Chapter 22
Why Gamification Fails in Education and How to Make It Successful: Introducing Nine Gamification Heuristics Based on Self-Determination Theory

Rob van Roy and Bieke Zaman

Abstract Gamification, a design technique that uses the motivational elements of games in other contexts, is increasingly looked at as a possible solution to the dropping levels of motivation observed in learners. However, previous research has presented mixed results as to the demonstration of whether gamification in education works or not. To better evaluate the potential of gamification, we argue that it is important to first focus on *how* gamification works. This chapter contributes to this discussion by asking three research questions, starting by specifying "What is gamification?" (*Q1*), to then revealing "How does gamification work?" (*Q2*). Looking at gamification from the perspective of self-determination theory, we show that various types of motivation guide people's behaviour differently and point to the importance of basic psychological need satisfaction. Furthermore, the answers to our first two research questions will explain why adding game elements as external, meaningless regulations is likely to cause detrimental effects on learners' intrinsic motivation. Finally, by cumulating these theory-informed insights, we address our last research question "How can gamification design be improved?" (*Q3*) and define nine gamification heuristics that account for (the interplay between) design, context and user characteristics. As such, this chapter forms a guide for researchers, educators, designers and software developers in fostering a promising future generation of gamified systems that resonates our plea for theory-driven design.

Keywords Gamification • Education • Motivation • Self-determination theory • Basic psychological needs

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22.1   Introduction

In the last decade, there has been a remarkable upsurge of the use of badges, leaderboards, challenges and other game elements in a variety of software, apps and websites. This phenomenon is referred to as gamification, a design technique that sets out to implement the compelling elements of games in other systems. Well-known examples of gamified systems are the sport app *Nike+ Running*™, the professional social networking site *LinkedIn*®, the navigation app *Waze*®, the online learning platform *Khan Academy*® and the language-learning app *Duolingo*®.

In this chapter, we focus on gamification in an educational context. We will explain that for the research field to mature, we should first achieve a deeper understanding of *how* the interaction with a gamified system may unfold in education, before we can address the question *whether* gamification works. Sophisticated theoretical underpinnings concerning gamification's direct influence on learners' motivation can help in gaining this much-needed understanding. This chapter aims at providing such theoretical insights and extends this knowledge by formulating concrete design guidelines that are likely to bring forth advanced and effective implementations of gamification in educational contexts.

This chapter is structured around the following three main research questions:

Q1 What is gamification?
Q2 How does gamification work?
Q3 How can gamification design be improved?

In the first section of this chapter, we answer the first research question (*Q1*) by defining gamification and discussing its potential in an educational context. Then, we rely on self-determination theory to explain the psychological processes underlying motivation and gamification, hereby addressing the second research question (*Q2*). The last section deals with the third research question (*Q3*) and discusses how our theoretical findings yield concrete design implications. More particularly, we end this chapter by introducing nine theory-based gamification heuristics.

22.2   *Q1* What Is Gamification?

In academia, gamification is generally defined as "the use of game design elements in non-game contexts" (Deterding et al. 2011, p. 9). Notwithstanding the consensus in definition, the operationalization of what exactly constitutes a gamified system remains a challenging endeavour. For instance, the definition does not specify the number and characteristics of the game design elements that have to be implemented in a system to label it gamified. It does also not put forward distinctive criteria to determine when a system stops to be a gamified one and when it is to be conceptualized as a full-fledged game instead.

Nowadays, gamification seems to be a buzzword, as something new and innovative to explore. However, the idea of gamification is not new. Looking beyond the recent booming of the academic and industrial discourses surrounding gamification (for an overview of the events leading to this boom, see Deterding 2015a, p. 30 and onwards) shows us that the practice of gamifying our lives is not new. It originated from the popularity of both offline and online games. People from various ages all over the world spend hours playing games without being forced to do so. For example, a recent survey concluded that about half the active European population plays video games, and this is for an average of more than 7 h a week (Interactive Software Federation of Europe 2016). This illustrates that games are inherently fun, motivating users to keep playing without any external pressure (Burguillo 2010; C.-H. Su and Cheng 2015). For years, practitioners and researchers have been experimenting with identifying what it is that makes games motivating, trying to use this knowledge to restructure other activities to make them as motivating (e.g. see the early work of Thomas Malone; Malone 1980, 1981, 1982). For instance, already from a nondigital era onwards, teachers have been rewarding children with stickers (*badges* in gaming jargon) when they performed well at school (Blohm and Leimeister 2013). However, it is only since the recent digitalization that the interest in gamification boomed in a variety of industrial and academic contexts (for an overview, see Hamari et al. 2014 or Seaborn and Fels 2015). Especially in education, gamification techniques are being welcomed as a promising strategy to enhance motivation (Ramirez and Squire 2015) which is found to be one of the most important determinants of educational success (Abramovich et al. 2013; Buckley and Doyle 2014; Taylor et al. 2014). Gamification is then thought of as presenting a potential solution to the dropping levels of learners' motivation (Busse and Walter 2013; Darby et al. 2013; Lepper et al. 2005; Pan and Gauvain 2012).

