

EAIT Encyclopedia:

Gamification

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1. Gamification, a definition

Coined in 2008, the term gamification has not yet reached a consensus from the academic community and, depending on the considered authors, two categories of definitions are proposed. A first category of definitions is based on the etymology of the term. Gamification consists of “making or fabricating a game” *i.e.*, applying game mechanics and using game elements such as badges, points, bonuses and leaderboard in order to convert a non game context into a game-like activity. This definition is based on a point of view about what is a game that falls within “essentialism” *i.e.*, the functions of a game result from a set of attributes. A second category of definitions is currently emerging. This category of definitions considers gamification to be a process focused on the player experience. This process consists of the implementation of motivational affordances grounded in game-design principles, and aiming at fostering ‘gamefulness’ or ‘gameful experience’. These latter definitions insist on the subjective nature of the experienced value of a game. Play is considered to be based on activity and meaning originating from the player. Gamification results in (internal) psychological and (external) behavioral outcomes because the focus is on influencing learning performances, attitude and/or behavior. From a learning perspective, gamification is considered to provide positive effects by fostering the learner engagement into epistemic activities. However, potential negative outcomes, such as increased competition, are also reported.

2. Introduction

The term gamification (coined as “game-ification”) appeared in 2008 in the digital media economic sector (Deterding, Khaled, Nacke, & Dixon, 2011). In a blog post following the Social Gaming Summit, Bret Terrill (2008) describes the word as “taking game mechanics and applying to other web properties to increase engagement”. Since then, the term has been popularized in different conferences (Google Tech Talk) by Zimmermann in 2010 and Amy Jo Kim in 2011 (Kapp, 2012). Gamification, as an emerging concept, has also attracted considerable attention of the educational research community and gamification is becoming a popular subject for academic inquiry (Hamari, Koivisto & Sarsa, 2014). Besides that, gamification is often incorporated in persuasive technologies to influence attitude and behavior.

Etymologically, the word gamification is based on the Latin verb *facere* ('to make' or 'to fabricate'), reflecting the idea that it is possible to 'create a game.' The concept emerged in the digital media economic sector (Deterding, Khaled, Nacke, & Dixon, 2011) but was early adopted by educators. The concept has close relationships with edutainment and game-based learning. However, edutainment is used in a broader sense and is not limited to game principles. Indeed, edutainment also refers to media for leisure such as television. Gamification is generally considered differing from game-based learning as gamification is more about applying game-design principles to non-game contexts than using individual video games.

In a usual gamification process, gameplay elements are implemented in real world processes or activities to stimulate behaviour (Deterding et al., 2011). For example, Classcraft (see the example below) consists of implementing loss or gain of points, powers and privilege as well as random events for classroom management.

Recent definitions, characteristics, and perspectives about gamification (Lieberoth, 2015), and the implemented motivational affordances are discussed in section 3. The resulting psychological and behavioral outcomes mentioned in the related literature are discussed in section 4. Section 5 provides some examples of gamified contexts in secondary and higher education, and regular households. Section 6 is dedicated to stress the ongoing debates on gamification and its use for educational purposes. Current trends in the gamification field are highlighted in section 7.

3. Gamification: definitions and characteristics

The emerging scientific literature describes gamification firstly as game mechanical elements and secondly in psychological terms. According to the first perspective, Terrill (2008) describes gamification as "*taking game mechanics and applying to other web properties to increase engagement*". Since then, several definitions have been suggested, such as '*the use of game design elements in non-game contexts*' (Deterding, Khaled, et al., 2011) and "*using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems*" (Kapp, 2012. p. 1). Games elements (or game design elements) are the game components or the objects that the player interacts with. Some games elements enable rewarding the player (points, badges, bonuses, leaderboard...), others are linked to the gameplay (limited time, game levels...). Game mechanics are methods invoked by agents for interacting with the game state (Lieberoth, 2015) such as the use of a dice as randomizer, movement of playing tokens or acting out roles. Game mechanics create emergent gameplay. Game mechanics are diverse and fall into several categories that are used to categorizing games (Seaborn & Fels, 2015).

