

# Illuminating the Predictive Power of Gamification to Inspire Technology Users

**Sebastian Weber**  
University of Bremen  
Bremen, Germany  
sebweber@  
uni-bremen.de

**Gerhard Klassen**  
University of Bremen  
Bremen, Germany  
gklassen@  
uni-bremen.de

**Marc Wyszynski**  
University of Bremen  
Bremen, Germany  
m.wyszynski@  
uni-bremen.de

**Bastian KorDYaka**  
University of Bremen  
Bremen, Germany  
kordyaka@  
uni-bremen.de

## ABSTRACT

This study explores the relationship between gamification design features and the motivational state of inspiration in the context of eLearning. We focus on three dimensions of gamification: immersion, achievement, and social. Using a cross-sectional survey design, covariance-based statistics, and structural equation modeling, we collected data from users of a language learning app. Our findings reveal that achievement-related gamification features, such as badges, points, levels, and tasks, evoke inspiration and foster the inspiration to learn. However, neither immersion-related nor social-related gamification features serve as a source of inspiration. This research contributes to the understanding of how gamification can be leveraged to enhance inspiration and possibly learning outcomes in eLearning environments.

## Author Keywords

Inspiration; Gamification; eLearning; Inspirational Technology

## ACM Classification Keywords

Human-centered computing~Human computer interaction (HCI)~Empirical studies in HCI

## INTRODUCTION

Since the dawn of digitization, technologies have been developed to change people's perceptions, motivation, and behavior toward desired target states and ultimately support individual learning. Consequently, so-called persuasive technologies have a long history in information systems (IS) and human-computer interaction (HCI) research that extends to the present [1]. Recent examples include various smartphone apps such as the well-known fitness tracking app MyFitnessPal, which encourages users to be physically

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active and lead a healthier lifestyle [2, 3], or the language learning app Duolingo, which offers interactive courses in multiple languages and personalized exercises to make learning enjoyable and accessible for users [4].

A desired target state that promises to support individual learning and has recently enjoyed steady popularity and attention is the motivational state of *inspiration* (i.e., a “motivational state that compels individuals to bring ideas into fruition” [5]). The concept of inspiration as a psychological construct was originally developed by Thrash and colleagues [6, 7]. At the conceptual level, they identified two process components, which they called *inspired by* (i.e., “appreciation of and accommodation to an evocative object” [7]) and on the other hand *inspired to* (i.e., “motivation to extend the qualities exemplified in the evocative object” [7]). Previous research has already shown that inspiration can be fostered by stimuli. For example, research [8, 9] showed that inspirational content like pictures with recipes can lead to a state of being inspired by in the realm of grocery shopping and lead to an inspiration to buy something (i.e., the state inspired to).

A well-established toolkit that promises to influence individual motivation and learning is *gamification*, where the concept can be understood as the use of game design elements such as points, badges, avatars, and leaderboards in non-game contexts [10]. Classically, previous work has categorized gamification characteristics based on the three motivational dimensions of immersion, achievement, and social [11, 12]. However, it is still unclear how gamification relates to the motivational state of inspiration and how the two components of inspiration are linked in the context of persuasive technologies and learning.

In this study, we aim to contribute to these two research gaps by examining, in a theory-driven manner, the relationships between a) gamification design features and inspired by and b) the two components of inspiration inspired by and “inspired to” for the first time in the context of learning. To do so, we draw on previous work that has examined gamification [11, 13, 14] and inspiration [6, 8, 15]. To this end, we use a cross-sectional survey design, covariance-based statistics, and structural equation modeling, and collect data from users of a language learning app. In summary, our study is guided by the two research questions listed below:

**RQ1:** *What is the relationship between the variables inspired by as an antecedent of inspired to in the realm of eLearning?*

**RQ2:** *What is the effect achievement, immersion, and social-related gamification design features to predict the motivational variable inspired by?*

By answering the RQs, we contribute to the research on inspiration in the fields of Information Systems and beyond. The rest of this study is structured in the following order. First, in the related work section, we introduce inspiration and gamification. Next, we describe the methodology including research design, data collection, and measurements used. Following this, we present the results comprising preliminary analysis and hypotheses testing. Afterwards, we discuss our main findings, their implications and limitations, and future work. The paper closes with a short conclusion section.