Research investigating the potential of gamification in educational contexts shows a scattered picture (see, e.g. de Sousa Borges et al. 2014 or Dicheva et al. 2015). Some studies have reported on positive effects of gamification on leaners' performance (e.g. in terms of better grades; see C.-H. Su and Cheng 2015) and study behaviour (e.g. in terms of the effort put into finishing assignments, see Barata et al. 2013). Others have found that the addition of badges to an online learning tool drove learners to contribute more and to be more engaged compared to a situation in which no badges could be collected (Denny 2013). Other studies have pointed to mixed results (see, e.g. de-Marcos et al. 2014), including instances in which no significant difference between a gamified and a non-gamified learning context could be observed. Although Hakulinen et al. (2013) found small differences in learning behaviour between learners who were rewarded with badges for doing exercises and those who were not, they did not find any difference in the grades obtained. Yet other studies revealed that the implementation of gamification in education might even yield undesirable effects. To illustrate, in some studies, it was found that students performed worse in a situation with badges, trophies, challenges, a leaderboard and levels compared to peers who weren't exposed to these game elements (de-Marcos et al. 2014; Domínguez et al. 2013). Non-gamified activities were also found to be more motivating compared to the gamified ones (Domínguez et al. 2013).

In an attempt to clarify these inconclusive results, some authors have argued that the desirable motivational effects are temporary in nature and that they can be ascribed to a novelty effect caused by adding digital and/or game elements in an educational context (Attali and Arieli-Attali 2015; Hanus and Fox 2015; Koivisto and Hamari 2014). Others have posited that the undesirable effects are rather a result of flawed design (Domínguez et al. 2013; Rojas et al. 2013). By simply adding points and leaderboards to a system, it is then argued, gamification is reduced to a meaningless *pointification* with no or aversive effects. Likewise, Domínguez et al. (2013) have pointed to flawed designs and the absence of a "sound pedagogy" (p. 9) as the origin of undesirable results.

In order to contribute to this discussion and better understand the various ways in which gamification can and cannot work, we argue that it is of utmost importance to first understand *how* this design technique is likely to work. To date, most gamification researchers have been concerned with a demonstration of *whether* the implementation of gamification yields the desired study behaviour and performance effects (Hamari et al. 2014). In doing so, however, they have been turning a blind eye to motivation as a prerequisite influencing a learner's performance. As a consequence, we are still lacking the explanatory insights on *how* and *under which conditions* gamification can work (Deterding et al. 2011; Richter et al. 2015).

22.3   *Q2* How Does Gamification Work?

Insights into the psychological concept of motivation will help us to better understand how gamification works. In this context, the perspective of self-determination theory (SDT; Deci and Ryan 2004), a research-based theory that has found general acceptance in motivational research both within and beyond the domain of education (Reeve 2004), is particularly instructive. SDT provides insights in the psychological processes underlying gamification (Deterding 2015b; Seaborn and Fels 2015), because it sheds a multidimensional light on people's motivations, which is explanatory for the variety in corresponding behavioural outcomes (Ryan and Deci 2000a).

22.3.1   *Intrinsic, Extrinsic and Amotivation*

Motivation describes the psychological processes that direct and energize behaviour (Reeve 2004). It is motivation that steers people's actions, as such being one of the essential driving factors of the effort learners put into study activities. The basic premise of SDT is that it is not the amount of motivation but the particular
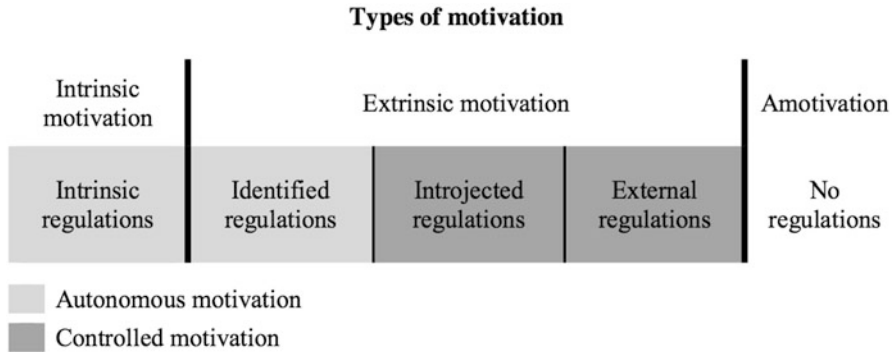
Types of motivation

Fig. 22.1   The different types of motivation (Based on Deci and Ryan 2004, p. 16)

nature of distinct motivational types that holds the most predictive and explanatory power as to how people behave (Deci and Ryan 2008a). In explicating the SDT principles, Deci and Ryan distinguish three main types of motivational states, namely, intrinsically motivated, extrinsically motivated and amotivated states (Deci and Ryan 2004). Figure 22.1 visualizes how intrinsic and extrinsic motivation form two poles of a spectrum, with on one side motivation caused by intrinsic regulations and on the other side motivation caused by external regulations; these two types of motivation are distinct from amotivation, for which there are no regulations present.

Amotivated signifies the characteristic of people who have no intention to perform a particular behaviour (Deci and Ryan 2004; Otis et al. 2005; Vansteenkiste et al. 2009). In an educational setting, this would imply that learners are not driven to execute an educational activity; they are unmotivated. Conversely, intrinsically and extrinsically motivated people do experience a certain drive to perform the action in question. The difference between the latter two types of motivation can be ascribed to their origin.

On the one hand, intrinsic motivation is derived from intrinsic regulations that originate from pleasure and interest found in the activity (Deci and Ryan 2004; Otis et al. 2005; Vansteenkiste et al. 2009). In an educational context, this happens when learners enjoy the engagement in an educational activity for no other reasons than for themselves. Because intrinsic motivation is fully autonomous, it is seen as the ideal motivational type to drive actions (Vansteenkiste et al. 2009). On the other hand, extrinsic motivation is derived from extrinsic regulations that are not related to the activity concerned (Deci and Ryan 2004; Otis et al. 2005; Vansteenkiste et al. 2009). These regulations are external cues that form an outside pressure controlling someone to conduct a desired behaviour. Examples of such external cues are punishments, rewards, feelings of shame and anticipated consequences.