However, basing definitions of gamification on a set of game elements or game mechanics is problematic. There do not seem to be a basic set of elements that are unique to games and game mechanics might be not specific to games. As a result, according to a second perspective, gamification is considered to be a process focused on the player experience. In that case, gamification is grounded on two core concepts: motivational affordance and gamefulness. Motivational affordances refer to actionable properties between an object and an actor (Gibson, 1977). The user is not forced to act upon these objects but they demand interpretation by the actor. Characteristically, they open the possibility for the occurrence of motivational needs and emotional states. Thus, rather than focusing on game elements that the user has automatically to interact with, gamification is considered to resulting from voluntary player's interactions with the game. Play is considered to be based on activity originating from the player (Sanchez & Mandran, 2017). The term 'Gamefulness' or the expression 'gameful experience' are used in this context to describe an experiential condition that is unique to games. This experiential condition makes possible for anyone to recognize a game. Play

is considered to be based on activity and meaning originating from the player. Therefore, *gamification* can be defined to be *the implementation, in non-game contexts, of motivational affordances grounded in game design principles and aiming at changing the meaning of the situation and fostering gamefulness where the focus is on influencing learning performances, attitude and/or behavior.*

A way out of the contrast we signalled, is to assume that gamification presupposes the first as well as the second perspective mentioned which is more or less the case in the definition of Seaborn and Fels (2015): *gamification is the intentional use of game elements for a gameful experience of non-game tasks and contexts* (p. 17). Game elements are, for this definition, patterns, objects, principles, models, and methods directly inspired by games.

4. Gamification and learning, attitude and behavior changes

In recent years, a number of studies have been conducted on the effects of gamification on learning processes through integration of several game elements (e.g. badges, leaderboards, points) in the learning environment. Most studies conducted in the education area on the effect of gamification focus on two variables: learning performances and learners' motivation.

Regarding learners' performance, most studies show a positive impact of gamification as the integration of one or several game elements. De Marcos et al. (2016) compared educational game, social networking, gamification and social gamification approaches in their impact on learning performances in an undergraduate course. They define social gamification as the combination of gamification and social networking to create compelling socially-driven user experiences (e.g. blogging, questions & answers, liking, friends, personalization (status/visibility)). They showed that social gamification induces better results for all types of assessments. Da Rocha Seixas, Gomes and de Melo Filho (2016) were also interested in the impact of badges on learners' performances, and the results indicate that their performance was improved. Landers, Bauer and Callan (2017) studied the impact of leaderboards on task performance and highlighted the interest of this gaming feature in supporting goal setting. The results obtained by Dominguez et al. (2013) are more nuanced considering the impact of gamification according to the type of learning task. The study conducted in a university course showed that gamification had a positive impact on the students' performances in practical assignments and on overall performance, but it had a negative effect on students performance in written assignments and participation in class activities, although the students' initial motivation was higher.

Regarding learners' motivation, we can observe differences in the results obtained in several studies (Seaborn & Fels, 2015). For instance, Hamari (2017) focused his study on the use of badges to increase learner engagement in the learning activity consisting of getting used to working with an application for online communities where one can share goods and services. Results show that learners who used badges were significantly more likely to post trade proposals, carry out transactions, comment on proposals and generally use the service in a more active way. However a related study conducted by Hanus and Fox (2015) showed that integration of a leaderboard and badges induces a lower level of motivation and lower final exam scores for students, thereby showing a negative effect of this gamification feature.

Beside the education area where the focus is on learning performances and learners' motivation, another area of gamification is the persuasion area where the focus is on influencing attitude and behavior. The 'educational component' is leveraged to persuade people to change their attitude or

