

The Agony of Choice – Analyzing User Preferences regarding Gamification Elements in Learning Management Systems

Completed Research Paper

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Abstract

Gamification is an approach to motivate users of information systems by implementing game elements. Despite its potentials, the use of gamification in practice has also received criticism because most gamification elements are integrated into systems without considering the preferences of the respective users and without considering contextual aspects. Hence, we aim at identifying which elements users of learning management systems prefer. Furthermore, we want to identify their preferences regarding the amount and combination of gamification elements. To identify user preferences, we conducted a discrete choice task among learning management system users following the best-worst scaling method. Our results show that users prefer a bundle of four gamification elements: level, goals, status, and points. This is especially interesting since popular elements, such as a leaderboard or badges, are not most preferred. This highlights the need to consider user preferences and contextual aspects to ensure a successful implementation of gamification elements.

Keywords: Gamification, Gamification Bundles, User Preferences, Learning Management Systems, Best-Worst Scaling

Introduction

One prominent example of information systems (IS) are learning management systems (LMS) (Alavi and Leidner 2001). LMSs are widely used in businesses and educational institutions such as universities (Alavi and Leidner 2001). LMSs are often referred to as technology-mediated learning, e-learning, and virtual learning, and they are used to support students or employees in improving their learning (Urh et al. 2015). Because LMSs have shown a high drop-out rate, prior research highlighted that relying on mechanics of computer games is one effective way to influence and change the behavior of LMS users (Bedwell et al. 2012; Demetrovics et al. 2011; Gupta and Bostrom 2009; Santhanam et al. 2016; Shang

and Lin 2013). People like to play games during their spare time, whether it is at home on the television or on their way to work on a mobile device (Attali and Areli-Attali 2015). Because games are successful in our everyday life, the concept of gamification has been developed. Gamification describes the use of game design principles in non-gaming activities to improve user engagement (Deterding et al. 2011; Thiebes et al. 2014). Gamifying an LMS is about adding game layers to it rather than developing a particular game that connects learning and playing a game (Santhanam et al. 2016; Urh et al. 2015). More precisely, game mechanics (e.g., points and badges), game dynamics (e.g., competition and collaboration), and mini games can be used to gamify an LMS (Biro 2013; Blohm and Leimeister 2013; Santhanam et al. 2016; Zaman et al. 2012).

While game design principles are increasingly used in learning environments, the concept, meanwhile has to face some criticism in research and practice (Gartner 2012; Santhanam et al. 2016). Contrary to the forecasts, the positive effects of gamification are often short-term in practice (Christy and Fox 2014). Gartner was one of the first to highlight the problems in the implementation of gamification in practice. Gartner predicted in 2012 that eighty percent of all gamification projects in 2014 would not be successful (Gartner 2012). From today's perspective, Gartner's assumptions can be confirmed, as most gamification approaches still have some major weaknesses (Fogel 2015). Despite some criticism about the overall gamification approaches, gamification projects often fail due to a missing consideration of the needs and preferences of system users. Fleming (2014) and de-Marcos et al. (2016), for example, highlight that current gamification concepts are designed without knowing which gamification elements users really want to have implemented. With regard to this, Santhanam et al. (2016) explain that there might be no one-size-fits-all solution for gamification designs. This criticism is, for example, reflected by the observation that the amount of gamification elements in previous studies varies from one gamification element (Davis and Singh 2015; Hamari 2013; Pedro et al. 2015) to five or more elements (Ibáñez et al. 2014; Peham et al. 2014; Simoes et al. 2013). Consequently, a possible explanation for the limited success of gamification in practice is that different gamification elements are combined and implemented without considering the preferences of users (de-Marcos et al. 2016; Fleming 2014). In this context, Schlagenhauer and Amberg (2015) note that there are only few empirical studies on user preferences and requirements when aiming to use game elements in a non-entertainment-based context. Seaborn and Fels (2015) revealed this point for future research. They explain that it is necessary to determine the usefulness of particular gamification elements and that future research should aim at isolating the most promising and least promising gamification elements for a particular context. This can be supported by Hanus and Fox (2015), who explain that it is more important to investigate specific gamification elements rather than an overarching concept. Furthermore, although gamification can have positive impacts on user engagement, more research has to investigate the role of contextual and situational aspects, as they determine the motivational affordance of gamification element designs (Mekler et al. 2015).

All these findings indicate that more research needs to be conducted to determine the usefulness of particular gamification elements (Hanus and Fox 2015). Hence, research should aim at isolating the most promising and least promising gamification elements for a particular context by considering the preferences of users (Seaborn and Fels 2015). Furthermore, future research has to determine the appropriate amount of gamification elements. This is necessary because motivational effects can be reduced by implementing a greater amount of gamification elements in an LMS (Hanus and Fox 2015). Hence, the goal of our research study is twofold. In a first step, we want to find out which gamification elements users of an LMS prefer. By isolating which specific gamification elements users prefer, we can better understand how to create a gamified LMS that increases engagement and motivation (Hanus and Fox 2015). Referring to this, we still do not know the relationship and its meaning between specific gamification elements and learning (de Santana, Sivaldo J. de et al. 2016). Furthermore, we want to find out how many gamification elements users would implement in an LMS and which elements they would combine to a bundle of elements. Consequently, our paper focuses on the following research questions:

RQ1: Which gamification elements do users of LMSs prefer?

RQ2: Which gamification bundles do users of LMSs prefer?

RQ 2.1: How many gamification elements would users of LMSs combine?

RQ 2.2: Which gamification elements would users of LMSs combine?

To determine which gamification elements users of LMSs prefer, we rely on a discrete choice task that follows the best-worst scaling method (Lansing et al. 2013; Louviere et al. 2013). Due to the results of our best-worst scaling, we can give theoretical and practical implications. The results show that users of LMSs prefer a bundle of four gamification elements. More precisely, they want to combine the gamification elements *level*, *points*, *status*, and *goals*. Furthermore, our results indicate that users of LMSs like to compete against themselves instead of competing against others. To achieve our desired goal, the remainder of this paper is structured as follows: First, we present the related work regarding research on gamification and LMSs. Afterwards, we provide details on our research design, including data collection and analysis, before we present our results. Next, we discuss the results of our analysis and derive implications for both theory and practice. Furthermore, we discuss the limitations of our study and areas for future research before we conclude our paper.