22.3.2   The Internalization Processes of Extrinsic Regulations

SDT postulates that people who experience pressure from external regulations – or in short, who are extrinsically motivated – are very likely to feel an innate need to internalize these regulations and make them a part of themselves (Deci and Ryan 2004). If and to which extent the internalization of these regulations takes place depends on the degree to which their psychological needs are supported (*see further*). The more successful the process of internalization, the more extrinsic regulations echo the characteristics of intrinsic motivation, and thus the more someone's motivation moves towards intrinsic motivation on the continuum (see Fig. 22.1).

In SDT, three distinct subtypes of extrinsic motivation[1] are put forward, depending on the successfulness of the internalization process (Deci and Ryan 2008a). As a first subtype, external regulations mark a situation in which no internalization takes place (Buckley and Doyle 2014; Deci and Ryan 2004; Vansteenkiste et al. 2006). In an educational context, this is the case when a learner does not concur with the reasons for doing the activity and only conducts the expected behaviour in order to avoid punishment or get rewarded (Vansteenkiste et al. 2009). Introjected regulations, as a second subtype of extrinsic motivation, are characterized by a small amount of internalization (Deci and Ryan 2008a). In the latter situation, extrinsic cues are somewhat accepted but not yet considered to be part of the learner's self (Buckley and Doyle 2014; Deci and Ryan 2004; Vansteenkiste et al. 2006). People are thought to be driven by introjected regulations when they perform an activity to avoid shame or prove competence (Vansteenkiste et al. 2009). The last subtype of extrinsic motivation refers to situations in which external regulations are accepted and deemed as personally important, hereby becoming identified regulations (Buckley and Doyle 2014; Deci and Ryan 2004; Vansteenkiste et al. 2006). This happens when people endorse an activity, but rather than performing it for the activity itself, they act because of the desirability of the outcomes (Vansteenkiste et al. 2009). Although identified regulations resemble intrinsic regulations, they are still extrinsic in nature as the reason for performing it lies beyond the activity (Kyndt et al. 2011; Vansteenkiste et al. 2006).

In the hypothetical example presented in Box 22.1, we learn about a situation in which four colleagues are all about to start learning a foreign language. Alicia is intrinsically motivated. Even though Ben, Charlie and Daisy are extrinsically motivated, various regulations are at stake that will eventually guide their behaviour in a different way.

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[1]Originally, Deci and Ryan (2004) defined four different types of extrinsic motivation, but in later years, various academics have combined identified and integrated types of regulations because of their resemblance (e.g. Vansteenkiste et al. 2009).

Box 22.1: Meet Alicia, Ben, Charlie and Daisy, Four Colleagues Who Are Driven by Intrinsic, Identified, Introjected and External Regulations, Respectively

Meet Alicia, Ben, Charlie and Daisy. They are all about the same age, live in San Francisco, California, and work as client representatives at a flourishing start-up. The four colleagues all speak English, French and German fluently. Because of the rise in European clients, and in particular Spanish customers, they decide to start following evening classes to learn how to speak Spanish. But what drove them to take this decision? Depending on the reasons they hold, they are motivated in qualitatively different ways. Let's take a look at their motives.

Alicia – Intrinsic regulations. Alicia really likes learning new languages, learning new vocabulary by heart, getting into grammar rules and grasping how a language developed over the years. Because Alicia's primary motive to learn Spanish is the joy she experiences while doing so, she is thought to be driven by *intrinsic regulations* and feels autonomously motivated.

Ben – Identified regulations. Ben is looking for a new job and is considering to apply for an interesting position of a colleague who is about to retire. One of the job requirements is to speak Spanish. To make sure he will be considered for this job, he decides to learn Spanish. Although Ben endorses learning Spanish, he primarily starts studying it in order to achieve his personal, valued goal of enhancing his career. Therefore, Ben derives his autonomous motivation mostly from *identified regulations*.

Charlie – Introjected regulations. In the office, the atmosphere among the four colleagues is often competitive. When Charlie finds out that Alicia, Ben and Daisy are going to take Spanish classes, he decides to do the same, convinced that this is a great opportunity for him to show off his language skills. Charlie's main motivation for following the course is not learning Spanish, as such, but merely enhancing his self-esteem. Therefore, he is motivated by *introjected regulations*, and experiences controlled motivation.

Daisy – External regulations. The government has enacted a law which states that every California-based enterprise should have at least four employees who speak Spanish. The CEO decides that Daisy should learn Spanish too, promising her a substantial promotion if she does so successfully in about 2 months. Daisy starts taking the course because she is promised a reward. She is therefore driven by *external regulations* and thus by controlled motivation.

22.3.3 *Autonomous Motivation Outperforming Controlled Motivation*

The fine-grained SDT insights regarding people's motivational (sub)types and the internalization processes of extrinsic regulations prevent us from considering motivation as a homogeneous construct. Moreover, as is illustrated in the example in Box 22.2, these theoretical insights help us to better understand and predict people's behaviour according to their position on the continuum between intrinsic and extrinsic motivation (Ryan and Deci 2000a). Finally, it presents us with information to judge the desirability of a particular type of motivation.

Research has shown that people who are primarily motivated by external and introjected regulations behave in similar ways. This behaviour is different from the behaviour of people who are mainly driven by identified and intrinsic regulations. Therefore, external and introjected regulations are often categorized together based on the shared characteristic of being regulations for *controlled motivation*. Identified and intrinsic regulations, then, are grouped together as both presenting prerequisites for *autonomous motivation* (Kyndt et al. 2015; Vansteenkiste et al. 2009). These two categories of controlled versus autonomous types of motivations are illustrated in Fig. 22.1 and in Box 22.1.

