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# Collecting Pokémon or receiving rewards? How people functionalise badges in gamified online learning environments in the wild

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ABSTRACT

Do game design elements like badges have one, fixed motivational effect or can they have several different? Self-Determination Theory suggests that people situationally appraise the *functional significance* or psychological meaning of a given stimulus, which can result in different motivational states, but there is little empirical work observing actual functionalisations of game design elements. We therefore conducted a qualitative in-the-wild diary and interview study with 81 university students who reported on their experiences with badges on two popular gamified online learning platforms, *Khan Academy* and *Codecademy*. Participants functionalised badges in nine distinct ways that only partially align with prior theory. Functionalisations shaped experience and motivation and prompted function-aligned behaviour. Badge design details fostered but did not determine different functionalisations, while no user or context characteristics were identified that reliably linked to particular functionalisations. We conclude that future research may need to conceptualise game design elements in a more differentiated way to capture what aspects support different motivational functions.

## 1. Introduction

Gamification is a design practice that uses game design elements in non-game contexts (Deterding et al., 2011, p. 10). Commonly used game design elements in gamification include rankings, levels, point scores, and badges (Hamari et al., 2014; McDaniel and Fanfarelli, 2016). A continued and still-growing application field of gamification is education (de Sousa Borges et al., 2014; Dicheva et al., 2015; Nah et al., 2014). Here, gamification is chiefly seen as an aid to learner motivation (Ramirez and Squire, 2015), given that motivation is one of the most influential factors of academic success (Taylor et al., 2014).

Empirical studies on learning gamification paint a scattered picture (de Sousa Borges et al., 2014; Dicheva et al., 2015; Nah et al., 2014): some find positive results, including better grades (Barata et al., 2013). Others find no or even negative effects, like a decrease in student performance (de-Marcos et al., 2014). Proponents of gamification have explained the latter with confounds like poor design (Domínguez et al., 2013; Rojas et al., 2013). Gamification sceptics in turn have pointed to confounds like novelty effects to explain observed positive effects (Hanus and Fox, 2015; Koivisto and Hamari, 2014). We find a similar mixed picture in gamification in health and wellbeing (Johnson et al., 2016) and gamification research more generally (Seaborn and Fels, 2015). Where findings contradict hypotheses, researchers often propose switching from one theory, construct or confound to another readily available one to explain results (see Mekler et al., 2017 for a recent example). Granted, we are beginning to see more explicitly theory-testing research into *why* gamification works (or doesn't) (Nacke and Deterding, 2017). However, given the post-paradigmatic plurality of current motivation theories (Reeve, 2015, pp. 25–37; 49–50) and the abundance of theories brought to bear on gamification (Sailer et al., 2013; Seaborn and Fels, 2015), purely theory-driven, hypothetico-deductive work promises slow, protracted research progress at best – be it for selecting theories or hypotheses within a given theory. To advance our understanding of gamification and avoid 'boiling the theoretical ocean', more open, holistic, bottom-up studies are useful. They can help empirically identifying likely applicable existing theories, or even developing new grounded theories of gamification's psychological mechanisms, where existing theories fail to explain data (Deterding, 2014; van Roy and Zaman, 2015).

Along these lines, this study aimed to ground one particular concept that has been proposed to explain mixed effects of gamification (Deterding, 2014), namely that of *functional significance*. Functional significance is a core component in Self-Determination Theory (SDT; Ryan and Deci, 2017), arguably the most frequently used theory in gamification research (Seaborn and Fels, 2015). Following SDT, a stimulus does not determine motivation; rather, its motivational impact is

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mediated by the motivational meaning or functional significance an individual ascribes to it (Ryan and Deci, 2017). Thus, whether and how a game design element motivates depends on how users functionalise it. Researchers early on suggested that a particular game design element, such as badges, could have *multiple, different* potential motivational functions (e.g. Antin and Churchill, 2011; Sailer et al., 2013). Yet we know little, empirically, whether people *actually* functionalise game design elements differently, and if so, what *actual* functionalisations occur.

In response, we conducted a qualitative in-the-wild (Rogers and Marshall, 2017) diary study of 81 students using one of two popular gamified online learning platforms, *Codecademy* and *Khan Academy*, to assess (1) whether and how people functionalised the badges on the platform, and if so, (2) how these functionalisations affected people's motivation and subsequent behaviour. We chose *badges* as a focal game design element and *online learning* as a context for three main reasons: both are prevalent in learning gamification research; influential yet untested prior work has hypothesised specific functionalisations for badges (Antin and Churchill, 2011; Sailer et al., 2013); and badging systems have received significant attention and investment in (online) education, with researchers urging for a deeper understanding of their psychological mechanisms and effects (Abramovich et al., 2013; Cruz et al., 2017; McDaniel and Fanfarelli, 2016). By unpacking people's functionalisations of badges, we highlight the importance of people's meaning-making in gamification and the complex motivational constitution of game design elements. In particular, we identify particular design factors relevant for specific functionalisations – and thus, for the successful design of gamified systems.