behavior (Bogost, 2007; Fogg, 2003). It is not surprising that this type of gamification has its roots in the corporate sector because changing attitude and behavior is one of the core activities of the marketing discipline. There are several studies that have reported changes in behavior when gamification strategies were used, but only a few report changes in attitude. Seaborn and Fels (2015) analyzed empirical findings of 31 studies. They reported that in 61% of the studies gamification had a positive effect, but 39% had mixed results. In almost all cases (97%) the aim was to influence behavior of the participants. Unfortunately none of the 31 studies reports about attitude changes. Only behavior, learning performances and/or engagement were measured. Hypothetically we would expect that attitudes should change if behavior changes by using gamification. An attitude is an evaluation of an object of thought. The focus of an attitude may comprise anything a person holds in mind, ranging from the mundane to the abstract, including things, people, groups, and ideas. Most researchers agree on this core definition according to Bohner and Dickel (2011). They also mention that researchers have long been using self-report scales, which directly ask a respondent to evaluate the focus of an attitude by checking a numeric response on single or multiple items. It is possible that the limitation of this method in measuring attitudes is the reason for researchers of the 31 studies not to examine attitudes. In another literature review of empirical studies on gamification of Hamari et al. (2014) psychological outcomes of 12 studies are reported. These psychological outcomes refer to perceptions, motivational affordances and engagement towards a gamification application and not to the behavioral context where this application is aimed at, for example, preserving energy in the household. Hamari et al (2014) state that in only four studies user qualities were believed to have an effect on attitudes towards gamification itself. All this suggests that there is a lack of research concerning attitude change by using gamification techniques. An exception is a study of Smith (2017) where a positive attitude shift is reported in a condition where students attended a gamified statistics course. Another one is reported by Bonvin and Sanchez (2017). Their study, based on the records of students' behavior of three classes, shows that gamification fosters collaboration among secondary students. Lastly, there are some studies – all on the area of sustainability - where attitude change using gamification is reported. Fijnheer et al. (2016) analyzed these (eight) studies where a gamified persuasive household energy application was developed - by implementing real world processes *in* the design - in order to influence energy consumption of households. All studies report a positive behavior change, seven studies report a positive knowledge change and six studies report a positive attitude change towards energy saving as well. The authors suggest the following gamification elements to be effective: gameplay (6 studies), feedback (5 studies), team play & social component (3 studies) and competition (3 studies)

5. Examples

Since gamification emerged, the concept has been applied in various educational contexts (De Sousa Borges et al., 2014; Ortiz-Rojas et al., 2017) from primary to higher education. According to these meta-reviews, there is a majority of papers on gamification for higher education. Studies on gamification for primary and secondary education are less frequent (*ibid.*). Gamification has been implemented into Massive Online Open Courses (MOOCs), training and lifelong educational programs. In the following, we describe three examples of gamified contexts.

5.1 Gamification of classroom management with Classcraft

Classcraft (Sanchez, Young, & Jouneau-Sion 2016) is a mobile web-based application for classroom management (fig. 1). Since Classcraft launched, more than 2.5 million active accounts have been

created, and ongoing analysis demonstrates the game's efficiency in terms of students' collaboration (Bonvin & Sanchez, 2017). Classcraft transforms the classroom into a role-playing game. Students are placed in teams and play as mages, warriors, or healers. In order to acquire powers, the players must meet teacher expectations by, for example, arriving to class on time, doing homework, and helping other students. Depending on its behavior, the player will win or lose gold pieces (GP) needed to customize their avatar, health points (HP), experience points (XP) and action points used to acquire powers. Randomness is another game mechanics that is leveraged in Classcraft. Once a week, the class starts with a random event that may have a positive or negative impact, such as losing or winning points, on every team. Randomness also manifests itself when, having lost all his points, the player must throw the "cursed die".

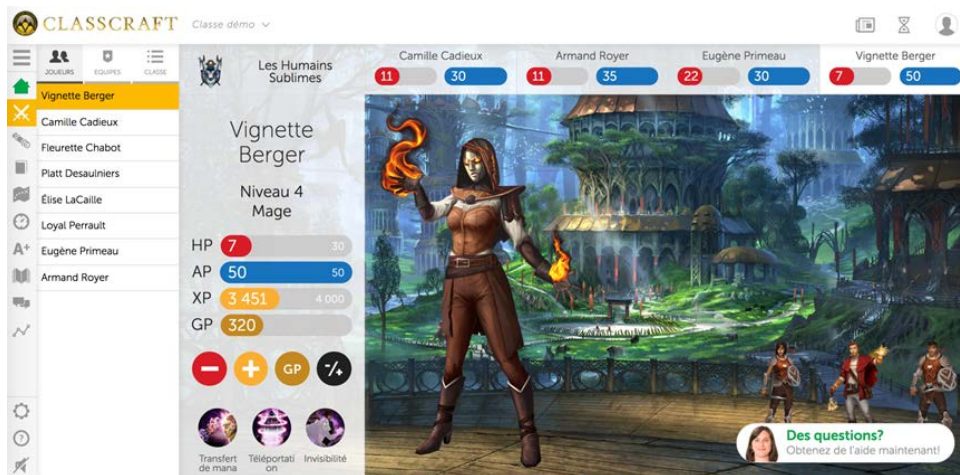


Figure 1: Screenshot of Classcraft©

Students progress in the game by exhibiting positive classroom behaviour and attitudes such as collaboration with peers, thus acquiring powers and progressing their avatar. With *Classcraft*, a student who comes to class five minutes late may use the power of 'invisibility' to avoid punishment. If the student does not have this power, the teacher, as gamemaster, deducts points. The loss of too many points causes death, which may mean a school detention or another punishment, depending on the rules set by the gamemaster. Students can also use their powers individually or collaboratively. For example, mages are very powerful and can often use their abilities to benefit their entire team. *Classcraft* is intended to foster student collaboration within teams. It is also designed to motivate students to comply with classroom rules of conduct.