Compared to controlled motivation, autonomous motivation is linked to more psychological well-being, persistence and better performance in different contexts (Deci and Ryan 2008a; Peng et al. 2012). Contrarily, controlled motivation is found to be more likely to quickly vanish when the external control is removed (Richter et al. 2015). This is not the case for identified regulations that are internalized; they are not dependent on the existence of particular external cues.

These insights have brought SDT researchers to conclude that autonomous motivation is the desired type of motivation (Deci and Ryan 2008a; Vansteenkiste et al. 2009), whereas controlled motivation, as the unstable determinant of behaviour, is considered as the least desired type of motivation. This explains why in an educational context, autonomous types of motivation have a more long-lasting positive effect on learning outcomes, grades and participation frequency (Hanus and Fox 2015; Kyndt et al. 2011; Liu et al. 2012), compared to controlled motivation. It further helps us understand why increased levels of controlled motivation are likely to go hand in hand with a decrease in learners' accomplishments (Kyndt et al. 2011), and why learners who are driven by controlled motivation are likely to lose their motivation and become amotivated when external regulations are removed (Richter et al. 2015). Concrete examples of these complex dynamics between learners' motivations and their study behaviour are provided in Box 22.2.

Box 22.2: The Takeover, How Controlled Versus Autonomous Types of Motivation Steer People's Behaviour in a Qualitatively Different Way
Four weeks after Alicia, Ben, Charlie and Daisy started following the Spanish course, the company is taken over by a large multinational. Alicia, Ben, Charlie and Daisy will soon be transferred to different offices all over the USA. As several of the new colleagues already speak Spanish fluently, there is no need for them to learn this language anymore.

Charlie and Daisy – Controlled motivation. Both Charlie and Daisy lose their motivation to complete the Spanish course, due to the removal of the external control. Daisy's promotion has been withdrawn, and she decides to stop taking the classes altogether. Charlie doubts what to do, knowing that he will see his former colleagues less often. He decides to take up the course again when there are new opportunities to show off his Spanish skills.

Ben – Autonomous motivation (*identified regulations*). For Ben, the direct external motivator to learn Spanish is removed because he can no longer apply for the vacancy at his old office. Nevertheless, he is still one of the most motivated students in class. Ben values studying Spanish primarily to enhance his career and is therefore still driven by identified regulations to complete the course.

Alicia – Autonomous motivation (*intrinsic regulations*). Alicia was very motivated to learn Spanish from the start and truly enjoys studying it. The reorganization does not change the fact that she enjoys learning new languages. Therefore, the intrinsic regulations Alicia holds are not affected by the takeover.

22.3.4   Basic Psychological Needs Co-shaping Motivations

The condition "essential [. . .] to experience growth, mastery, integrity and well-being" (Ryan and La Guardia 2000, p. 149), SDT argues, is that psychological needs are satisfied. With every person having an innate drive to flourish (Deci and Ryan 2008a; Gunnell et al. 2013), activities fulfilling these needs are thought of as particularly sparking autonomous types of motivation. The three psychological needs put forward in SDT are autonomy (related to volition), competence (related to the perception of being able to successfully complete a task) and relatedness (i.e. the feeling of belonging to a group of people) (Deci and Ryan 2004). These psychological needs are found to hold universal merit, deeply nested in people

across different cultures and ages (Ryan et al. 1997; Ryan and Deci 2000a), but the way in which these needs are supported is culture specific (Deci and Ryan 2008a). Moreover, these psychological needs shape the particular manifestations of people's motivations. For instance, research shows that people tend to internalize external regulations quicker and more thorough when they come from friends or family, a phenomenon caused by the feeling of relatedness (Ryan and Deci 2009).

In general, in the case of need fulfilment, internalization processes are likely to occur, resulting in enduring motivation. Contrarily, activities and contexts experienced as thwarting psychological needs are likely to diminish initial levels of autonomous motivation (Deci and Ryan 2008a; Kyndt et al. 2015; Vansteenkiste et al. 2009). In Box 22.3, we exemplify how these basic psychological needs are related to the different types of motivation. It demonstrates how the degree to which people perceive a particular activity and its surroundings as contributing to satisfying their basic psychological needs determines how the internalization processes of external regulations will unfold (Deci and Ryan 2008a) and consequently whether the motivation to pursue the activity in question can be conceptualized as autonomous or controlled in nature (Deci and Ryan 2008a; Kyndt et al. 2015; Vansteenkiste et al. 2009).

Box 22.3: The 6-week Turning Point, Exemplifying How Basic Psychological Needs Co-shape People's Motivations

Six weeks after the start of the course, Alicia and Charlie are still actively participating in class. Charlie considered quitting but soon realized that by improving his Spanish skills, he can also show them off to his new colleagues. Alicia is still genuinely interested in learning Spanish.

Alicia – Intrinsic regulations and the need for competence. As the course continues, Alicia finds it more and more difficult to complete the assignments and to keep up with the pace of the classes. Because she was very motivated to learn Spanish when she signed up for the course, she chose to start at the advanced level instead of taking the introductory course. Although she was able to quickly catch up with the basics on her own, she now finds herself in the position that her classmates are speaking Spanish significantly better. Alicia starts to doubt her language skills, and as such her feeling of competence is thwarted. Her initial enjoyment decreases; she loses her autonomous motivation and starts to think about quitting the course.