Theoretical Background on Gamification

Gamification

Gamification has its origin in the use of games in daily life. More precisely, people like to play games during their spare time, whether it is at home on the television or on their way to work on a mobile device (Attali and Areli-Attali 2015). In total, there are two different ways to use games in IS. One possibility of integrating games into IS is the use of serious games (Stapleton 2004). Serious games can be defined as follows: “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” (Zyda 2005). Hence, serious games have been developed for the broader purpose of training and behavior change in many different areas (Connolly et al. 2012). According to this, playing serious games is increasingly linked to learning, with some studies showing the positive learning outcomes that playing digital games can have (Connolly et al. 2012; Stapleton 2004; Wouters et al. 2013).

Unlike serious games, gamification refers to the use of different elements instead of developing an entire computer game. The term gamification originated in the digital media industry (Deterding et al. 2011) and was first used in 2008, though the concept gained recognition in the second half of 2010 when it became a topic in conference presentations and was adopted by the industry (Thiebes et al. 2014). Even though a limited number of definitions of the term gamification are available, two of the mostly widespread definitions are outlined by Deterding et al. (2011) and Hamari et al. (2014). Deterding et al. (2011) define gamification as an “informal umbrella term for the use of video game elements in non-gaming systems” in order to “improve user experience and engagement”. Summarized, it can be defined as the use of game design elements in non-game contexts. On the other hand, Hamari et al. (2014) define the term as a “process of enhancing services with (motivational) affordances in order to invoke gameful experience and further behavioral outcomes” (Hamari et al. 2014). Hence, the authors take their definition further and elaborate on it by including certain characteristics. They suggest that gamification contains three parts, namely the implemented motivational affordance, the resulting psychological outcome, and further behavioral outcomes. Finally, Thiebes et al. (2014) characterize gamification as the application of game design principles to existing organizational, real-world problems, situations, or processes. Referring to this, Blohm and Leimeister (2013) classify gamification elements into three groups: mechanics, dynamics, motives. Mechanics are constructing elements for designing a gamified IS and dynamics describe the effects of mechanics on the subjective user experience over time. Motives are internal driving forces that encourage people to act, such as achievements or social exchanges (Blohm and Leimeister 2013; Turabik and Baskan 2015). Gamification elements are mostly clustered into a bundle of elements and intend to motivate and engage IS users in a regular system use (Aparicio et al. 2012). To combine the definitions stated above and to identify a definition that fits our research goal, gamification can be seen as the use and combination of game mechanics (in the following referred to as gamification elements) in a non-game context for designing a gamified LMS (Blohm and Leimeister 2013; Turabik and Baskan 2015) that ideally cause a resulting psychological outcome by leading to motivational incentives (Deterding et al. 2011; Hamari et al. 2014).

Referring to motivation, playing games motivates especially intrinsically. Regarding this, intrinsic motivation refers to a condition that can be achieved if an individual has fun while doing an activity (Lafrenière et al. 2012). Additionally, intrinsic motivation means that an individual thinks an activity is

challenging, useful, and interesting. The same intrinsic motivational effects can be caused if an individual can exercise power or make progress in an activity. Extrinsic motivation, on the other hand, is combined with a reward. This reward can be earned by successfully finishing an activity (Lafrenière et al. 2012). Furthermore, extrinsic motivation can be stimulated by the avoidance of punishment. With regard to this, gamification elements such as level, goals, status, and leaderboard encourage intrinsic motivation (Attali and Areli-Attali 2015; Hanus and Fox 2015; Melero et al. 2015; Passos et al. 2011), whereas elements such as points, badges, and virtual goods encourage extrinsic motivation (Attali and Areli-Attali 2015; Bunchball 2010; Hamari 2013). Considering the meaning of motivation, many research studies find positive effects of gamification in motivating system users to regularly use the system (Bedwell et al. 2012; Demetrovics et al. 2011; Lee et al. 2013; Shang and Lin 2013; Sigala 2015). Furthermore, a regular system use supported by gamification can have positive effects on the learning outcomes of IS users (Urh et al. 2015).

With regard to the use of gamification elements, previous gamification studies identified different lists of gamification elements. Thiebes and Scott (2014) identified a list of 31 different gamification elements. Hsu et al. (2013) as well as Hamari et al. (2014) identified only nine different kinds of gamification elements. Bedwell (2012), for example, identified different game attributes in his research studies. Overall, he identified 19 different attributes. Scheiner (2015), on the other hand, identified seven gamification elements. Finally, de-Marcos et al. (2016) identified a list of 29 elements. Additionally to the different amounts of elements, they are also somehow categorized in different ways. Due to this, there are significant differences regarding the use and combination of gamification elements in IS. For example, Thiebes et al. (2014) use the gamification element competition as an element. In other studies, competition is used as a category, not as an element. Hsu et al. (2013) use achievement for categorizing the gamification elements rewards, goals, reputation, and status. Thiebes et al. (2014) use achievement as gamification element in the category of rewards, and de-Marcos et al. (2016) use achievement as gamification element without any categorization. Furthermore, Scheiner (2015), for example, classifies level, badges, points, and story as game mechanics, whereas Bedwell (2012) classifies story as a game attribute, and de-Marcos et al. (2016) classify points as features.

Based on the different kinds of categorizations and amounts of gamification elements, we conducted a literature review to analyze which and how many gamification elements had been used in previous research studies. In our literature review, we focused on studies that used gamification elements in LMSs. Therefore, we identified 36 studies that used the following gamification elements: points, goals, time pressure, loss aversion, avatar, level, leaderboard, badges, achievements, progressive disclosure, progress bar, virtual goods, status, story, fantasy, challenges and, rewards. In six research studies, the authors used just one gamification element. Three of the five studies used different variations of badges for motivating users (Davis and Singh 2015; Hamari 2013; Pedro et al. 2015). On the other hand, Jones (2014) used goals in his research study, whereas Wang (2015) used status, and Fernandes (2012) integrated a point system into his research study. Most gamification elements were combined by Liu et al. (2013) and Simoes et al. (2013) who used seven different gamification elements in their research study. Additionally, we could identify studies that integrated an amount from two to seven gamification elements. A list with all studies that used two or more gamification elements can be seen in the appendix (Table 9). Referring to the selected gamification elements, most studies used the gamification elements points (20), badges (16), and leaderboard (13). Referring to our research goal, no study selected gamification elements in consideration of the needs and preferences of users.