5.2 Gamification and enhancement of sustainability

The inclusion of reality by using gamification principles in a gamified persuasive application can be an effective means to change people's energy-related attitude (Fijnheer & van Oostendorp, 2016). When people are highly engaged they are apt to adopt the attitude that is promoted in the application (Ruggiero, 2015). This can lead to a higher awareness of relevant factors involved in, for instance, energy saving. In effect, attitude may positively change and, as such, subsequently trigger a change in energy saving behaviour itself. The assumed chain of events: higher awareness (more accessible knowledge) - attitude change - behaviour change is what gamified persuasive applications try to influence (Aronson et al., 2013; Chen & Chaiken, 1999; Soekarjo & van Oostendorp, 2015). The application *Powersaver* (Fijnheer & Van Oostendorp, 2016; Fijnheer et al., 2016) is used as an

instrument of a larger research project that will give insight into what the influence of playing in the real world is on attitudes towards sustainability, and on sustainable behaviour in the long term. The focus is specifically on energy consumption in households by means of electricity and gas usage. The target is to contribute to the stimulation of individual sustainable behaviour by studying how gamification can be a positive incentive for people to change their behaviour regarding energy use at home. Therefore several gamification elements such as missions, levels, quizzes, narrative, competition, badges and feedback are implemented. It aims to study whether transfer from game play to real life behaviour has a long-term character (Gustafsson et al., 2009a).



Figure 2: Screenshot of Powersaver

Powersaver (fig. 2) is used in a household whereof the whole family is involved by implementing the gamification element cooperation. The navigation by the user is done by point and click on a tablet. *Powersaver* is basically an Internet page. It starts with an introduction of a story. This constitutes the narrative gamification element. A family arrives at a dilapidated country house where a professor had caused a failed experiment. Avatars of the family members are the central characters of the narrative. The family composition in the application is customized to the household. The family enters the main hall of the house that contains several locked doors. Behind each door a room is situated where a character in the form of a confused electrical device is placed. A cat (former pet of the professor) called Kyoto guides the family in the narrative. Every mission session the family is asked to enter a preselected room. Before the door opens a quiz has to be played. A quiz contains questions that will prepare players for the missions that are occurring in that specific room. When the family enters the room a character in the form of a device that is in a confused state is shown. The family has to accomplish, in one and a half or two and a half day, missions to help the device to get in a normal state. All missions (e.g. washing clothes on low temperatures) take place in the real world. In time the missions are getting more difficult. The total period of using the system is five weeks. *Powersaver* has thirteen missions, eight quizzes and an end-battle/scene. These missions are an important gamification element and represent the real world processes that are incorporated in the persuasive system. A real time connection between the household energy meter and computer server is accomplished by data-loggers with an Internet connection. Energy consumption is monitored a month before the application

starts to set a good baseline of average energy consumption. Another gamification element is feedback that users are getting on energy use and savings, the results of the quizzes and achievements of completed missions that are displayed with badges. Another implemented gamification element is competition. A household is in competition with seven virtual households, but assumes to play against real households.

5.3 An example from higher education: Brewing Beer

Brom et al. (2017) studied with university students a complex process (brewing beer) in a computerized simulation. In a two-hour interactive simulation they learned how to brew beer. The simulation focused on the boiling, fermenting and conditioning phases of the brewing process. The graphical interface (fig. 3) showed different panels, e.g. an animation panel showing the content of fermentation vessels, graphs and histograms showing the amount of ingredients, buttons for controlling the processes, etc. They examined adding several gamification elements to the simulation like providing a clear game goal, increase of the freedom of choice (of tasks to work on), points, virtual currency and including verbal feedback.