Charlie – Introjected regulations and the need for relatedness. Although Charlie's initial motivation to take the Spanish course was the opportunity to brag about his newly acquired language skills, he eventually starts to enjoy the classes because of the teamwork involved. This way, his main reason for going to class has gradually shifted from mere ego boosting towards the enjoyment of studying in a group. Consequently, his feelings of belongingness and relatedness towards his classmates make him more autonomously motivated than before.

22.3.5 A Self-Determination Theory Perspective on (Gamified) Motivation in Education

Gamified systems that provide learners with feelings of autonomy, competence and relatedness are likely to foster autonomous motivation (Mekler et al. in press), hereby both causing and explaining enjoyable, motivating and engaging experiences (Deci and Ryan 2008b; Peng et al. 2012). For the same reason, it has been concluded that any "future intervention effort that intends to capitalise on the motivational pull of video games should purposely include game futures that have the potential to increase need satisfaction" (Peng et al. 2012, p. 192). Unfortunately, the state of the art of gamification systems implemented in educational contexts has presented very little to no evidence of supporting learners' basic psychological needs. The design practice of gamified systems shows a general overreliance on external motivating regulations. Many designs only include decontextualized points and badges, which are easy and straightforward to implement in practice. Moreover, most gamification research goes out from some sort of gut feeling of the researcher neglecting motivational theory (Seaborn and Fels 2015). Researchers who do address motivational theory (in most cases SDT) do so in a popularized, simplified way (Deterding 2015b; Seaborn and Fels 2015).

By considering this common practice of designing gamification as an implementation of external regulation, SDT helps us to understand the often undesirable side effects. Based on SDT, we know that when students are introduced to external forces as a way to steer their study behaviour, they are more likely to feel less autonomous as a learner and perform study activities primarily to receive the promised external rewards. Additionally, in such a situation, the controlled motivation may also undermine any pre-existing autonomous motivation. Learners may then start ascribing their motivation to the added external regulations, which reduces or even removes any initial, intrinsic drive (Cameron et al. 2005; Filsecker and Hickey 2014). Consequently, feelings of autonomy may further descend, hereby even diminishing any intrinsic motivation left, so that eventually the learner's motivation changes from intrinsic to controlled motivation (Glover 2013; Tohidi and Jabbari 2012).

The latter fundamental motivational process in which initial intrinsic motivation is overruled by external regulations has been described in research as the *overjustification*, *undermining* or *corruption effect* (Lepper et al. 1973; Lepper and Henderlong 2000; Weibel et al. 2010) and is demonstrated in Box 22.4.

Box 22.4: Supplementary Exercises, Unfolding the Process of Overjustification When Intrinsic Motivation Is Overruled by External Regulations
Alicia – Intrinsic regulations being overruled by external regulations. After catching up with her fellow students, Alicia is asked to participate in a

(continued)

Box 22.4: (continued)
nationwide contest designed for students learning foreign languages, which awards the winner a cash prize of $ 10,000. In order to stand a chance to win the prize, Alicia's teacher tells her to practise her skills a lot, supplying her with supplementary exercises. Initially, Alicia likes making the exercises, but after a couple of days, she starts feeling washed out. She starts to experience the once-in-a-lifetime chance to win $ 10,000 as the main motivator to keep going, replacing her initial intrinsic motivation of enjoying to learn a new language. The cash prize starts to serve as the controlling force, driving Alicia's study behaviour. The reason for learning a new language has shifted from a mere interest in the activity to the external control caused by the potential promised reward.

Exclusively relying on the implementation of external regulations in gamification design isn't always causing a problematic motivational scenario, though (Deci and Ryan 2008a; Hidi 2015). When motivational cues that are originally external in nature appeal to the psychological needs of the actor, the external regulations will be thoroughly internalized resulting in autonomous motivation (Deci and Ryan 2008a). The latter process also explains why an absence of an overjustification effect is happening in scenarios where external regulations successfully support people in their basic psychological needs. As such, it can be inferred that external regulations, and by extension the typical gamification implementations, do have the potential to intensify feelings of autonomous motivation on the condition that people perceive them as appealing to their psychological needs. In an educational context, such need support is linked to various positive educational consequences, like improved grades and better understanding of the course materials (Deci and Ryan 2015; Mekler et al. in press; Ryan and Deci 2009).

22.4   *Q3* How Can Gamification Design Be Improved?

Based on SDT, we argue that gamification can motivate learners in a qualitative good way when it supports the three basic psychological needs innate to everyone, as such echoing earlier statements of Peng and Mekler and their colleagues (Mekler et al. in press; Peng et al. 2012). Acknowledging that this is a relatively vague design guideline, we will reflect on the concrete design implications of our theoretical insights by introducing nine theory-based gamification heuristics. This way, we answer the third research question on how to improve gamification design from the perspective of the system characteristics of a gamified system, as well as the situational factors that co-shape the effects of gamification, being user (in this case the learner) and context characteristics.

22.4.1   Supporting Basic Psychological Needs

In this section, we will first provide a more in-depth understanding of the three basic psychological needs and zoom in on their interplay. Then, we will consider how game elements can be selected in order to support learners in their psychological needs. During this discussion, we present evidence from both video game and educational research.

22.4.1.1   Need for Autonomy

The need for autonomy refers to feelings of volition (Deci and Ryan 2004). When feeling autonomous, the learner perceives no demanding external constraints or pressure. Performing the activity then goes out from the perception of a free choice and complies with the learner's sense of self. Perceived autonomy is an important antecedent for autonomous motivation. In educational contexts, teachers and parents who provide children with choices and support them in their initiatives are found to positively stimulate the autonomous motivation to engage in learning behaviour, more than teachers and parents who are strict and controlling (Jang et al. 2009; Rigby and Ryan 2011).

