

# Is this new? Family Resemblances in Gamification in Education

Jan Broer, Member, IEEE Computer Society Technical Committee on Learning Technology

**Abstract**—Gamification in education is often hard to distinguish from traditional approaches to teaching and learning as well as from educational games. We briefly present an instrument for the structured assessment of gamification in a given system, discuss its evaluation, and interpret results from its application to learning management systems. We discuss the usefulness of such a tool for further research in gamification in education and in answering the question whether gamification is actually new or just a digital adaptation of well-known principles.

**Index Terms**—gamification, education, evaluation, learning management systems

## I. INTRODUCTION

GAMES, in various forms, play a large part in academic discussion of technology enhanced learning these days. Game-based learning (or serious games) and recently gamification have shown promising results and are experimented with in a variety of settings. (See [1] for an overview of gamification in education.) While both terms are derived from the term game, they differ in their application and use. We will briefly introduce a variety of definitions and discuss their usefulness.

In one early academic work on gamification, Deterding et al. distinguish between serious games and gamification as being on different ends of a scale from full game to elements [2]. Gamification, according to the authors, is “the use of game design elements in non-game contexts” [2]. Definitions of the term serious game mostly differ in their limitation to an educational context. Many follow Abt’s definition of serious games as games with an “explicit and carefully thought-out educational purpose” [3, p. 9] whereas others include a broader spectrum of areas of application. Zyda, for example, considers serious games to be “a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives” [4]. A variety of similar terms exist, such as (digital) game-based learning or edutainment. Bente & Breuer [5] provide a good overview.

Often, discussions of serious games and gamification are conflated and the two terms used interchangeably. When we reviewed the papers discussed in Hamari et al.’s review of gamification literature [6], we had to exclude some that dealt with full games instead [7]. Some authors question this distinction; Kapp, for example, considers serious games to be a subset of gamification [8, p. 18]. No matter how you frame the definitions, however, it is obvious that full games can have different effects (and require a different design approach) than the application of individual game design elements to a non-game context. In fact, much of the critique of classic approaches to gamification (such as points, badges, and leaderboards) stresses that adding these elements to an activity does not make it a game (c.f. [9]). It is therefore necessary to distinguish between the two in research, as one cannot generalize the success or failure of one approach to cover the other.

It follows that a good understanding of the term gamification is necessary for its study. Many authors have tried to define gamification, varying from rather precise definitions such as the one by Deterding et al. above to very broad ones such as Kapp’s “using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” [8, p. 10] or even Zichermann and Linder’s “the process of engaging audiences by leveraging the best of loyalty programs, game design, and behavioral economics” [10, p. xii]. The latter correctly refer to gamification as a process, a view indicated by the term itself (something is being game-ified) but not often discussed. If we pick any of the above definitions, it is relatively easy to identify whether a process can be considered gamification or not. Are the designers of the system taking elements from game design and applying them to a non-game context? If so, Deterding et al. would consider it gamification. Unfortunately, researchers rarely have the opportunity to investigate the process, instead we have to look at a finished system and identify whether it is the result of gamification.

Especially in education, this can be very difficult as many of the concepts used for gamification have already been used in education before the term even existed and did not necessarily originate in games. Gold stars or stickers given to students (c.f. [11]) have a strong similarity to badges, a mainstay of contemporary gamification, and the focus on autonomy, competence, and relatedness stressed by gamification literature is hardly new to education either (c.f. e.g. [12]). Awarding

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J. Broer is with the Institute for Information Management Bremen at the University of Bremen, Am Fallturm 1, 28359 Bremen, Germany. (email: jbroer@uni-bremen.de)

stickers to elementary school children could easily be considered gamification according to Deterding et al.'s definition, even though teachers most likely did not actually make use of an element from games but rather one that happens to also be used in games.

One tempting distinction is the choice of medium. Most implementations of gamification discussed in literature use digital media (see [1] for a breakdown focused on education) and many elements are adapted from computer games. One could therefore argue that the methods of gamification are not new, but that their use in digital media is. That would mean that getting a sticker for handing in your homework on time would not be gamification, but getting a badge in a digital system would be. While such a distinction would solve the problem of gamification not being new, it does not seem very useful. Technology certainly has an influence, but it is dangerous to overemphasize its importance. In the context of literature, Aarseth points out that such distinctions often "obscure the more profound structural kinships between superficially heterogenous media" [13, p. 14]. Excluding non-digital forms from the definition of gamification would mean the loss of much information that is very likely to transcend the choice of medium.

Nevertheless, the process of gamification is relatively new, even if its results are often similar to other approaches. Furthermore, we see a large variety of definitions being used, depending, among other factors, on the context that the gamified system is used in. A similar variety of definitions can be observed for the term game itself. Many scholars and game designers have attempted to find proper definitions of the term (e.g. [14, p. 80], [15, p. 36], [16, p. 34]), making the question of whether something constitutes a game increasingly complicated. Arjoranta [17] proposes an approach to defining games that is not nominal in nature, but rather follows the idea of Wittgenstein's family resemblances [18, p. 27e]. There are various kinds of games that have some properties in common with other games - but not necessarily all of them. Following such a definition, one cannot have one set of properties that defines all games, but rather a larger set of properties that can be found among games.