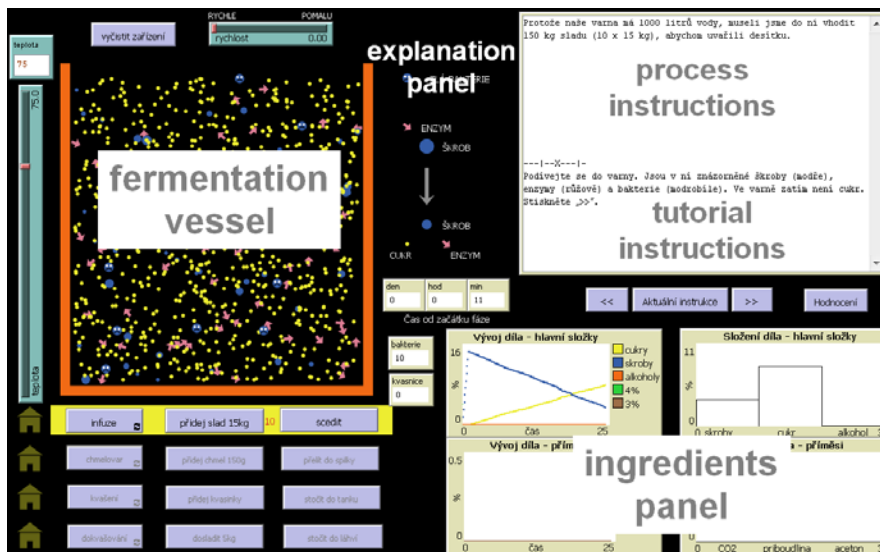


Figure 3: Screenshot of graphical interface (Brewing Beer)

No differences between the gamified simulation and control versions were detected, nor concerning learning outcomes nor concerning affective-motivational aspects. Also one month after playing the simulation no differences were found. However, one significant difference concerned perceived difficulty: the gamified simulation was *perceived* to be easier than the control versions. Maybe the gamification seduced learners to a light learning conception with the risk to engage only in superficial learning, and failing to help learners to engage in deep learning (Conway, 2014).

The null-results of this study may indicate that the gamification did not succeed in increasing learning nor motivation perhaps caused by increased distraction due to the many extra details in the user interface. An important implication of their study is that one should be careful with adding gamification elements (Conway, 2014; Seaborn & Fels, 2015). Researchers should also consider individual characteristics like attitude toward ICT, ICT experience and background knowledge.

6. Criticisms levelled

- Gamification vs Ludicization

Etymologically, the word gamification reflects the idea that it is possible to ‘create’ or to ‘fabricate’ the game. Therefore, gamification is considered to be an automatic and non-problematic transformation (Silva, 2013) often referred to as *pointsification*, i.e., gamification that exclusively relies on points, badges and leaderboards (Kapp, 2012). However, right in 2011, Deterding et al. state that gamification consists in addressing playfulness (the experiential and behavioural dimensions) and in using these dimensions for the design of structures with ludic affordances. As a result, some authors suggest to adopt the word ludicization in order to focus not on the artefact but on the situation that takes place when an individual accepts to play (Genvo, 2013; Sanchez et al., 2016). Therefore, play is considered to be *performative* (Sanchez & Mandran, 2017) and play depends on the *lusory attitude* (Henriot, 1969) of an individual who accepts the arbitrary and artificial rules of the game. According to this approach, there is no specific game element that can be used to make a game (as supposed by gamification), but it is possible to subtly combine elements in order to design a learning context where play can take place (ludicization). The term ludicization is based on *ludus*, the Latin root of ludicization, which means both game and school work. In addition, the suffix “-icization” does not mean that it is possible to “create” the game, as suggested by the suffix “-fication” (*facere*) of gamification, but primarily that it is possible to transform the situation (Sanchez, 2014).

- Short-term vs long-term effects

Beside the difficulties faced by researchers to assess the results of gamification, some studies show that the results of gamification may not be long-term, but instead could be caused due to a novelty effect (Hamari et al., 2017). Due to the lack of longitudinal studies, this issue remains unclear and needs further investigations (Seaborn & Fels, 2015).

- Edutainment and the chocolate-covered broccoli approach

Gamification is often considered to belong to the edutainment trend. Edutainment considers that educational objectives should be hidden to students or, are at least, ‘sugar coated’. This approach is in line with the maxime *placere et docere* (to please and teach) (Horace 65-8 bc) and the humanist-learning tradition expressed by Erasme (1467-1536). Criticisms expressed by Bruckman (1999) underline the risk that instructional game-based techniques that consist of just covering games over the learning content in order to make the learning content more palatable, have become synonymous with the *chocolate-covered broccoli* approach of teaching (Habgood & Ainsworth, 2011).