In our research study, we focus on ten gamification elements in total (see Table 1). Due to the varying approaches of previous research studies, we defined characteristics for the exclusion of some gamification elements. As mentioned above, we focus on game mechanics. The gamification element achievement was excluded because it can be categorized as motive (Blohm and Leimeister 2013). The gamification element challenges was excluded because it belongs to gamification dynamics (Blohm and Leimeister 2013). Furthermore, we did not consider gamification elements such as story and fantasy because they belong to the design of a serious game (Li et al. 2012). We excluded the gamification element progressive disclosure because it needs the presence and use of other elements (Hew et al. 2016). The gamification element progress bar was excluded due to the similarity to the gamification element status. Finally, we excluded the gamification element rewards because this element was used as additional points (Liu et al. 2011). A description of the ten gamification elements we used in our research study can be seen in Table 1.

Table 1. Gamification Elements Used in Our Research Study	
Gamification Element	Description
Goals	Goals can be reached by successfully completing a task or activity (Domínguez et al. 2013). Mostly, they are adapted as challenge for the user (Passos et al. 2011).
Time Pressure	Creating pressure on given tasks or activities by integrating an hour glass or a counter. Hence, a user has to complete a task as fast as possible (Burgers et al. 2015).
Points	Points are rewards given for successfully performing a task or an activity. They are mostly a part of an overall point score (Attali and Areli-Attali 2015).
Badges	A badge is a reward that is given for fulfilling activities or tasks outside the scope of the core activities (Hamari 2013).
Status	A status informs users about their current activities and the progress they made in a system by giving feedback (Passos et al. 2011). Some studies use the term feedback instead of status (Burgers et al. 2015).
Leaderboard	A leaderboard offers the opportunity to compare own results with the results of other IS users (Hanus and Fox 2015).
Level	A level indicates the progress of a user regarding a certain task or activity. Furthermore, it indicates the proficiency regarding the overall performance in a game over time (Melero et al. 2015).
Virtual Character	A virtual character accompanies a system user during the use of a system, it is similar to a kind of tutor (Christy and Fox 2014; Davis and Singh 2015; Domínguez et al. 2013; Filsecker and Hickey 2014; Pedro et al. 2015; Simoes et al. 2013; Wang and Hou 2015). In some cases, they represent the users (Passos et al. 2011).
Loss Aversion	Loss aversion influences the user not by a reward, but by a punishment (Liu et al. 2013) if a task or activity is not achieved.
Virtual Goods	Virtual goods are non-physical and intangible objects that can be earned by successfully completing a task or activity (Bunchball 2010).

In summary, despite the different amounts of integrated and analyzed gamification elements, all previous research studies draw other conclusions due to their different research results. Hence, some research studies may not be successful due to their missing consideration of user preferences. According to this, research should focus more on the selection, amount, and combination of gamification elements in different contexts by considering the usefulness of particular gamification elements. Referring to this, Seaborn and Fels (2015) imply that future research should aim at isolating the most and least promising game elements for a particular context. Hence, with our research, we want to focus on the preferences of LMS users with regard to the type of gamification element, the amount, and combination.

Learning Management Systems

According to Hess et al. (2014), LMSs have a utilitarian purpose and are used on a voluntary basis. They can be defined as “an environment in which users’ interactions with learning materials, peers, and/or instructors are mediated through technologies” (Alavi and Leidner 2001; Sims 2003). Therefore, a virtual-based classroom can become a virtual learning space that can furthermore be supported by collaborative learning structures (Arbaugh 2000). In terms of learning materials, two forms of student-content interaction can be identified: those initiated by a system user and those initiated by the information system (Evans and Gibbons 2007). Overall, LMSs are used to support students or employees to improve their learning (Urh et al. 2015). Therefore, it enables learning from anywhere and at any time. The increasing number of interdisciplinary programs leads to different kinds of learning situations that can be handled more effectively by using gamification (Urh et al. 2015). Thus, gamification is a possible approach to motivate users to use systems more regularly (Scheiner and Witt 2013). Hence, gamifying learning has two purposes (Ibáñez et al. 2014). The first is to encourage desired learning behavior. The second is to engage the users in learning by the use of learning materials such as tutorials or digital documents. Therefore, engagement has been proved to be positively correlated with the outcomes of user success, such as user satisfaction and academic achievements (Ibáñez et al. 2014). Accordingly, gamification

increases the motivation of users by providing different gamification elements, by making an activity or task more fun and engaging, and by encouraging exchange between users. In the following, we describe our research method for the identification of user preferences.

Methodology

Best-Worst Scaling

Different approaches are available for assessing user preferences in general. A popular technique is conjoint analysis, which concentrates on combining a limited number of attributes (Green and Srinivasan 1990) and is often used in marketing for example for evaluating the price or design of a product (Green and Srinivasan 1990). However, conjoint analysis does not work well for a large number of attributes (seven or more) (Matzner et al. 2015). Another possibility of identifying user preferences for a large number of attributes is the self-explicated approach, which contains several methods such as ranking, rating, maximum difference scaling, or O-methodology (Matzner et al. 2015). In regular ranking mechanisms, respondents are asked to rank attributes from most attractive to least attractive (Cohen 2003). Hence, the resulting data is ranked ordinally. By using a rating measurement, respondents rate each item on a scale from, for example, 1 least attractive to 10 most attractive (Bacon 2003). Maximum difference scaling (MaxDiff) is a method for paired comparisons where participants have to choose a preferred attribute from a pair of attributes (Thurstone 1927). Finally, Q-methodology enables individual rankings for a factor analysis in order to reveal correlations between different kinds of profiles (Stephenson 1935).