## 2. Related work

Where current research acknowledges particular motivational functions of game design elements, these are commonly regarded as fixed and unitary. A particular type of game design element deterministically produces one and only one motivational function: customisation supports autonomy, badges support goal-setting, etc. (for a review, see Deterding, 2015; one notable exception is Sailer et al., 2013).

Against this stands a strand of gamification research building on theoretical work by Deterding (2011,2014), grounded in SDT, which questions the existence of a "one-to-one relationship" (Deterding, 2014, p. 317) between a game design element and its motivational function. It suggests that game design elements can yield different motivational functions (or not) depending on how users *make sense and use* of the element in relation to their psychological needs – how they *functionalise* it. Importantly, both situational (e.g. Çakıroğlu et al., 2017; Cruz et al., 2017; van Roy and Zaman, 2015) and personal (Abramovich et al., 2013; Çakıroğlu et al., 2017; Cruz et al., 2017; van Roy and Zaman, 2017) characteristics inform this functionalisation process. In turn, the user's functionalisation will shape the degree and kind of their motivation, and result in behavioural strategies responding to that functionalisation (see Fig. 1).

Multiple broader bodies of research motivate and support this model. Firstly, it is directly grounded in SDT, a highly influential and empirically well-supported need-based theory of human motivation (Ryan and Deci, 2017). According to SDT, beyond physiological needs, human behaviour is energised and directed by three basic psychological needs: autonomy, competence, and relatedness. We are *intrinsically motivated* to do certain activities – we actively seek them out and engage in them 'for their own sake' – because engaging in them directly satisfies basic psychological needs, which comes with experiences of enjoyment and self-determination. We are *extrinsically motivated* when we act energised by factors we perceive as pressures from outside our self, such as rewards. However, according to Cognitive Evaluation Theory (CET), a major subtheory of SDT, "[i]t is not external events or occurrences per se but rather their psychological meaning – what we call their *functional significance* – to individuals that determines their effects on intrinsic motivation." (Ryan and Deci, 2017, p. 159). In particular, SDT foregrounds three perceived aspects of external events that directly impact basic needs, and thus motivation: an informational aspect (perceiving the event as information about one's ability to affect one's environment), supporting competence; a controlling aspect (information about external pressure to think, feel, or act in a certain way), thwarting autonomy; and an amotivating aspect (information about one's inability to produce a given outcome or lack of valuing it), thwarting both extrinsic and intrinsic motivation (Ryan and Deci, 2017, p. 130). How people perceive and evaluate an event (as informational, controlling, amotivating) shapes what type of motivation occurs (intrinsic, extrinsic, amotivated); and this in turn impacts people's style of behaviour. This functionalisation process is predictably shaped by identifiable intrapersonal and social-contextual factors. There is abundant empirical support for each proposition of SDT and CET (Ryan and Deci, 2017). For example, Deci and Ryan (1987) observed that an autonomy-supportive classroom atmosphere led students to functionalise teacher feedback as informational, which fostered competence experience and intrinsic motivation. A controlling atmosphere in contrast prompted students to perceive feedback as controlling, which thwarted autonomy and thus, increased extrinsic motivation. Importantly for our context, multiple studies link intrinsic or highly self-determined motivation to positive educational outcomes, whereas extrinsic or controlled motivation correlates with negative outcomes (Kyndt et al., 2011; Liu et al., 2012).

Several other empirically supported motivation theories posit meaning-making as a core mediator between environmental antecedents and motivational and behavioural consequences (Molden and Dweck, 2000). Appraisal theories of emotion for instance posit that appraisal – the transactional process that "detects and assesses the significance of the environment for well-being" – determines emotions as response complexes of experienced feelings, action tendencies, behaviours, and physiology (Moors et al., 2013, p. 120). In educational research, work around the Cognitive Mediational Paradigm (Winne, 1987) shows that learners interpret instructions by relating them to personal cognitions and the learning context, which shapes their educational outcomes (Cornillie et al., 2012; Vandercruysse et al., 2015). In communication research, the so-called Uses and Gratifications approach sees users as actively selecting media offerings to solve situationally appraised problems based on basic human needs (Rubin, 2009; Ruggiero, 2000). Finally, social constructivist work in games research argues that the design of a game may afford but does not determine its psychological effects. In Montola's (2012) words, "every player has different readings" (p. 314) of a game depending on personal characteristics and the context of play (see also Elson et al., 2014).