## RELATED WORK

### Learning Inspiration

The role of inspiration in the learning process is a compelling area of study, with potential implications for motivation, creativity, concentration, and receptivity to new ideas. Stemming from the Latin word ‘inspirare’ (‘to breath into’), the construct of inspiration has a long history and is broadly used across disciplines. Against this multifaceted background, it is often ill-defined or used interchangeably with other constructs. However, Thrash and Elliot [6, 7] unified various literature streams of inspiration to build a common understanding. Their work highlights the different aspects of the construct of inspiration. In the following, we classify inspiration in terms of motivation, explain the main characteristics, define learning inspiration, propose our first hypothesis, and introduce the concept of inspirational technology (e.g., gamified systems) as a possible source of inspiration.

#### *Inspiration as a Motivational State*

Motivation is described as the psychological force that enables goal-directed behavior [16]. Comprising an amalgamation of elements such as energy, representing the vitality needed for action; direction, outlining the chosen path to realize objectives; persistence, showing tenacity in goal pursuit; and equifinality, illustrating the flexibility of achieving the same goal through various means [17], motivation is a dynamic entity that empowers us to strive for existing goals and kindles the creation of new goals [18]. Furthermore, it can be of extrinsic (i.e., less self-determined behavior driven by the desire to attain a certain outcome) or intrinsic nature (i.e., self-determined behavior driven by the inherent satisfaction of the activity) [17]. According to its definition (see introduction), inspiration can be considered as a specific type of intrinsic motivation that leads to autonomous behavior with a strong epistemic component [8].

However, compared to other intrinsically motivated behaviors, inspiration is evoked by an external source and is associated with the realization of a new idea [6]. In summary, inspiration is an intrinsic motivational state that starts with an activation (i.e., inspired by) and translates into an intention (i.e., inspired to).

#### *Core Characteristics of Inspiration*

The three core characteristics of the state of inspiration are specified by the tripartite conceptualization [6]. These aspects are namely: evocation, transcendence, and approach motivation. The term evocation refers to the notion that inspiration is evoked rather than initiated by an individual (i.e., the state of inspiration is elicited and sustained by a stimulus object). The stimulus object can be manifold and range from music, art, people, or other sources depending on the context. Next, transcendence describes that while the inspirational experience, the individual becomes aware of new potential possibilities. Particularly, the new awareness yields a vivid and tangible vision, transcending the usual limits of consciously formed thoughts. Furthermore, after being inspired, the individual is motivated to transfer, actualize, or express the new vision (i.e., the individual has approach motivation). In our context, we define learning inspiration as a learner’s temporary motivational state that facilitates the transition from the reception of a learning environment-induced idea (e.g., through gamification) to the intrinsic pursuit of a learning-related goal.

#### *Component Processes*

Besides characterizing the state of inspiration, inspiration can also be described in terms of its so-called component processes [7]. In this line, previous literature highlights two temporally and functionally distinct processes: a passive process that is called inspired by and an active process that is called inspired to [7]. In contrast to being inspired to, which is motivated to actualize or expand some focal aspects to a new object, being inspired by includes recognizing the value of a stimulus in a certain way. In our context, the inspired-by activation state relates to the reception of a gamification feature-induced new idea (i.e., evocation) and the shift in learner’s awareness toward new possibilities (i.e., transcendence). The inspired-to state relates to the intrinsic pursuit of a learning-related goal. In this state, learners experience an urge to actualize the new idea (e.g., by learning content in a new way) [19]. Hence, we hypothesize:

*Hypothesis 1: Inspired by positively predicts inspired to.*

#### *Inspirational Technology*

Based on these frameworks characterizing the motivational state of inspiration, it is evident that the state of inspiration cannot be directly manipulated. However, it is possible to manipulate the stimulus object that elicits this state of activation. While a wide range of stimuli can trigger such a

state of inspiration, technological interventions, such as gamification features, also lend themselves to this in light of motivational nature. In this research, we thus focus on inspirational technology that aims to foster the motivational state of inspiration in the context of learning. To date, there is little research on this. For example, Lakshmanan and Krishnan found that moments of extreme insights in the process of discontinuous learning lead not only to positive affect but also to increased usage intentions [20]. Furthermore, Boettger [15] integrated inspiration into a goal-systemic perspective, which suggests that inspiration results from the realization of new goal-means associations. In this regard, gamification elements could serve as new means to achieve goals (i.e., learning a new language).