The aim of our research study is to identify which gamification elements users of LMSs prefer. As mentioned before, we want to compare each gamification element individually, which is why conjoint analysis seems to be inappropriate as a first analysis. Using simple ranking mechanisms seems to be not suitable because they suffer from potential order effects and a lack of ties and absolute scores (Cohen 2003). Simple rating mechanisms allow participants to rate every choice option equally high, which would not lead us to usable results for our analysis if no preference differences are indeed reflected by their ratings (Matzner et al. 2015). Hence, we decided not to use a simple rating mechanism for evaluating user preferences. Q-methodology is a method that is used in psychology and social sciences to rate how people think about a topic, which is why we decided not to use this method (Stephenson 1935). Instead, to identify which gamification elements users of LMSs prefer, we decided to use a MaxDiff scaling and conducted a so-called discrete choice task. More precisely, we used BWS for gaining insights into users' preferences. BWS was developed by Louviere and Woodworth (Louviere et al. 2013), and it is an extension of the MaxDiff scaling by Thurstone (1927). BWS describes a cognitive process by which survey participants repeatedly choose two objects in varying sets of three or more objects that they feel exhibit the largest perceptual difference on a described continuum of interests (Finn and Louviere 1992). In comparison to other methods, BWS has several advantages. First, it provides a high level of ranking information because each decision for a pair of attributes provides implications for the not chosen attribute (Marley and Louviere 2005; Thiebes et al. 2014). Furthermore, it is scale free, which prevents response styles and therefore does not affect the mean value and the variance obtained (Lee et al. 2013; Thiebes et al. 2014). Finally, other response biases can be avoided by using BWS (Lee et al. 2007). Overall, comparisons with other rating methods show that BWS provides better results regarding the discrimination between different attributes (Lee et al. 2007; Matzner et al. 2015). BWS relies on a classic random utility choice model that is enhanced by two contrary choices options (Louviere et al. 2013). Overall, there are three different BWS cases. In the first case, respondents have to choose between attributes. In the second case, they have to choose between different attribute levels. And in the third, they have to choose between profiles of attributes that differ by attribute levels. As indicated by the name best-worst a respondent has to choose the most and the least preferred attribute out of one choice set. By using observations obtained from all choices of every participant, preferences for each attribute (and/or level) can be calculated by using a scoring mechanism and a conditional logistic regression analysis (see next chapter). For our analysis, we decided to use case 1 of BWS. The survey results can be used to derive a preference ranking indicating the most and least preferred gamification elements. For the evaluation of BWS data, two scaling models can be used. As mentioned above, the MaxDiff model represents a cognitive process by which respondents repeatedly choose two (the most and least preferred) attributes out of a varying set of three or more objects (Finn and Louviere 1992). On the other hand, the sequential choice

model represents a cognitive process by which respondents first have to choose the most preferred attributes and then the least preferred attributes. We evaluated the MaxDiff model for our analysis. In the following, we describe the design of our discrete choice task and explain how we implemented BWS in our survey.

Task Design and Data Collection

Before deploying the final survey, we conducted a pre-test with 15 graduate students and 20 researchers. The pre-test was intended to assess whether the survey was accurate and whether or not the questions were understandable for the participants. Apart from some typing mistakes, the participants stated that our survey is understandable. After pre-testing our survey, we applied minor changes to the wording and specified the order of appearance of gamification elements within each choice set to avoid any potential order effects. Our final survey consisted of three steps: description of gamification elements, choice task, and combination task. In addition to these tasks, we asked for demographics. In the first task, we described and visualized each gamification element in detail. In addition to the description of each element, we used a screenshot with which we visualized the elements in an LMS. In our pre-test, we found out that this kind of explanation is helpful for the participants to understand the meaning and purpose of each gamification element. To ensure that our participants are familiar with the described gamification elements, we added two questions to the first part of our survey. Besides the question whether the participants know the elements, we asked them from where they knew the gamification elements. In the choice task, each respondent was shown 10 gamification elements in 15 different choice sets. A choice set represents a varying set of four gamification elements. The choice sets were constructed due to the use of BWS for the evaluation of user preferences. In general, 2^k choice sets are necessary to obtain valid results (Cohen 2003). According to this, k stands for the amount of attributes in the analysis. As we used 10 attributes, we would normally have to present 1024 choice sets. However, most studies use a balanced incomplete block design (BIBD), which offers a smaller amount of choice sets to receive valid results as well (Flynn et al. 2007; Lansing et al. 2013; Louviere et al. 2013; Severin et al. 2013). A BIBD is a type of design in which each choice option (i.e., gamification element) appears and co-appears equally often with each other choice option (Lee et al. 2008; Louviere et al. 2013). By using the `find.BIB` command in the statistical software program R, we were able to identify a sufficient amount of choice sets. According to the identified choice sets, we followed the guidelines by Orme (2005). In accordance with Orme (2005), there are four different general recommendations (Table 2) that we fulfilled. Additionally, to avoid order effects, we showed each gamification element at each position (Cohen 2003). A complete list of the identified choice sets can be seen in the appendix (Table 10). Except for the position of each gamification element, we present the appearance and the total number of elements in one choice set.

Criteria by Orme (2005)	Criteria for Our Research Paper
Display four or five items per choice set. Displaying more than five items provides little incremental gain.	For our analysis, we displayed four items per choice set.
Make sure each item is displayed three or more times for each respondent.	For our analysis, we displayed each item six times for each respondent.
Show an item just once in one choice set.	For our analysis, we presented four different items (gamification elements) in one choice set.
For 10 or less items, stop around 15 choice sets.	For our analysis, we used 10 items (gamification elements) with 15 choice sets.

In the third step, we asked the participants how many and which elements they would like to have in an IS. The participants were instructed to select the gamification elements out of a list that they would like to have within a bundle. More precisely, the participants could freely choose how many and which gamification elements they would combine. Thus, we made a descriptive analysis for identifying which and how many gamification elements users of LMSs would like to combine. Hence, we used a frequency distribution to present and analyze the results of our combination analysis. More precisely, we calculated the frequency of the gamification bundles and identified the frequency of each individual gamification

element in the constructed bundles. Finally, in the last part of our survey, we added some scales for evaluating demographic data. Therefore, we constructed our survey to identify which gamification elements IS users prefer. For that reason, we asked university students who regularly use LMSs for their participation. The respondents for the survey were recruited via a social network asking for participants who use an LMS at their university. Additionally, we sent our survey via email to several universities. In total, we were able to obtain 287 completed and usable surveys for our analysis. Overall, 145 (50.52%) participants were female, 142 (46.98%) male. The youngest participant was 17 years old and the oldest 51 years old. The participants' average age was 26 years. In the next section, we discuss the results of the BWS.