Within gamification research, several theoretical papers early on suggested *multiple potential* functions of game design elements in general, and badges in particular. Antin and Churchill (2011) hypothesised five potential functions of badges in social media, namely goal-setting, instruction, reputation, status/affirmation and group identification

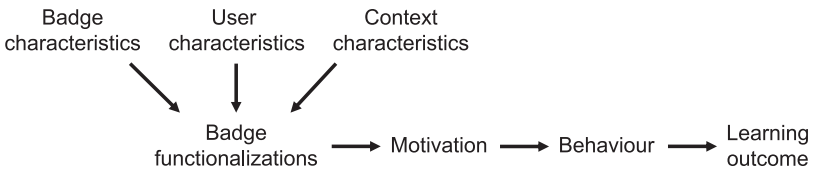


**Fig. 1.** Theoretical framework informing the study design.

(repeated by Weiser et al., 2015). Sailer et al. (2013) proposed four motivational mechanisms underlying badges: they can serve as success feedback feeding competence and power needs; status signalling feeding power needs; group symbols feeding affiliation needs; and finally, as goal-setting. Gibson et al. (2015) similarly theorised three functions of digital badges in learning: motivation, status recognition, and evidence of achievement. Even non-gamification work on digital badges in education proposes that they can have multiple, different functions (e.g. Halavais, 2012; McDaniel and Fanfarelli, 2016). McDaniel and Fanfarelli (2016, p. 77) explicitly hypothesise that the user experience of a badge should be shaped by the specific function a user ascribes to it – resulting in function-specific design guidelines for badges.

Nevertheless, there is little if any *empirical* work on functionalisations of game design elements. Cruz et al. (2017) conducted focus group interviews on users' perceptions of badges on meta-game platforms like Xbox Live or Kongregate, where players receive badges for attaining certain game states in different games. Here, players discussed badges in terms of multiple values or benefits, ranging from achievements to assignments and even ego maintenance (Cruz et al., 2017). As part of a quantitative survey on user perceptions of leaderboards in fitness, social networking and productivity apps, Jia et al. (2017) informally analysed user answers to open-ended questions suggesting that leaderboards could be perceived as a competition, progress tracking, or an incentive. Notably, none of these studies expressly aimed to uncover functionalisations. Therefore, it is likely that they didn't bring to light the full spectrum of naturally occurring functionalisations. Furthermore, both Cruz et al. (2017) and Jia et al. (2017) straightforwardly asked participants for usage rationales and took these at face value, a highly problematic elicitation and analysis strategy when it comes to identifying motivations (Briggs, 2007; Orbuch, 1997).

To summarise, while researchers have hypothesised many potential functionalisations of badges, we know little empirically about how the functionalisation process works in gamification, what people's *actual* functionalisations of badges are, and what intrasubjective, contextual, and design factors affect these – specifically in educational contexts. This study aims to address this gap by answering the following two research questions:

$RQ_1$: How do students functionalise badges on a gamified educational platform?
$RQ_2$: How do student functionalisations of badges impact their experience with and behaviour on a gamified educational platform?

## 3. Method

Since we wanted to naturalistically observe people's experience, meaning-making, and action, we decided to study their engagement with existing gamified platforms 'in the wild' (Rogers and Marshall, 2017), choosing a site that was as ecologically valid as possible and manipulating it as little as possible. Particularly, we wanted to collect data on a gamified experience widely encountered by subjects as a normal, typical part of their everyday life. Based on our own lifeworld experience and available statistics on online learning (e.g., Allen and Seaman, 2007; Center for Educational Innovation, 2017), we considered higher education students engaging with gamified online courses on introductory programming to be such a case. To further minimise threats to ecological validity such as demand characteristics (Orne, 1969), we only recruited students who self-identified as currently actively considering joining an online course to learn programming. Furthermore, participants could choose freely when to use or not use the platform, whenever they saw fit. Similarly, we chose a low incentive for participation to attract people interested in learning how to code instead of people interested in earning money. Lastly, we expressly unlinked study completion and compensation from actual or continued platform use after signing up for the study.

Given our interest in generating theory, we opted for a qualitative research design, triangulating a diary study with follow-up interviews. We reasoned that diary studies allow good access to in-the-wild experience with minimal interference (Bolger et al., 2003), which interviews could then enrich with in-depth data on experiences and interpretations at each relevant diary-recorded incident while still being grounded in diary-recorded actual experience, thus reducing the risk of interviewees veering into generalising accounts (Hurlburt and Akhter, 2006; Rodriguez and Ryave, 2002).