### Gamification

One way to influence individual motivation in a desired manner is gamification. In recent decades, gamification has emerged as a powerful digital toolkit to motivate people to perform desired actions [21–23]. On a content level, gamification in this context refers to the use of so-called gamification design features (for a list and definitions used in this research, see Table 1) that leverage the capabilities of game experiences to influence users' behavior and cognitive processes in desired ways [11, 12]. In addition, gamification

research has previously shown that gamification has the potential to increase user engagement and participation, and ultimately performance [24, 25].

As a structuring element, previous studies have often classified gamification design elements according to the three motivational dimensions of immersion (e.g., refers to gamification design elements creating an engaging and captivating experience that deeply absorbs and engrosses individuals), achievement (e.g., refers to gamification design elements that motivate and reward individuals for reaching goals, milestones, or accomplishments), and social (e.g., refers to gamification design elements that foster interaction, collaboration, and competition among individuals or groups) [11, 12, 26]. For a concrete classification of gamification design features in relation to the motivational dimensions see Table 1. However, research explaining if gamification design elements can be combined to be effective in a specific context is still at an early stage [27]. A study by Groening and Binnewies [28], for example, shows a curvilinear relationship with regard to the number of game design elements and motivation indicating a combination could make sense. With this in mind, we adopt and examine this three-dimensional structure of gamification features that has been used by a large majority of the gamification literature [26].

Motivational dimension	Design feature	Definition
Immersion	Avatar	Visual representations of players in the gamification environment, which are chosen or even created by the player.
	Personalization	Has been defined as activities where users themselves modify some aspect of an interface to a certain degree.
	Narrative/Story	Alter the meaning of real-world activities by adding a narrative ‘overlay’ to the gamification environment.
Achievement	Badges	Visual representations of achievements, which can be collected within the gamification environment.
	Virtual currency	Can be earned through environmentally desirable activities and users can also use this virtual currency to buy virtual items.
	Points	Can be accumulated for certain activities within the gamification environment.
	Progress bars	Provide information about the players' performance compared to their preceding performance.
	Levels	A system of advancing in the gamification environment by collecting a certain number of points or carrying out specific actions.
	Leaderboards	Leaderboards rank players according to their relative success, measuring them against a certain success criterion.
	Tasks	Little tasks that players have to fulfil within the gamification environment.
Social	Competition	Possibility for a player or a group of players to win while others lose in the gamification environment.
	Team	Cooperation of teams by creating defined groups of players that work together towards a shared objective in the gamification environment.
	Social network features	Comprise messages, blogs, chat, and connections to social networks.

**Table 1. Gamification dimensions and features**

Related to the context of our study and to the best of our knowledge, no study up to now has tried to explore relationships between gamification design and inspiration. Research only showed that that utilitarian and especially hedonic inspirational content (e.g., marketing ads) fosters inspiration [9]. This is surprising because it seems plausible that gamification elements such as points, badges, leaderboards, or progress bars which promise utilitarian and hedonic value [29] might positively influence users' inspiration. A review by Morschheuser et al. [13] shows empirical evidence that gamified environments, are fostering motivation, which in turn influences behavioral intentions. Furthermore, it has been suggested elements, such as points, levels and leaderboards could enhance feelings of competence, and therefore boost intrinsic motivation [14, 30–32]. Considering these findings, one can hypothesize that gamification features that enhance motivation also serve as source for the motivational state of inspiration. Hence, we hypothesize:

*Hypothesis 2: Achievement-related gamification features positively predict inspired by.*

*Hypothesis 3: Immersion-related gamification features positively predict inspired by.*

*Hypothesis 4: Social-related gamification features positively predict inspired by.*

## METHODOLOGY

### Research Design

To answer our two RQs and the corresponding hypotheses, we used a cross-sectional approach collecting self-reported data from users of language learning apps. After data collection, we analyzed the data with covariance-based statistics (i.e., regression analysis and structural equation modelling) using SPSS 28 and AMOS 28.