We have taken a similar approach to an attempt to define gamification. Instead of looking for the one, true definition of the term we are rather interested in a list of properties that many gamified systems have. Individually, such properties would not signify gamification, but a system that has several of those properties would resemble other gamified systems enough to be considered gamified itself. One would expect that gamified systems for education would also share some of those properties with other educational approaches, but in a smaller proportion. Ideally, such research would also allow us to identify groups of gamified systems that are related closely to each other, with other groups being considered extended family. Furthermore, it would be able to show the relation between gamification and established teaching techniques and their differences. Unfortunately, literature does not provide us

TABLE I  
EXAMPLE ITEMS FROM THE GAMIFICATION INVENTORY

#	Category	Subcategory	Question
E1	experiential	accomplishment	Does the system provide the user with a sense of accomplishment?
E3	experiential	challenge	Does the system include tasks designed to be challenging for the user to complete?
M1	mechanics	collecting	Does the system provide opportunities for the user to collect things?
M7	mechanics	storytelling	Does the system make use of storytelling?
R5	rewards	points	Does the system reward users with points of any kind?
G1	goals	clear goals	Does the system provide the user with clear goals / ideas about what to do next?
S1	social	fame / getting attention	Does the system provide means for the user to gain fame / attention?

Full instrument available at: <https://db.tt/DaZNzaTA>

with a consolidated set of properties of gamified systems. Many authors mention some, but only points, badges, levels, and leaderboards are almost ubiquitous in literature. We will briefly describe an approach to generating such a catalogue, the instrument itself, as well as early results of its use.

## II. GAMIFICATION INVENTORY

### A. Method

In order to identify a set of properties that may signify membership in the family of gamified systems, we followed a two-step process. At first we collected a set of 60 terms that are used in literature (e.g. [8], [12], [15], [19], [20]) to describe games or gamification. Similar terms were conflated. A full list of all terms and an example reference for each can be found at <https://db.tt/WOyS3CTf>. Please note that many of these terms have been adopted by a variety of authors and that the examples listed do not necessarily point to their first mention. These 60 terms were then distributed to 13 experts in an expert survey. Experts were recruited from a list of authors of peer-reviewed papers on gamification as well as among the participants of a workshop on gamification at the Mensch und Computer 2014 conference. The experts were asked to rate each term as a) relevant to a description of a gamified system of their choice, b) relevant to a description of gamification in general, or c) not relevant to a description of gamification. The experts were further asked to name any other terms that they considered to be relevant. There was no limit to the amount of items the experts could mark as relevant. Unlike nominal definitions, this approach embraces the fact that not all gamification has identical results, but rather results that resemble each other. By asking experts what the most important properties for describing gamified systems are, we could identify areas in which gamified systems may overlap.

Out of the 60 predefined terms, all terms that were mentioned as relevant by at least two thirds of the experts in either a) or b) were included for further consideration as well as all terms that at least a quarter of experts added manually.

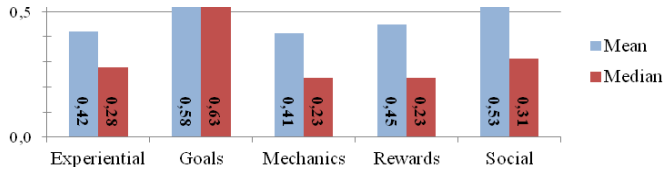


Fig. 1. Average disagreement between raters in each category as the sum of variances in responses for each item.

### B. Description of the Instrument

This resulted in 38 terms, which we grouped into five categories. Two categories contain most of the items, split according to an experiential / systemic dichotomy (c.f. [21]). The other three categories (rewards, goals, social) are mostly systemic in nature as well, but address specific issues often discussed in gamification literature and therefore deserve highlighting.

The experiential category contains terms dealing with the user's experience, or, more specifically, with affordances for specific experiences. An example item is competence, meaning whether the system affords the user feeling competent. The second category, system mechanics, deals purely with the functionality of the system. (Interactive) storytelling, for example, is a mechanic that can be adopted from games. The rewards category highlights some mechanics that are very common in gamification, those dealing with extrinsic rewards – such as points or badges. Similarly, the goals category includes those items that stress the importance of goals and structured tasks in games. Finally, the social category encompasses social functionalities that one might adopt from games.

For the use of experts, we have expanded the terms from the survey to questions that can be answered in the positive or the negative and asked for descriptions of how each term was expressed in the analyzed system. The resulting inventory (see Table 1 for example items) allows for a structured investigation of gamification aspects in a given system and a structured comparison of such systems.

### C. Evaluation

The catalogue is by no means final, but rather provides a preliminary synthesis of gamification literature and expert opinions. Further adaptation is best done through application of the instrument. We have taken a structured approach to a first evaluation of the instrument by asking four evaluators (one expert and three evaluators with basic training in gamification) to analyze the same five systems for gamification and comparing their results. Details of the evaluation will be available elsewhere, but we will include a summary of conclusions here.