### 3.1. Materials

The materials included two online introductory courses in programming, namely the "HTML & CSS" course on Codecademy[1] and the "Intro to HTML/CSS: Making Webpages" course on Khan Academy.[2] We selected these websites due to their wide adoption (45 million registered users on Codecademy, 40 million monthly users on Khan Academy) and use of gamification: both work with badges, points, progress bars, and streaks. In addition, Khan Academy also showcases an upgradeable character (see Fig. 8 in annex). We chose these two specific courses because (1) their content was similar, (2) they required little to no prior technical knowledge, and (3) they were freely and publicly available at the time the study took place.[3]

Both Codecademy and Khan Academy featured a wide range of badges (see Figs. 3 and 7 in Annexes). Following Hamari (2017), badges can be defined as "optional rewards and goals, the fulfilment of which is located outside the scope of the core activities of a service" (p. 470). Hamari and Eranti's Game Achievement Framework (2011) identifies three formal components of badges: a signifier, completion logic (consisting of trigger, conditions, prerequirements and multiplier) and a reward. We established that the *signifier* of each badge on Khan Academy and Codecademy consisted of a title and a visual, and on Khan Academy also a description. On both websites, badges were typically unlocked when the user completes a certain amount (*multiplier*) of exercises or finishes a lesson (*trigger*). In some cases, this has to occur in a certain time frame or with less than a pre-defined number of mistakes (*conditions*). *Pre-requirements* are rare on both platforms. There are no consequences attached to unlocking a badge other than its display (*reward*). Users receive notifications when they have unlocked a new badge, and can check their profile to see an overview of all their unlocked badges (see annexes 1 and 2 for relevant screenshots). Additionally, Khan Academy also offers the option to consult locked badges and their fulfilment conditions, and to visit other users' profiles to see their badges. Furthermore, users can choose up to five badges they want to exhibit prominently on their profile page using the 'showcase function' (see Fig. 10 in Annex 2).

### 3.2. Data collection

Our study procedure consisted of five phases and was approved by our universities' ethics review bodies. After participants were briefed (phase 1), they were asked to write a diary entry each time they interacted with Khan Academy or Codecademy during a two-week diary phase (phase 2). After a free phase of one week (phase 3), participants took part in one-on-one interviews (phase 4), followed by a debriefing (phase 5).

During the individual face-to-face introduction session, participants were informed about the objective of the study, which was presented as an investigation of the user experience of a gamified course, and gave informed consent. Participants were then randomly assigned to either

[1] https://www.codecademy.com/
[2] https://www.khanacademy.org/
[3] After the end of this study in 2017, Codecademy introduced paid pro-features and replaced the HTML & CSS course with another similar course.

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**Table 1**
Overview of participants per website and per gender.

| | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | *n* | Diary entries | *n* | Diary entries | *n* | Diary entries |
| **Codecademy** | 18 | 74 | 19 | 78 | 37 | 152 |
| **Khan Academy** | 32 | 115 | 12 | 64 | 44 | 179 |
| **Total** | 50 | 189 | 31 | 142 | 81 | 331 |

Codecademy or Khan Academy. If a participant had previously used one of them, they were automatically assigned to the other platform. No participant had prior experience with both websites. Participants where then invited to create an account on the assigned platform using their real names or an alias, and received detailed instructions for the diary phase.

During the diary phase, participants were to follow the course at their own pace, using the website as little or as often as they liked. It was made clear that there were no expectations as to how many sessions the participants should conduct. Every time participants did use the website, they were to fill out a short digital diary entry. For this, we created two digital diary forms in Dutch using Google Forms; they only differed in naming the website the participant used. On the form, a brief introductory text reminded participants that each diary entry should concern their last usage session of the website. The first part of the form asked for the participant's initials and birthday to stably identify answers from the same participant. The remainder consisted of open-ended questions on (a) participants' reasons for use and (b) their use and experience of the website, including their usage context. Participants were only prompted to answer section (b) if they indicated to have interacted with badges during that use session. The form ended with an open non-obligatory field for additional remarks (see Annex 3). Participants received an easy to remember shortlink that brought them to the Google Form. Participants had thus no access to their earlier entries. Since people's experienced or actual motives often differ from their reported reasons (Antin and Shaw, 2012; Briggs, 2007; Orbuch, 1997), we asked participants to diary-record their *experiences right after they occur*, based on best practices in *experience sampling* (Csikszentmihalyi et al., 2006; Hurlburt and Akhter, 2006) and *systematic self-observation* (Rodriguez and Ryave, 2002). This procedure of using the website first and filling out the diary afterwards was demonstrated in the introduction session. During the diary phase, participants received two gentle email reminders, including links to the online course and the digital diary. The reminder focused on participation in the overall study, *not* engagement with the website: participants were not explicitly asked to use the latter.