### Data Collection, Procedure and Participants

We recruited a total of 154 participants via the digital crowdsourcing platform Clickworker. The survey took approximately between 8 and 10 minutes. Each worker was offered and paid 1.50 Euro for successfully completing the survey. The survey consisted of two parts. First, participants were introduced to gamification and they got a description of the gamification elements (see Table 1). We then motivated the context of gamified language acquisition through some exemplary mock-ups showing the gamification features (for each feature) of a learning app for languages (see Figure 1 for an example). Second, in a hypothetical scenario, participants were then asked about their own preferences regarding the design of a gamified language learning app (i.e., rate which features are relevant for them) and after this how a gamified learning app designed according to their preferences would inspire them to learn.

To ensure quality of our data, we included attention checks in the survey have considered the task as not very credible. Nine participants did not pass the attention check and were excluded. Furthermore, we excluded eight participants who answered the questionnaire significantly too fast (< 100 seconds) and six participants who gave dubious and/or questionable responses (e.g., stating that they hold a PhD in combination with a reported age of 19). After this procedure the final data set consisted of 131 participants. All recruited participants were German-speaking, their age ranged from 18 to 72 years ( $M = 38.34$ ;  $Mdn = 37$ ;  $SD = 11.33$ ), the majority was male ( $n = 75$ ), and holding a bachelor's degree ( $n = 33$ ). Furthermore, participants reported an average previous use of language learning apps ( $M = 2.89$ ;  $SD = 1.62$ ) measured a seven-point Likert scale ranging from 1 (*never*) to 7 (*always*) as well as foreign language fluency ( $M = 3.58$ ;  $SD = .75$ ) measured on a five-point Likert scale ranging from 1 (*poor*) to 5 (*excellent*).

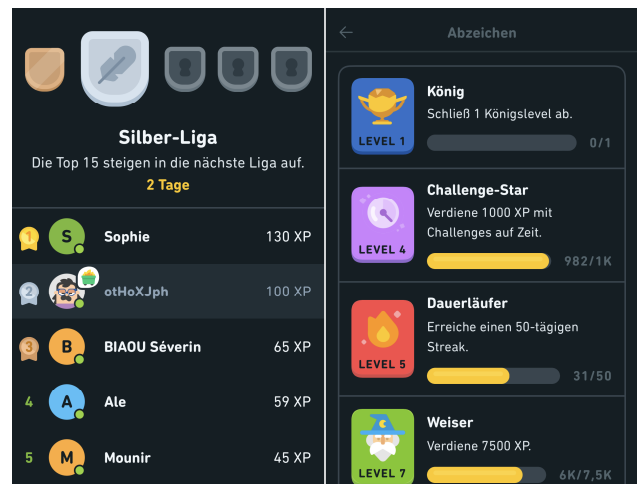


Figure 1. Exemplary features (competition and badges)

### Measurements

To measure the variables in our study, we used validated scales and items from previous research adapted to the context of our study to ensure comparability.

### Dependent and Mediating Variables

To measure the dependent (i.e., inspired to) and mediating variables (i.e., inspired by) in our study, we used an empirically validated scale from Böttger et al. [8] (Customer Inspiration: Conceptualization, Scale Development, and Validation). Specifically, we asked participants with five items each regarding the mediating variable inspired by ( $M = 4.83$ ;  $SD = 1.11$ , Cronbach's Alpha = .91) and the dependent variable inspired to ( $M = 5.43$ ;  $SD = 1.02$ , Cronbach's Alpha = .92). Regarding both constructs, participants were asked to rate the items on a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) in relation to the previously shown gamification elements. Table 2 shows the adapted items.

Construct	Items
Inspired by	If the learning app, contained the design features described on the previous page, ... ...it would stimulate my imagination. ...I would be stimulated by new ideas. ...I would unexpectedly and spontaneously have new ideas. ...my horizon would be broadened. ...I would discover something new.
Inspired to	If the learning app, contained the design features described on the previous page, ... ... I would be inspired to learn something. ...I would feel the desire to learn something. ...my interest in learning something would be increased. ...I am motivated to learn something. ...I feel the urge to learn something.

