gameplay leads to volitional behaviour and as such is supportive of the pursuit of intrinsic goals. The review suggests that game elements such as badges, achievement markers, predefined levels and quests all provide varying degrees of intentionality and the promotion of choice making by learners, and thus help to satisfy the basic psychological need of autonomy. While employing game elements such as badges has been shown to improve engagement and performance in participants (Mekler, Brühlmann, Opwis & Tuch, 2013, October), removal of these elements has been demonstrated to result in a significant drop in task engagement and performance (Amriani, Utomo, & Junus, 2013, October). This would suggest that game elements such as badges, et cetera, are not in

themselves adequate to fully provision volitional choice making and as such do not entirely satisfy the psychological need of autonomy.

7. Relationships Motivation Theory

The final sub-theory of Self-Determination Theory is Relationships Motivation Theory (RMT), which examines the nexus between relatedness, autonomy and high-quality interpersonal relationships. According to RMT, relationships in which both parties successfully experience autonomy and also provide support for the fostering and development of autonomy are more likely to be of high quality and satisfy the need for relatedness (Deci & Ryan, 2014). In a study into autonomy and control in the teaching/learning process, Weinstein, Hodgins & Ryan (2010) found that dyads who were primed with autonomy supporting concepts achieved better outcomes in terms of closeness, emotional attunement, cognitive attunement, encouragement, positive mood and engagement (see Fig. 6).

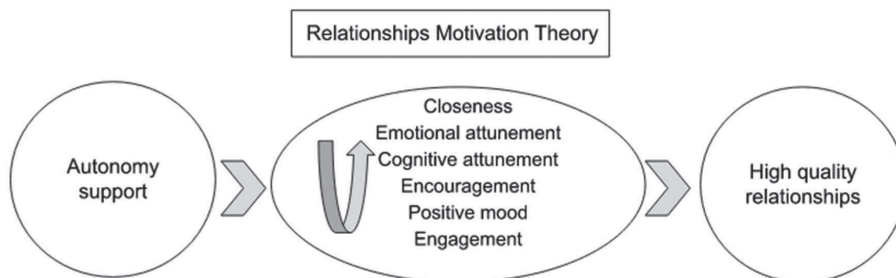


Fig. 6 (Based on Weinstein, Hodgins & Ryan, 2010)

Przybylski, Rigby, & Ryan (2010) examine the psychological motivation for video game participation from the point of view of Self-Determination Theory and point out that the psychological need of autonomy is provisioned by games through the ability of players to make meaningful choices within the games. The study cites such games as Final Fantasy which allows players to make choices relating to gameplay strategies, goals, various routes to obtaining objectives, choice of missions, characters and alliances with other characters. Another game referenced in the study, Spore, actually generates game content from the way in which players engage with the game, thus allowing players to impact the game-world in meaningful and tangible ways. As evidence for this provision of autonomy, Przybylski, Rigby, & Ryan (2010) cite a regression model of player

need satisfaction, from an earlier study (Ryan, Rigby, & Przybylski, 2006), in which beta values of 0.36 for “Wellbeing” autonomy need satisfaction and 0.49 for “Game enjoyment” autonomy need satisfaction were recorded. This satisfaction of the need for autonomy through game play is of particular relevance to Relationship Motivation Theory due to the social elements of video games and the relationships that players form with each other and non-player characters, both in-game and on other platforms.

8. Conclusion

This literature based conceptual review of the six sub-theories of Self-Determination Theory and several key papers has attempted to cast light on the specific areas of motivation impacted by the utilisation of gamification in an educational context. Cognitive Evaluation Theory, Causality Orientations Theory, Organismic Integration Theory, Basic Psychological Needs Theory, Goal Contents Theory, and Relationships Motivation Theory have been briefly outlined and discussed with reference to published works which are of particular relevance to each. The limitations of this study are inherent in the fact that it has attempted to cover a lot of ground across a broad spectrum of topics relating to motivation, and as such does not offer granular detailed analysis of any specific area. More work needs to be done, in a more focussed and specialised manner, in order to examine and elucidate the finer nuances of the interplay between gamification and learner motivation.

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