Results

Results of Best-Worst Scaling

For the analysis of our results, we used the statistical software program R. R provides several packages for the analysis of BWS results. More precisely, we made two different kinds of analyses. Therefore, we calculated a counting analysis and two kinds of conditional logistic regressions. Due to the counting analysis and the conditional logistic regression analysis, we were able to determine a ranking of all gamification elements. The results of our analyses can be seen in Table 3.

Table 3. Results of Best-Worst Scaling									
Counting Analysis					Conditional Logistic Regression				Rank
Element	B	W	Mean	STD	MaxDiff Model		Linear Prob. Model		
					Coef.	STD	Coef.	STD	
Level	826	82	0.4320	0.3676	1.1367	0.0368	0.0720	0.0026	1
Points	746	60	0.3983	0.3868	1.0636	0.0373	0.0663	0.0026	2
Goals	752	99	0.3792	0.4531	1.0209	0.0375	0.0632	0.0026	3
Status	550	209	0.1980	0.1980	0.5725	0.0401	0.0330	0.0026	4
Badges	312	450	-0.0801	0.5216	-0.2385	0.0414	-0.0133	0.0026	5
Leaderboard	396	538	-0.0824	0.6135	-0.2454	0.0414	-0.0137	0.0026	6
Virtual Goods	319	495	-0.1022	0.5644	-0.3031	0.0412	-0.0170	0.0026	7
Avatar	158	604	-0.259	0.4829	-0.7327	0.0393	-0.0431	0.0026	8
Time Pressure	189	646	-0.2653	0.5177	-0.7490	0.0392	-0.0442	0.0026	9
Loss Aversion	49	1114	-0.6184	0.3879	-	-	-	-	10
B=Best; W=Worst; STD=Standard Deviation; All regression coefficients are significant at p<.001									

With the counting analysis, we calculated a score for each gamification element for each of the 287 respondents. Therefore, we first calculated the difference between the number of times each gamification element was chosen as most preferred (best) and the number of times each gamification element was chosen as least preferred (worst). Afterwards, we divided the difference by the number of times each gamification element was shown (hence, six times) multiplied by the total number of responses (Finn and Louviere 1992; Flynn et al. 2007; Louviere et al. 2013; Severin et al. 2013). For the element *level*, our calculation would for example be the following: $\text{mean} = (826 - 82) / (6 * 287) = 0.4320$. The resulting scale ranges from -1 to 1. A higher score implies a higher preference and vice versa. In addition, we made two conditional logistic regressions. Marley and Louviere (2005) as well as Orme (2005) argue in their research studies that a conditional logistic regression should lead to the same results as the counting approach. Table 3 shows that the regression analysis provides the same results for the ranking positions as the counting analysis. As we needed a dependent variable for the regression analysis, we followed the

guidelines by Flynn et al. (2007) and Hair (2010). Therefore, we used a binary coded dummy variable. More precisely, we created one observation for each possible best-worst pair per choice set per respondent. For example, if we had a choice set with *points*, *level*, *avatar*, and *leaderboard*, there would be 24 possibilities of best-worst combinations for one respondent for this choice set. As an example, the participant could choose *points* as best and *avatar* as worst. In this case, the dummy variable would be coded with 1, with the combination indicating *points* as best and *avatar* as worst; it would be coded with 0 for all other possibilities. The gamification elements were used as independent variables for the regression analysis. To avoid the dummy variable trap, we chose one independent variable as reference category and excluded it from our data sets (Hair 2010). We decided to exclude loss aversion, as it is the element with the lowest rank in the counting analysis. To determine whether any of the gamification elements are strongly related to the overall level of preferences for gamification elements, we examined Kendall's tau correlations between the most and least scores provided out of the counting analysis and the 10 gamification elements (Finn and Louviere 1992). The strongest positive correlation could be identified for the element *level* (.080), the strongest negative correlation for *loss aversion* (-.11). This confirms the results of our counting analysis. However, all values for Kendall's tau indicate that there is not much variation in the overall level of preferences (Finn and Louviere 1992). Overall, referring to Kendall's tau, the results of the counting analysis, and the results of the regression analysis, the four gamification elements *level*, *points*, *goals*, and *status* are positively correlated. All other gamification elements are negatively correlated. In particular, *loss aversion* has the strongest negative correlation in comparison to the other negatively correlated gamification elements. The total variation of our dependent variable explained by our MaxDiff regression model can be measured by R^2 (Hair et al. 2010). In total, our model explains 72.93 percent ($R^2=0.7293$) of the variation from our dependent variable.

Results of the Combination Analysis

For answering our second research question, we added a combination section to our survey. More particularly, we wanted to find out which gamification elements users would combine to bundles in an LMS and how many gamification elements they would like to have in an LMS. Therefore, we first counted the frequency of how many gamification elements the participants included in a bundle. The results can be seen in Table 4.

Amount of Elements	Frequency
1	7
2	31
3	65
4	80
5	39
6	46
7	12
8	7
Mean	4.1637

The results indicate that the amount of gamification elements within a bundle varies. The participants created bundles with one, two, three, four, five, six, seven, and even eight gamification elements. Most participants would integrate 3 or 4 gamification elements into an LMS (the overall mean is 4.164, see Table 4). According to the results of the combination analysis in our survey, we identified 167 different combinations of gamification elements. Most combinations included four (48 different combinations) and three (37 different combinations) gamification elements. Twenty-four different combinations included five elements, whereas 27 combinations included six gamification elements. Ten and five different combinations included seven and eight gamification elements, respectively.

Next, we assessed the frequency of the gamification elements in the created bundles. More precisely, to measure the frequency regarding the bundles, we counted each gamification element in the bundles in relation to the total amount of participants. The frequency of the gamification elements in the bundles is similar to the results of the BWS. From rank 1 to 7, the order of the frequency is different to the order of the BWS. However, in both rankings, we can identify the same elements for ranks 1 to 4 with a different order (please recall that the mean value for the number of gamification elements that should be included is 4.164). The results can be seen in Table 5.