**Table 2. Constructs and items of inspiration**

### Independent Variables

In order to measure the importance of gamification design features, we used items from Xi and Hamari [11] and asked participants for each feature to choose a value ranging from 1 (*very unimportant*) to 7 (*very important*) to indicate the relevance of including the feature in the language learning app. Based on this, we determined scale values inserting seven items regarding achievement ( $M = 4.63$ ;  $SD = 1.10$ , Cronbach's Alpha = .82), and three items each for immersion ( $M = 4.15$ ;  $SD = 1.32$ , Cronbach's Alpha = .74), and social

related gamification design features ( $M = 3.86$ ;  $SD = 1.39$ , Cronbach's Alpha = .77).

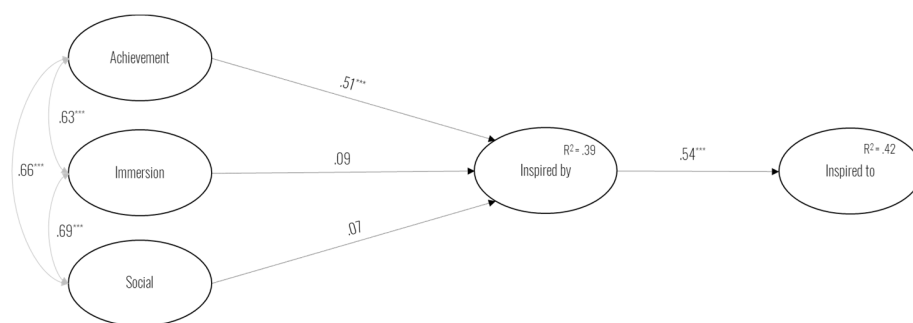
## RESULTS

### Preliminary Analysis

To control for any unwanted effects of the demographic and control variables on the dependent variable inspired to, we conducted a multiple linear regression analysis. Therefore, we inserted the demographic (age, sex, education) and control (language learning app experience, foreign language skills) variables as predictors of the dependent variable inspired to. The regression showed a non-significant result ( $F(5,125) = .42$ ,  $p = .83$ ) and explained 0% of the variance of the dependent variable inspired to. After controlling for the false discovery rate using the Bonferroni correction [33] none of the predictor weights had significant effects on inspired to ( $p \geq .70$ ).

### Hypothesis Testing

To test the hypotheses of our study, we inserted the postulated relationships between the three dimensions of gamification design features as an antecedent of the mediating variable inspired by as well as the mediating variable inspired by as an antecedent variable of our dependent variable inspired to. Furthermore, we allowed for potential modifications. To test the specified model, we calculated a structural equation (path) model [34] allowing for correlations across the gamification design dimension. After doing so, all fit indicators consistently indicated and excellent fit between the theoretical and the empirical model ( $\chi^2(3,131) = 4.68$ ,  $p = .20$ , CFI = .99, RMSEA = .06, SRMR = .03). Figure 2 summarizes the results of our SEM.



**Figure 2. Structural equation model**

Based on the results of our model, all predictors accounted for 42% of the variance of inspired to. Whereby, inspired by ( $\beta = .54$ ,  $p < .001$ ) predicted inspired to as postulated in our Hypothesis 1. Regarding the dimensions of the gamification design features only achievement ( $\beta = .65$ ,  $p < 0.001$ ) predicted inspired by (Hypothesis 2). Opposed to this neither the immersion related gamification design dimension

( $\beta = .09$ ,  $p = .37$ , Hypothesis 3) nor the social related gamification design dimension ( $\beta = .07$ ,  $p = .47$ , Hypothesis 4) predicted the mediating variable inspired by. Furthermore, all three dimensions of the gamification design features showed significant positive correlations ( $r \geq .63$ ,  $p < .001$ ). In summary, we found mixed support for our hypotheses.

## DISCUSSION

### Main Findings

Based on the results of our study, we are now able to answer our two research questions. 1) what is the relationship between the variables inspired by as an antecedent of inspired to, and 2) what are the relationships between achievement, immersion, and social-related gamification design features to predict the variable inspired by. taken together, we summarize our key findings with the following two points: First, inspired by was (as postulated in our Hypothesis 1) a relevant and positive predictor of inspired to.