Inter-rater reliability on the standardized part of the instrument was rather low (Fleiss' kappa,  $\kappa = 0.23$ ). A variety of possible explanations exist – among them the relatively low knowledge of gamification theory among three of the evaluators, leading to a misunderstanding of terms, the test

setup, and the inclusion of a “maybe” option in the standardized part of the instrument. Analysis of the free-form responses shows, that in many cases evaluators found the same functionality but chose to rate it differently in the standardized part.

Such disagreements in ratings as well as in the understanding of the meaning of certain questions were not evenly split among questions. In order to identify the items with the highest disagreement among evaluators (indicating the need for improvement of those items), we calculated the sum of variances in ratings. Items with high disagreements were spread widely among the five categories (see Fig. 1) and included (in order of disagreement, highest first) learning / mastery, social engagement loops, points, nurturing/growing, positive emotions, challenges / quests / missions / tasks, time pressure, clear goals, relatedness, competition, cooperation, fixed rules, and progress. All other items showed very low variance in their rating.

While these results show that there is room for improvement in the instrument (as well as a need for additional validation), a disagreement between raters is irrelevant when the instrument is used for its primary purpose – structuring an individual expert's analysis of gamified systems and providing a framework for the detection of family resemblances.

### D. Application to Learning Management Systems

An example application of the inventory on a set of learning management systems (LMS) is described in [22]. Four experts were asked to describe the gamification of each of five LMS using our instrument. The results showed strong family resemblances between the systems, employing a gamification strategy mostly focused on the awarding of badges to students. All systems were also rated as providing a sense of accomplishment, learning/mastery, and positive emotions to the user as well as allowing for autonomy. Curiosity, purpose and concentration were notably absent in the experiential category, as were game-like mechanics such as nurturing/growing, storytelling, and surprise. The systems were not identical in their expression of each item, however, exemplified by the use of time pressure and cooperation in some but not all systems.

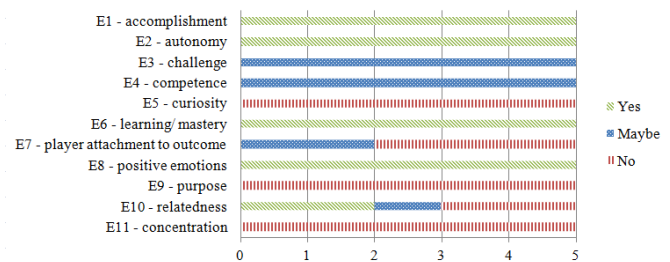


Fig. 2. Comparison of five learning management systems in the experiential category. Originally published in [22].

### III. DISCUSSION

The instrument we have briefly introduced here is an application of Wittgenstein's concept of family resemblances to gamification. As the results of our expert survey show, there are many properties of gamified systems that experts consider to be important to describe its gamification but that do not individually signify its presence. E.g. accomplishment, autonomy, or feedback alone do not signify that one is dealing with a gamified system. The system may have been created through the process of gamification, but it might as well not have any connection to games at all. The higher the amount of items in our inventory that are answered in the positive, the more likely it is that gamification played a role in the process. Applying our inventory produces much more useful information, however. For one, one can identify similarities and differences between different gamified systems, eventually allowing for subcategories within the family of gamified systems that allow for more focused research. One example of such similarities has already been shown in [22] between different learning management systems. For another, it allows for a structured comparison between the expressions of each property of gamification. Some properties in the instrument are already rather specific (e.g. badges), but other properties allow for many different implementations. Autonomy, for example, may be reached in a variety of ways and degrees. In the example of LMS, autonomy was mostly provided through the ability to choose when to complete tasks and the order in which to complete them. Further possibilities for autonomy could be the ability for learners to choose what to learn or how to prove acquired competences to the teacher. The open, qualitative part of our instrument is essential for such comparisons and more detailed analysis.

Returning to the question of gamification's novelty, it will be very interesting to analyze the resemblances between educational systems that are considered to be gamified and traditional approaches to teaching. If gamification really is just a collection of old techniques applied to a new medium, one should be able to find very strong similarities in the analysis. If there are differences, these may help us to identify which parts of gamification are actually new and innovative - and possibly even candidates for use in traditional media as well.

### IV. CONCLUSION

We have introduced the Gamification Inventory, an instrument for structured assessment of gamification in a given system. While improvements and further evaluation are necessary, the instrument has shown itself to be useful in comparing the results of gamification in different systems. We have shown a strong family resemblance in the way LMS are gamified. The concept of using family resemblances instead of nominal definitions seems to be useful for the discussion of gamification and may help to bridge the gap in understanding between gamification and traditional teaching methods. We hope that both such a more nuanced approach to gamification

and our instrument can be helpful in further research on the topic. Examples of further research include the application of the Gamification Inventory to additional digital systems and to more traditional teaching methods. Not only will this deepen our understanding, it will also help improve the instrument itself. Eventually, we should be able to understand whether gamification is simply a way of doing old things with a new technology or whether it has inherent added value.

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