Element	Frequency (in %)	Rank BWS
Points	75.61%	2
Goals	66.55%	3
Level	63.41%	1
Status	54.01%	4
Leaderboard	41.46%	6
Virtual Goods	27.87%	7
Badges	26.83%	5
Avatar	26.48%	8
Time Pressure	26.48%	9
Loss Aversion	7.67%	10

After analyzing the frequency of each gamification element, we focused on the frequency of the most preferred gamification elements in the bundles. Therefore, we focused on the most preferred bundles of three, four, five, and six gamification elements. Hence, we counted the amount of the best-ranked gamification elements *status*, *level*, *points*, and *goals* in the most preferred bundles of three to six gamification elements (see Table 6). Sixty-five participants wanted to have an element bundle consisting of three elements. Forty participants integrated *points*, 26 integrated *level* as well as *goals*, and only 22 integrated *status* regarding a bundle consisting of three gamification elements. Based on our results, 79 of our participants preferred having four elements in an LMS. Regarding this, 60 participants integrated the gamification element *level* as well as *goals* into a bundle consisting of four gamification elements. Fifty-eight participants integrated *points* and 45 integrated *status*. Regarding bundles consisting of five elements, most participants integrated *points* compared to *level*, *goals*, and *status*. However, 36 of these 39 participants included *points* in their bundles of five gamification elements. Thirty-one participants integrated the gamification element *level* as well as *goals* into a bundle consisting of five elements. The element *status* was included by 26 participants in a bundle consisting of five gamification elements. In a bundle of six gamification elements, 45 participants included *points* and 42 participants included *goals*. Thirty-eight participants integrated *status* and 36 integrated *level* into a bundle of six gamification elements.

Number of Elements in a Bundle	3	4	5	6
Number of Participants	65	79	39	46
Level	26	60	31	36
Points	40	58	36	45
Goals	26	60	31	42
Status	22	45	26	38

In a next step, we analyzed how often the four most preferred gamification elements were combined together. More precisely, we analyzed how many participants combined *points*, *level*, *status*, and *goals* in one bundle. Hence, we analyzed how often all four, three, two, and one of the most preferred gamification elements were combined within a bundle. The results can be seen in Table 7. According to our previous results, we focused on the amount of the most preferred bundles with three to six gamification elements.

Number of Elements in a Bundle		3	4	5	6
Number of Participants (total)		65	79	39	46
Amount of participants who integrated best elements in bundles*	All four elements	0	16	15	30
	At least three of the best four elements	13	37	17	10
	At least two of the best four elements	28	20	7	5
	At least one of the best four elements	19	6	0	1
	None of the best four elements	5	0	0	0
*Each participant was considered only once.					

Our previous results show that 65 participants wanted to have a bundle consisting of three gamification elements. Thirteen (20.00%) of these 65 participants integrated three of the best four gamification elements into a bundle. More precisely, the bundles with the best-ranked elements are: *status*, *goals*, *level*; *points*, *goals*, *level*; *points*, *status*, *level*; *points*, *status*, *goals*. Further, 28 (43.08%) of the 65 participants integrated two of the most preferred gamification elements into their bundles of three elements, whereas 19 (29.23%) of the 65 participants integrated at least one of the most preferred elements. Five (7.69%) of the 65 participants included none of the four most preferred gamification elements in their bundles of three gamification elements. Most combinations could be identified in a bundle consisting of four gamification elements. One combination integrates our four most preferred gamification elements. Sixteen (20.25%) of these 79 participants chose the combination of *goals*, *points*, *level*, and *status*. Thirty-nine (46.84%) of the 79 participants used at least three of the four most preferred gamification elements in their bundles consisting of four elements. Further, 20 (25.32%) of the 79 participants used at least two of the four most preferred elements. Six (7.59%) of 79 participants integrated at least one of the four most preferred elements. Consequently, there were no participants who included other gamification elements than the four most preferred elements in their bundles of four elements. Thirty-nine participants wanted to combine five gamification elements in an LMS. Fifteen (38.46%) of these 39 participants integrated all four most preferred gamification elements together with a further element into a bundle consisting of five elements. Seventeen of the 39 participants integrated at least three of the four most preferred gamification elements into their bundle of five gamification elements. The remaining 7 (17.95%) of the 39 participants included at least two of the four most preferred elements in their bundles. Finally, 46 participants wanted to combine six gamification elements in a LMS. Thirty (65.22%) of these 46 participants integrated the four most preferred gamification elements together with two of the six other elements, and 10 (21.74%) of the 46 participants integrated three of the four most preferred gamification elements into their bundles of six gamification elements. Furthermore, 5 (10.87%) of the 46 participants included at least two, and one (2.17%) of the 46 participants included one of the four most preferred gamification elements in their bundles of six elements. Again, there is no bundle without at least one of the most preferred elements. In the next chapter, we discuss our results to give precise implications for research and practice. Furthermore, we provide implications for future research.

Discussion and Implications

Previous research studies developed considerable gamification approaches but provided little guidance for considering user preferences and investigating contextual aspects. Many research approaches differ regarding the type and amount of gamification elements. In our study, we applied BWS to help consider

which and how many gamification elements users of an LMS really want. Hereafter, we discuss the results of our research questions and implications for research and practice. Considering the research questions of our study, the key findings can be seen in Table 8.

Table 8. Summary of Research Results regarding our Research Questions	
<i>RQ1: Which gamification elements do users of LMSs prefer?</i>	<i>RQ2: Which gamification bundles do users of LMSs prefer?</i>
	<i>RQ 2.1: How many gamification elements would users of LMSs combine?</i>
1. Level (most preferred)	Overall, users would implement a combination of four gamification elements in an LMS (mean = 4.1637).
2. Points	
3. Goals	<i>RQ 2.2: Which gamification elements would users of LMSs combine?</i>
4. Status	The four elements that were most frequently part of the combinations were:
5. Badges	1. Points (2 nd in overall preference)
6. Leaderboard	2. Goals (3 rd in overall preference)
7. Virtual Goods	3. Level (1 st in overall preference)
8. Avatar	4. Status (4 th in overall preference)
9. Time Pressure	Thus, even though the ranking of the frequency of the part in a bundle varies slightly compared to the overall preference results, users would on average implement a bundle of the four top ranked gamification elements in an LMS.
10. Loss Aversion (least preferred)	The preferred elements were most commonly integrated into the bundles. In the majority of bundles, users integrated three or even all four most preferred gamification elements.