The implications for the design of gamified systems in education are that learners' need for autonomy is to be accounted for at design time. To illustrate, when a gamified system provides a variety of meaningful, learning supporting challenges ready to be handpicked by the learner, this system is likely to support autonomy. However, if the challenges form an obligatory part of the course, learners will rather feel externally controlled by the obligation to complete the challenges and as a result may start feeling anxious and losing autonomous motivation. Therefore, the first heuristic we propose is:

#1 Avoid Obligatory Uses
Avoid forcing the user to use (a part of) the gamified system in order not to give them the feeling of being controlled.

Providing options to choose from is often thought of as supporting people's need for autonomy too. Previous research has confirmed that a moderate amount of choice is likely to incite the perception of being autonomously motivated (Deci and Ryan 2008a; Deterding 2015b; Peng et al. 2012; Rigby and Ryan 2011). People can also feel autonomous when there is no choice situation, though. Rigby and Ryan (2011) point to examples in which people are only presented with a single option and still feel autonomous. If the single available option is one complying with the user's internal values, then it presents people with a meaningful and valued perspective. For example, when a teacher instructs students to write an essay on a specific topic that aligns with their interests, they can still feel autonomous, even though they were not provided with a choice. Therefore, when the specific context inhibits

the complete removal of the feeling of obligation (e.g. in formal education), action should be undertaken to make the activity's alignment with the user's interests and needs explicit.

Conversely, too many choices can yield negative effects, known as *The Paradox of Choice* (Schwartz 2009). The reasoning then goes that when someone is presented with many different but equivalent options to choose from, they are likely to feel anxious to make a decision, feeling uncomfortable because they experience loss with respect to the options that could not be selected, fearing to miss out (Ryan and Deci 2006). Reutskaja and Hogarth (2009) experimentally demonstrated that people's satisfaction with a task follows an inverted U-shaped function of the amount of choices provided. In a context of gamification in education, these insights stipulate not to provide learners with an endless stream of options to choose from, as such placing them in dilemmas. Rather, the gamified system should be conceptualized in such a way that it presents at least one option that is meaningful and valuable to the future learners. Therefore, the second heuristic reads as follows:

#2 Provide a Moderate Amount of Meaningful Options
Find the sweet spot between supporting users' autonomy by providing them with at least one option that is meaningful and complies with their values, while avoiding placing them in a dilemma by offering too many options.

22.4.1.2 Need for Competence

The need for competence refers to our desire to feel that we can successfully achieve a goal, being the master of the activity in question (Deci and Ryan 2004). The perception of competence leads to autonomous motivation. In educational contexts, learners who experience competence are found to be more persistent and have better study results than learners who feel incompetent (Rigby and Ryan 2011). The design implications for gamified systems in education are not just a matter of making the activity as simple as possible. In order to optimally motivate learners, tasks should be designed in such a way that they just fall outside the learners' comfort zone while still being perceived as attainable. Malone talks in this respect about tasks with "an appropriate difficulty level" (Malone 1980, p. 163, 1981, p. 358). This way, learners are challenged to persevere in improving themselves (Peng et al. 2012), given the "room to grow" (Rigby and Ryan 2011, p. 16). This principle of ensuring that a task is not too easy, causing boredom, but also not too hard – causing anxiety – is well known in game research, meticulously described in the *flow theory* (Csikszentmihalyi 1990). This advice is integrated in our third heuristic:

#3 Set Challenging but Manageable Goals
In order to support the user's feelings of competence, create tasks that pose a significant challenge while remaining perceived as feasible to fulfil.

Another way of fostering feelings of competence is by providing constructive and meaningful feedback (Niemiec and Ryan 2009). In gamification design, this typically takes the form of badges. Compared to traditional grading in educational settings, these badges can provide more information and yield more motivational power (U.S. Department of Education 2013). More particularly, well-designed badges can give both outcome and progress feedback. Moreover, badges are not limited to evaluating strict cognitive outcomes and can more broadly and explicitly relate to the competences at stake (e.g. "You can now make a call in Spanish!"), as opposed to grades (e.g. "You obtained an A-grade for this task") or other types of meaningless, non-informative feedback (see also Hanus and Fox 2015).

However, some types of feedback can also cause undesirable effects. These include feedback mechanisms that only focus on performance and less on competence, which is likely to be perceived as controlling, as such undermining autonomous motivation (Reeve 2004). Additionally, all types of negative feedback have been found to erode feelings of competence too, hindering learners' autonomous motivation (Deci and Ryan 2004, 2008a).

The insights presented above imply that in gamified systems, it is advised to approach learners with positive competence-related feedback, as stipulated in the fourth heuristic:

#4 Provide Positive, Competence-Related Feedback
Support feelings of competence by integrating feedback mechanisms that positively inform learners about their progress in gaining competences and avoid negative feedback.

22.4.1.3 Need for Relatedness

When people feel they belong to a group, their need for relatedness is satisfied (Deci and Ryan 2004). Being connected to others gives us a sense of value; it makes us happier and lets us feel better about ourselves. The positive feelings evoked by being part of a group are deepened when people share experiences (Rigby and Ryan 2011), and losing a beloved one is found to be one of the hardest things to process psychologically (Rigby and Ryan 2011).

In an educational context, learners who work together, sharing experiences and a common goal, have stronger bonds, resulting in relatedness need satisfaction and autonomous motivation. Carr and Walton (2014) found that giving students the impression that they are working together – although actually they are not – already suffices to foster feelings of relatedness.