- Behavioral patterning and ethics

Gamification is a process by which end-user engagement and behavior can be shaped and directed. As a result, by applying normative constraints, gamification has the potential to be used as an instrument of coercion. Therefore, there is a risk to apply techniques leading to loose the emancipatory aim of education. This ethical issue seems not yet being addressed by researchers and is not often mentioned in research papers.

7. Current trends in the gamification field

Although gamification is a term still used with diverse meanings and grounded on underdeveloped theoretical foundations (Seaborn & Fels, 2015), research in the educational field is very active.

Below, we present two current trends of research in the gamification field: the inclusion of reality by using gamification elements in a gamified persuasive application and adaptive gamification

7.1 Inclusion of reality by using gamification elements in a gamified persuasive application

Usually in gamification processes gameplay elements are implemented in real world processes or activities to stimulate behaviour (Deterding et al., 2011). In some research projects a different and novel approach of integration of gamification is chosen. Real world processes, e.g. household energy saving activities, are implemented *in* the design of a gamified application. In this approach, situated learning experience is provided by integrating a persuasive simulation with gamification elements such as missions, levels, quizzes, narrative, competition, badges and feedback. The learner applies his/her knowledge directly to solve problems (Gustafsson et al., 2009b) by performing tasks in the real world that are at the same time directly interconnected to the gameplay in the digital world. The inclusion of reality by using gamification elements in a gamified persuasive application can optimize the transfer of knowledge from the application to reality (Kors et al., 2015). Some gamification research suggests that the integration of serious games into real life could have positive effects on attitude and behaviour (Gustafsson et al., 2009a; Hamari et al., 2014). It can be assumed that implementing real world processes, instead of simulated/fictive processes, in a gamified persuasive application will have positive effects. It is important to note that in this novel, reversed approach it is *not* the case that gameplay elements are included in real world processes. Instead, real world processes, e.g. household energy saving activities, are included in the application itself. *Powersaver* described above illustrates this approach. This approach tries to optimize the transfer between the digital world and the physical world. When the transfer is optimized the application can be more effective in change of attitude and behaviour (Kors et al., 2015). At the moment of this writing (November 2017) this first study with *Powersaver* is in its ending phase and the results are promising. Households in the gamified condition have reduced up to 21% in energy consumption during the intervention and have a reduction on average of 10% in the period after the intervention. Households in a control condition that used the Powersaver energy dashboard - the Powersaver application without gamification elements - didn't change their behaviour in energy consumption. So the essential difference between both conditions involved the gamification elements (Soekarjo & van Oostendorp, 2015). In a recent, comparable project Casals et al. (2017) report similar positive effects.

7.2 Adaptive gamification

Gamification in itself still lacks the adaptivity required to reach a wide range of users (Vassileva, 2012) and to meet learners' game mechanism preferences (Harviainen, 2014). In fact, users show different types of engaged-behaviors when interacting with online environments (Bouvier, Sehaba & Lavoué, 2014) and different player preferences (Bartle, 1996). According to Harviainen (2014), "*the very elements that motivate some learners (e.g., competition) are the ones disliked by others, and also those that when taken to excess, cause problems*". Research in the gamification field tends to consider the role of individual differences, for example, personality differences (McCrae & John, 1992), player types (Yee, 2006; Hamari & Tuunanen, 2014, Monterrat et al., 2015) and demographic differences (Koivisto & Hamari, 2014) in the perception and effects of the gamification process. Furthering this line of research could refine the understanding of user related factors (Hamari, 2015) and build foundations for adaptive gamification.

Still little is known on *how* to adapt game elements to users in learning environments and more generally in computer-based environments. The work conducted by Monterrat et al. (2015) is one of the first to address this issue. They integrated and adapted gaming features in a learning environment

according to player types. The exploratory study they conducted showed the potential of the adaptation of gaming features for enhancing learners' motivation. This supports the hypothesis that there is a need for adaptive gamification of learning environments. In a more recent study, Monterrat et al. (2017) also showed that the users' activity can help to predict their profile that can be used for the adaptation process. In their study, the adaptation process did not improve learners' engagement as expected, but it draws a path for future research toward an adaptive approach for learning environment gamification.

8. Related Entries

Educational games, Game-Based Learning, Games in Primary and Middle School Settings, Games in High School Settings, Games in Higher Education, Games, Simulations, Immersive Environments and Emerging Technologies

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