For answering our first research question, our study produced an order of gamification elements in an LMS under consideration of user preferences. According to our results, users of LMSs prefer the gamification elements *level*, *points*, *goals* and *status*. The significantly negative correlations of the gamification elements *badges*, *leaderboard*, *virtual goods*, *avatar*, *time pressure*, and *loss aversion* indicate that users of LMSs are less concerned about these elements. Unlike our research results, existing research studies mainly used the gamification elements *badges*, *leaderboard*, and *points* (Davis and Singh 2015; Domínguez et al. 2013; Filsecker and Hickey 2014; Hamari 2013; Huotari and Hamari 2012; Wang and Hou 2015). In contrast to previous research results, our findings show that users of LMSs prefer intrinsically motivating gamification elements. Apart from *points*, all of the most preferred elements motivate users intrinsically. Therefore, current studies clarify that gamification approaches should focus more closely on intrinsic motivation. Cruz et al. (2015) explain that motivation caused by extrinsic gamification elements is just short-term. While previous research studies primarily used *badges* in LMSs for motivating extrinsically, our results indicate, that users of LMSs do not prefer *badges*. For example, Haaranen et al. (2014) evaluated that users of LMSs have strongly negative emotions towards *badges*. Hence, to achieve long-term effects regarding motivation, more approaches should focus on the use of intrinsically motivating gamification elements (McKernan et al. 2015). More precisely, basic psychological literature demonstrates that individuals are intrinsically motivated to fulfill activities that satisfy their basic psychological needs (Deci and Ryan 2000). However, our results indicate, that intrinsically motivating gamification elements might be more effective because elements such as levels or status clearly visualize the individual progress of LMS users (Melero et al. 2015).

Concerning our first research question, our results suggest that users of LMSs prefer gamification elements that support them in challenging their own results by achieving a higher *level* or by finishing a certain *goal* (Melero et al. 2015; Passos et al. 2011). Contrary to our results, previous research concentrates on encouraging competition by a *leaderboard*, whereas our results indicate that users of LMSs do not prefer leaderboards. Competition refers to competence and the need of individuals to take part in competitions to feel more competent and efficient (Mummendey 1990). Strong competence indicates that individuals want to compare their achievements with those of others because they think that they are superior to them. More precisely, competence refers to self-presentation, which means that an individual can impress other individuals with a positive self-presentation (Mummendey 1990). According to our results, competitiveness seems to have a different role and meaning in LMSs. Sanathanam et al. (2016) analyzed the role of competition in their recent research study. They found support for the idea that effects of competition on learning outcomes vary across different competitive structures. Overall, our results indicate that users of LMSs prefer gamification elements that provide assistance in their individual learning progress without considering the progress of other users (Schöbel et al. 2016). Thus, the results of our research imply that gamification elements should be selected and designed by considering contextual aspects.

With our second research questions, we focused on the amount and combination of gamification elements in LMSs. The participants of our survey integrated one to eight gamification elements into their bundles. More precisely, the participating users of LMSs wanted to integrate four gamification elements. Referring to previous research studies, the amount of gamification elements in an LMS varies from one (Davis and Singh 2015; Fernandes et al. 2012; Hamari 2013; Jones et al. 2014; Pedro et al. 2015; Wang and Hou 2015) to six elements (Ibáñez et al. 2014; Peham et al. 2014). True to the saying “less is more,” our results indicate that users would prefer a combination of four gamification elements in an LMS. Regarding this, long-lasting motivational effects may be reduced by implementing a greater amount of gamification elements in LMSs (Hanus and Fox 2015). Based on the amount of gamification elements in LMSs, we evaluated which elements users of LMSs would combine. Regarding this, we could strengthen the results of our BWS. Most users integrated the gamification elements *points*, *level*, *status*, and *goals* into their bundles. More precisely, the users preferred to have at least three of the four most preferred gamification elements in their bundles of four elements. Hence, it is important to focus on the design and combination of specific gamification elements rather than on constructing an overarching game with the highest possible amount of elements (Hanus and Fox 2015).

Our research project helps us to provide theoretical and practical implications. First, we can give theoretical implications on how to implement gamification elements under consideration of user preferences in the domain of LMSs. Our results indicate that gamification element preferences might be determined by contextual and situational aspects. Users of LMSs prefer gamification elements that provide guidance for their individual learning progress regarding a certain task. Further, our results indicate that users of LMSs like to compete against themselves instead of competing against others. More precisely, using *levels* instead of *leaderboards* might be more appropriate to challenge users of LMSs in achieve better results. Therefore, gamification elements in LMSs should clearly refer to certain tasks of users by focusing on and rewarding the individual success of users. According to our results, the importance of experiences that are intrinsically motivating, meaning enjoyable, might dominate as predictors of better learning outcomes. From a practical perspective our findings indicate that LMSs can be optimized by gamification elements based on the needs and preferences of users. Organizations and gamification project managers must understand the potential of gamification to develop the skills of LMS users to lead them to better learning outcomes. In many cases, gamification is not working because most gamification projects focus on obvious gamification elements such as *badges*, *leaderboards*, and *points* rather than the more subtle game design that considers contextual aspects as well as the needs of the target group (Fleming 2014). Referring to this, our results indicate that gamification elements should be designed under consideration of contextual aspects to make the system use more engaging for the target audience. Hence, gamification designers should consider a gamification element design that visualizes the individual learning progress of users. For constructing a gamified LMS, gamification designers should integrate a maximum of four gamification elements. Having a large number of gamification elements might have contrary effects on motivation and learning outcomes (Hanus and Fox 2015). Furthermore, gamification designers should consider that gamification elements such as *time pressure* or *loss aversion*

might work in daily life but not in a LMS. Hence, such elements should not be used because they distract users from their learning activity.

Limitations and Future Research

This study is not without limitations, which provides implications for future research. Relating to the survey participants, we focused on university students. Therefore, the average age was 26 years. Hence, further analyses should consider employees of various ages from companies that use LMSs. Additionally, we focused on LMSs. That is why we should have a closer look on different kinds of IS (Hess et al. 2014). Furthermore, we did not consider gamification dynamics and motives such as achievements or challenges (Blohm and Leimeister 2013). Finally, we conducted an online survey for analyzing user preferences regarding gamification. Hence, it is necessary to implement gamification elements in an LMS for evaluating user preferences.