The need for relatedness also plays an important role in video games (Rigby and Ryan 2011) and is often explicitly afforded for by design, e.g. by encouraging players to team up while tackling a challenge (Peng et al. 2012). People who feel related to others during gameplay are more likely to enjoy the game experience, feel

more engaged and have higher future play motivation, compared to gamers who don't feel connected to others during gameplay (Peng et al. 2012).

As relating an activity to others supports people's feelings of relatedness, it follows that promising gamified systems are those that emphasize these links too. Previous research has indeed shown that students who used a gamified system in which social features were enabled performed better on assessments compared to those who used the gamified system without social features (de-Marcos et al. 2016). The insights mentioned above result in the definition of a fifth heuristic:

#5 Facilitate Social Interaction
Eliminate factors that hinder social interactions between users, and facilitate them to interact and support their feelings of relatedness instead.

22.4.1.4   Interplay Between Psychological Needs

Gamified systems that support one of the three basic psychological needs are likely to provide autonomous motivation; systems that satisfy all three of them may even be more successful in motivating users, as the value of satisfying each single need adds up (Deci and Ryan 2004). One can take group work as an example (Rigby and Ryan 2011). Gamified systems that encourage group work contribute to feelings of belonging to a team (cf. need for relatedness) and lend itself well to present complex challenges that benefit from gamers who join forces, therefore letting the group's skills flourish (cf. need for competence). Last, working in a group typically implicates that new strategies can be used to attain the game's goals, hereby presenting gamers with more alternatives to choose from (cf. need for autonomy).

The fact that each single need adds up also implies, however, that in combination, one need fulfilment may equally lead to an impediment of another need fulfilment. When unfolding in everyday situations, the three psychological needs are indeed found to often clash (Ryan and Deci 2000b). For example, when a certain group challenge doesn't leave room for individual decisions and contributions, the need for relatedness might be fulfilled at the expense of an individual's need for autonomy.

The implementations of badges as a gamification strategy should also be understood as potentially pertaining to various psychological needs simultaneously. To illustrate, successful motivational badges afford constructive, noncontrolling feedback (Deci and Ryan 2008a; Deterding 2014) and support the need for competence by focusing on the achieved capabilities of the learner (*see heuristic #4*). The learner should, however, not possess all the necessary information about what activities have to be undertaken in order to achieve them, so that by no means, the badges can be perceived as controlling. In general terms, gamified systems should thus wary to not thwart one of the basic psychological needs, when trying to support another. This leads us to postulate our sixth heuristic:

#6 When Supporting a Particular Psychological Need, Wary to Not Thwart the Other Needs
When designing a specific element in order to support users in one of their basic psychological needs, wary to not thwart one of the other needs.

22.4.2   Situational Gamification

Gamification systems are not implemented in a vacuum; they are to be situated within the broader activity and context that is gamified, and the interaction with them unfolds depending on the characteristics of the user. In this section, we will provide more concrete design guidelines about how we can account for the way gamification may unfold in a particular context of use, accounting for aspects of the activity context, the implementation context and the user characteristics.

22.4.2.1   Integration of Gamification into the Activity Context

As for the integration of gamification in education, two fundamentally different activity contexts come together. In games, motivating the player to keep playing the game is central (Deterding 2015b; Gee 2008), whereas in education knowledge acquisition is at heart. Therefore, it is beneficial to align the motivational goal of games with the learning goals, as a way to profit from the motivational pull of games in an educational context. A good gamified system should thus "*both* directly support end user activity (by ease of use) *and* facilitate it through enjoyment and motivation" (Deterding 2015b, p. 304 author's emphasis). When the alignment between both goals fails, the systems will resemble *chocolate-covered broccoli* (Deterding 2014; Lee and Hammer 2011; Linehan et al. 2011), that is, an unmotivating, unappealing activity at heart with only a fun, sweet holster. The derived heuristic reads as follows:

#7 Align Gamification with the Goal of the Activity in Question
Alight the motivational pull of gamification with the goal of the activity, as such tuning gamification to both facilitate motivation and goal achievement.

22.4.2.2   Implementation Context and Environment

Different authors have stipulated the significant impact contexts can have on the effectiveness of gamification (Deterding 2014; Mekler et al. in press; Richards et al. 2014). For instance, as people are generally socialized with the belief that playing is inappropriate in certain contexts, for example, in class or in a bus, it follows then that the implementation of game elements in these contexts may cause confusion and embarrassment (Deterding 2014; van Roy and Zaman 2015). Moreover, in a school context, the strong emphasis on formal evaluation and learning task completion serves as a controlling force upon students that is only to be intensified when external regulations are added through gamification (Mekler et al. in press).

A school environment is often very competitive, which may form a threat for bonding with peers and consequently for the need for relatedness (Ryan and Deci 2000b; Ryan and La Guardia 2000). Conversely, competition that drives learners to be on their top behaviour can also positively influence feelings of competence and relatedness as everyone involved in the competition drives the others to

improve (Rigby and Ryan 2011). Furthermore, studies illustrate that how teachers communicate with students can significantly impact the way in which learners perceive the educational context as a whole (Cheon and Reeve 2015; De Meyer et al. 2014; Haerens et al. 2015; see also Deci and Ryan 2008a). For example, Cheon and colleagues found that students of teachers who followed an *autonomy-supportive intervention programme* (ASIP) in which they are taught to provide meaningful rationales acknowledge negative feelings, use noncontrolling language, offer choices and nurture inner motivational resources (Y.-L. Su and Reeve 2010, p. 162) experienced more autonomous motivation and less amotivation (Cheon and Reeve 2015). The same positive implications of a need-supportive context on motivation and performance are reported in other domains (Cheon et al. 2015; Katz et al. 2015; see also Y.-L. Su and Reeve 2010). These results prove that small interventions can transform a context from a controlling one into a need-supportive one, in the end resulting in better learning performances. Therefore, when implementing a need-supportive gamification system, one should wary to do this in an equally need-supporting context. This leads us to the postulation of our eighth gamification heuristic:

#8 Create a Need-Supporting Context
In order to support the user's basic psychological needs, the gamified system should be implemented in a setting that is perceived as open and supporting as opposed to controlling.