Second, only the achievement related dimension of the gamification design features had a substantial influence on our mediating variable inspired by adding support for Hypothesis 2. Contrary to this, neither the immersion related dimension of the gamification design features nor the social related dimension of the gamification design features had an influence more frequently than random on our mediating variable inspired not indicating any support for our specified relationships in Hypotheses 3 and 4.

### Implications for Research

The current study introduced the innovative concept of inspirational technology, which combines the psychological conceptualization of inspiration [5, 6] with motivational technological elements, specifically gamification features [5-9].

Our results support the theoretical frameworks characterizing the motivational state of inspiration proposed by Thrash and colleagues [5-7, 35, 36]. Through empirical evidence, we demonstrated a direct relationship between gamification features and the two component processes inspired to and inspired by. In particular, we show that technological design features related to the motivational dimension of achievement may elicit a motivational state of inspiration (inspired to) mediated by the inspired by component process.

Furthermore, while gamification has already been linked to several attitudinal and behavioral outcomes [11, 22, 26, 37], we showed that gamification can also serve as an antecedent to inspire people to learn. However, as already stated by other literature - context matters (i.e., not only the setting but also the researched variables) [14]. Our results confirm this observation, as only achievement-related features seem to be important regarding this endeavor.

In summary, these findings contribute to a better theoretical understanding of the relationship between technological features (e.g., gamification) as elicitors of an inspirational state, highlighting the potential of technological interventions. By linking psychological theories and technological advances, our study opens new opportunities

for applying inspirational technologies to foster motivation in a variety of settings.

### Limitations and Outlook

As with any empirical research, our study has its limitations. We outline these below and suggest potential avenues for future research to address them.

Firstly, our research was conducted within the context of eLearning. This context may have introduced specific elements unique to our study. While this was intentional, we caution against generalizing our findings to other areas. We aimed to show that gamification has a significant influence on inspiration for the first time and leave more detailed insights (e.g., regarding different application contexts) as tasks for future research. In this regard, it should also be emphasized that gamification features should be considered individually and that there are other gamification features or frameworks with which analyses should be performed. The results also call for further research, analyzing gamification features individually and jointly [27].

Secondly, our data was collected from the online platform clickworker. While online data collection provides a wide reach, it sometimes faces issues such as participants falsely claiming eligibility and providing low-quality responses. We attempted to mitigate these limitations by introducing several attention-check questions in our research. However, we recommend future research to replicate our study with samples sourced from other platforms or locations to test for potential similarities and differences.

Lastly, for reasons of parsimony, we conducted a cross-sectional study. This approach limits the validity of our results. However, this was a deliberate choice as we were exploring the relationship between gamification features and inspiration for the first time. Given this, we suggest future research to conduct longitudinal studies with real users to compare with our results and test the stability of evaluations [38]. Further, it would be interesting to research boundary conditions based on, e.g., the Theory of Planned Behavior [39] to better understand the transition from inspired by to inspired to.

These limitations notwithstanding, we believe our study provides valuable insights into the role of gamification in eLearning and opens up new avenues for future research. Furthermore, with regard to persuasive technologies, it would be interesting to look at further positive outcomes of intrinsically-driven autonomous behaviors [40] but also at deficit-oriented outcomes (e.g., detrimental behaviors in groups [41]) and the use of gamification in future research.

## CONCLUSION

In conclusion, this study provides valuable insights into the role of gamification design features in evoking inspiration in the context of eLearning. The findings reveal that

achievement-related gamification features, such as badges, points, levels, and tasks, serve as a significant source of inspiration and foster a desire to learn (i.e., learners are inspired to learn). However, neither immersion-related nor social-related gamification features were found to serve as a source of inspiration. These findings suggest that while these features can enhance the user experience and foster a sense of community among learners, they may not directly contribute to inspiration. Therefore, while these features should not be overlooked, their impact on inspiration and motivation to learn may be limited. Instead, the focus should be on designing and implementing effective achievement-related gamification features to foster inspiration and

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