However, the limitations of our research paper deliver several implications for future research. Our first step will be an analysis of the differences in relation to demographic data. Several studies indicate that women and men prefer different gamification elements (Koivisto and Hamari 2014). We will analyze the role and meaning of age with regard to gamification element preferences and combinations, too (Koivisto and Hamari 2014; Lepper et al. 2005). Our survey was carried out in universities, which is why the average age is 26 years. Thus, we will conduct our survey in companies that use LMSs. Since individuals can be motivated differently, we will identify and analyze different kinds of groups with regard to the individual motivations of LMS users (Deci et al. 1994; Deci et al. 2001; Deci and Ryan 2000). Using the results of the survey, we will obtain new insights into what kind of motivational structures determine which gamification elements users of LMSs prefer. Future analyses should focus on the adaption of gamification elements to the cooperative and competitive structures of users by considering their preferences (Schöbel and Söllner 2016). Santhanam et al. (2016) suggest that it is necessary to isolate the effects of different competitive structures because not all competitions are the same and there may be no one-size-fits-all solution. Additionally, future research should analyze the possibilities presented by cooperative dynamics to strengthen the relationship between users of LMSs (Wilson et al. 2016). Liu et al. (2013) point out that very little research has considered the cooperative, competitive, and cooperative-competitive design of gamification elements. This comes along with further research on the combination of cooperative and competitive gamification elements. Future research could determine whether adding cooperative elements makes competitive elements more engaging and enjoyable than using cooperative or competitive elements alone (Liu et al. 2013). Therefore, studies should analyze the meaning of cooperation and competition in the context of learning (Wilson et al. 2016).

Finally, we want to implement the gamification elements in an LMS under consideration of user preferences. Our long-term goal is to analyze the effects on user motivation, system use (Söllner et al. 2016), and learning outcomes achieved by gamification elements that are adapted to the preferences and individual motivation structures of LMS users.

Conclusion

This study analyzed and tested which gamification elements users of LMSs prefer. The ranking from 1 (most preferred gamification element) to 10 (least preferred gamification element) is as follows: *level*, *points*, *goals*, *status*, *badges*, *leaderboard*, *virtual goods*, *avatar*, *time pressure*, *loss aversion*. Gamification elements are always combined to bundles. Referring to this, our research study tested which and how many gamification elements users would combine in an LMS. Therefore, we included a further analysis. We asked our participants to indicate which and how many gamification elements they would integrate into an LMS. Referring to the results of the combination analysis, we could strengthen the results of the BWS. With BWS, we identified the four elements *level*, *points*, *status*, and *goals* as the most preferred gamification elements. The most frequently used gamification elements in the bundles are the same. On the basis of our research findings, we were able to provide precise implications for research and practice. Therefore, our research recommends to integrate gamification elements into LMSs that focus on the individual learning progress of users without considering the progress of other users. Given the immense growth of gamification projects and the potential of motivating users by games, more research on this topic is guaranteed.

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Appendix

Table 9. Literature Review																		
Author	Points	Goals	Time Pressure	Loss Aversion	Avatar	Level	Leaderboard	Badges	Achievements	Progressive Disclosure	Progress Bar	Virtual Goods	Status/Feedback	Story	Challenges	Rewards	Fantasy	Amount
Hamari et al. (2016)						X									X			2
Shi and Cristea (2016)		X											X					2
Wang (2015)			X										X					2
Faghihi et al. (2014)	X							X										2
Manson et al. (2012)	X							X										2
Burgers et al. (2015)			X		X								X					3
Boticki et al. (2015)	X				X			X										3
Perry (2015)	X							X							X			3
Attali and Arieli-Attali (2015)	X												X			X		3
Cramer et al. (2011)	X							X					X					3
Shute et al. (2015)	X	X						X		X								3
Silpasuwanchai et al. (2016)	X						X	X										3
Hew et al. (2016)	X						X	X										3
Hanus and Fox (2015)							X	X				X						3
Mekler et al. (2015)	X					X	X											3
Dominguez et al. (2013)							X	X	X									3
Melero et al. (2015)	X				X	X										X		4
Smith and Baker (2011)	X	X			X							X						4
Santhanam et al. (2016)						X			X			X			X			4
Usami et al. (2015)	X						X	X	X									4
Cheng et al. (2015)	X				X	X							X					4
Santana et al. (2016)	X						X	X	X									4
Christy and Fox (2014)	X					X	X			X				X				5
Peham et al. (2014)	X					X	X					X	X					5
Ibáñez et al. (2014)	X	X					X	X	X									5
Liu et al. (2013)			X	X		X							X		X			5
Filsecker and Hickey (2014)		X			X		X	X	X	X								6
Li et al. (2012)		X	X										X	X		X	X	6
Simoes et al. (2013)	X						X	X	X		X	X				X		7
Liu et al. (2011)	X			X		X	X	X				X				X		7
Total	20	6	4	2	6	9	13	16	7	3	1	6	9	2	4	5	1	

Gamification Elements	Choice Set Number															Appearances
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Level	0	1	0	0	0	1	0	0	1	0	1	0	1	1	0	6
Points	0	1	0	1	1	0	0	1	0	0	1	1	0	0	0	6
Goals	1	0	1	0	1	0	0	1	0	0	0	0	1	0	1	6
Status	1	1	0	0	0	1	1	0	0	1	1	0	0	0	0	6
Badges	1	0	0	0	0	0	1	0	1	0	0	1	0	1	1	6
Leaderboard	0	0	0	1	1	0	1	1	0	1	1	0	0	0	0	6
Virtual Goods	1	0	1	1	0	1	0	0	1	1	0	0	0	0	0	6
Avatar	0	0	1	0	1	0	0	0	0	1	0	1	1	0	1	6
Time Pressure	0	0	1	1	0	0	1	0	0	0	0	1	0	1	1	6
Loss Aversion	0	1	0	0	0	1	0	1	1	0	0	0	1	1	0	6
Total Number of Elements in Set	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Note: 1 indicates a gamification element is present in a set, 0 indicates the gamification element is not present in a set.																