22.4.2.3 User Characteristics

People's individual characteristics affect how they experience the interaction with technology. In game research, it is found that high competitive people who are given the choice between a competitive and non-competitive version of the same exergame prefer the former version, whereas low competitive people are more likely to pick the latter alternative (Song et al. 2013). People's demographics have been found to influence the experience with gamified systems, too (Mekler et al. in press). Based on personal differences, Barata et al. (2015) defined a user typology (consisting of achievers, disheartened, late awakeners and underachievers) of users who interacted with the same gamified course in different ways. They conclude that gamification will be more effective when it accounts for the unique ways in which these different types behave on the platform (Barata et al. 2015).

An educational gamified system can anticipate on this variety in personal characteristics and the related behaviour by implementing flexible system choices, supporting users in fine-tuning system properties according to their personal preferences. The gamified system will then be more likely to satisfy people's psychological needs and provide meaningful motivational experiences to various types of users (Barata et al. 2015; Hakulinen et al. 2013). This leads to the ninth and last heuristic:

#9 Make the System Flexible
To account for personal differences, the gamified system should be flexible and adaptable in order to comply with the users' personal needs and preferences.

22.5   Conclusion

Gamification is looked at as a possible solution for the observed dropping levels of learners' motivation. However, previous research has presented inconclusive findings as to the demonstration of whether gamification works or not. In this chapter, we contribute to this discussion and argue that the wrong types of questions have been focused on. Rather than asking if gamification works, we posit that it is more instructive to first focus on *how* gamification may work. To pave the way to answer this question, this chapter scrutinized the potential of gamification in educational contexts from the perspective of self-determination theory (SDT). By doing so, we described the psychological processes underlying the working of motivation and reached a better understanding of how gamification can facilitate or hamper these processes. Based on the in-depth insights on how to spark desirable types of motivation via gamification, we postulated nine gamification heuristics (see Table 22.1). These heuristics aim for affording autonomous as opposed to controlled types of motivations and account for the importance of basic psychological needs fulfilment.

Acknowledging the importance of user characteristics (cf. *heuristic #*9) in addition to system properties (cf. *heuristics #1–7*) and contextual demands (cf. *heuristic #*8), we have shown that the phenomenon of gamification should be understood holistically. This is in accordance with Hassenzahl and Tractinsky's view (2006) that, in general, user experiences with technologies are shaped by three pillars, including system, context and user. Similarly, our heuristics should also be understood holistically. For instance, *heuristic #3* points to the design rule of creating challenging but manageable goals in a gamified system; however, whether and how users will eventually experience these goals as motivating depends on their skills and the context in which these goals are being implemented. Therefore, just like we can only design *for* user experience and not design the user experience itself, designing a gamified system is also about designing *for* motivational experiences and not about designing the motivational experiences themselves (Seaborn and Fels 2015).

Although this chapter focused on an educational context, the gamification heuristics are based on fundamental SDT insights, as such holding merit in other contexts as well. In this way, this chapter forms a first step towards a better understanding of how gamification works and arms researchers, educators, designers and software developers with well-informed rules of thumb to build desirable gamified systems. Acknowledging that our theory-based heuristics may benefit from empirical validation and refinement, we call upon future researchers to put them into practice and further extend our knowledge of gamification.

Table 22.1 Overview of the nine theory-based gamification heuristics and the challenges they address

Challenge	Heuristic
Support learner's autonomy	**#1 Avoid obligatory uses**
	Avoid forcing the user to use (a part of) the gamified system in order not to give them the feeling of being controlled
	#2 Provide a moderate amount of meaningful options
	Find the sweet spot between supporting users' autonomy by providing them with at least one option that is meaningful and complies with their values while avoiding placing them in a dilemma by offering too many options
Support learner's competence	**#3 Set challenging but manageable goals**
	In order to support the user's feelings of competence, create tasks that pose a significant challenge while remaining perceived as feasible to fulfil
	#4 Provide positive, competence-related feedback
	Support feelings of competence by integrating feedback mechanisms that positively inform learners about their progress in gaining competences, and avoid negative feedback
Support leaner's relatedness	**#5 Facilitate social interaction**
	Eliminate factors that hinder social interactions between users, and facilitate them to interact and support their feelings of relatedness instead
Interplay between needs	**#6 When supporting a particular psychological need, wary to not thwart the other needs**
	When designing a specific element in order to support users in one of their basic psychological needs, wary to not thwart one of the other needs
Integration of gamification into the activity	**#7 Align gamification with the goal of the activity in question**
	Alight the motivational pull of gamification with the goal of the activity, as such tuning gamification to both facilitate motivation and goal achievement
Contextual characteristics	**#8 Create a need-supporting context**
	In order to support the user's basic psychological needs, the gamified system should be implemented in a setting that is perceived as open and supporting as opposed to controlling
Individual characteristics	**#9 Make the system flexible**
	To account for personal differences, the gamified system should be flexible and adaptable in order to comply with the users' personal needs and preferences

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