At the end of the diary phase, participants were informed through email that they could continue using the website if they wanted to, but no longer needed to write diary entries. We allowed for one such 'free' week between the end of the diary phase and the beginning of the interview phase. We did so mainly to be able to interview students about potential differences in experience and behaviour between diary and 'free' weeks as a result of demand effects.

During the interview phase, participants took part in audio-recorded one-on-one interviews. Interviews were conducted individually and lasted 30 minutes on average. Each started with a discussion of general experiences with the educational platform, initiated via broad questions. The interview then focused on each participant's individual situated experiences and functionalisations of badges through participant-specific questions based on their diary entries. Here, the researcher prompted richer accounts of the participant's experiences and meaning-making at the time. At the end of the interview, each participant could share additional thoughts (see Annex 4 for the general interview guide). At the end of the interview, participants were thoroughly debriefed and thanked for their participation.

### 3.3. Participants

We recruited Belgian university students without programming knowledge. Participants had a chance of 1 out of 5 to win a €10 voucher of a large Belgium multimedia chain. Interested students could register for participation by filling out a short online registration form. In this form, students were asked to indicate their initials and birthday, age, gender and previous experience with Codecademy and Khan Academy.

In total, 94 students expressed an interest to participate. 13 were excluded from data analysis for the following reasons: quitting the study prematurely ($n = 8$); not filling out the diary ($n = 1$); not using the website during the diary phase ($n = 1$); and not taking the right courses ($n = 3$). This led to a definite sample of 81 participants (age: $M = 20,81$; $SD = 1,31$) who completed the study, with 31 self-identifying as female, 50 as male (see Table 1). 44 participants used Khan Academy and produced a combined total of 179 diary entries (on average 4,07 diary-entries per person), while 37 participants used Codecademy, filling out 152 diary entries (on average 4,11 entries per person).

### 3.4. Data analysis

Interviews were transcribed *ad verbum* and coded together with the diary entries using computer-aided qualitative data analysis software (MAXQDA12). We analysed diary entries and interview data jointly and treated them as equally important, although interviews overall yielded richer insights. We followed a standard qualitative data analysis process, alternating first and second cycle coding with diagrammatic sense-making (Miles et al., 2013). Given our clearly pre-defined interest in identifying functionalisations and their impact on experience and behaviour, our coding formally qualifies as directed content analysis (Hsieh and Shannon, 2005). However, we did not enter coding with theory-derived provisional codes (Saldaña, 2016, p. 168): although the concept of *functionalisation* originates within SDT, we were interested in openly capturing all occurring functionalisations. Therefore, we engaged in a first cycle *initial coding* (Saldaña, 2016, p. 115) of sections describing motives, reasons, or feelings related to badge use. This first cycle generated 52 codes, often in vivo (i.e. using the participants' language), ranging from functionalities (e.g. "recognition") to related feelings (e.g. "satisfaction"). As a form of code mapping (Saldaña, 2016, p. 218), all authors then individually performed a card sorting task with the 52 codes, ordering different codes into higher-order themes. Comparing and discussing these orderings and underlying transcripts, a more concise set of codes emerged. Analysis allowed to distinguish and link a first set of 13 candidate functionalisations vis-à-vis resultant experiences. For example, we observed that "satisfaction" as an experience resulted from users interpreting badges as "recognition" of their learning performance. In a second cycle of *pattern coding* (Saldaña, 2016, p. 236), we then coded the data using this first candidate functionalisation set in order to challenge and refine these codes, remaining open for new candidate functionalisations that wouldn't be covered by the initial set. While new functionalisations did not emerge, this second cycle did corroborate but also further specify the candidate functionalisations (e.g. "recognition" comprised badges as "feedback" and as "milestones"). We then coded, compared, and contrasted data within each functionalisation for characteristic experiences and behaviours. In a final cycle of *focused and axial coding* (Saldaña, 2016, pp. 239–250), the refined functionalisations were organised into overarching functions by creating a mind map (see Fig. 2) with post-its and drawing labelled links between the different functionalisations. By identifying these relations, five function categories emerged. To relate our observed functionalisations to the literature, we represented previously hypothesised functionalisations (Antin and Churchill, 2011; Sailer et al., 2013; Gibson et al., 2015) with different coloured stickers we attached to post-its with fitting observed functionalisations.

To account for potential issues of reflexivity or bias, results were

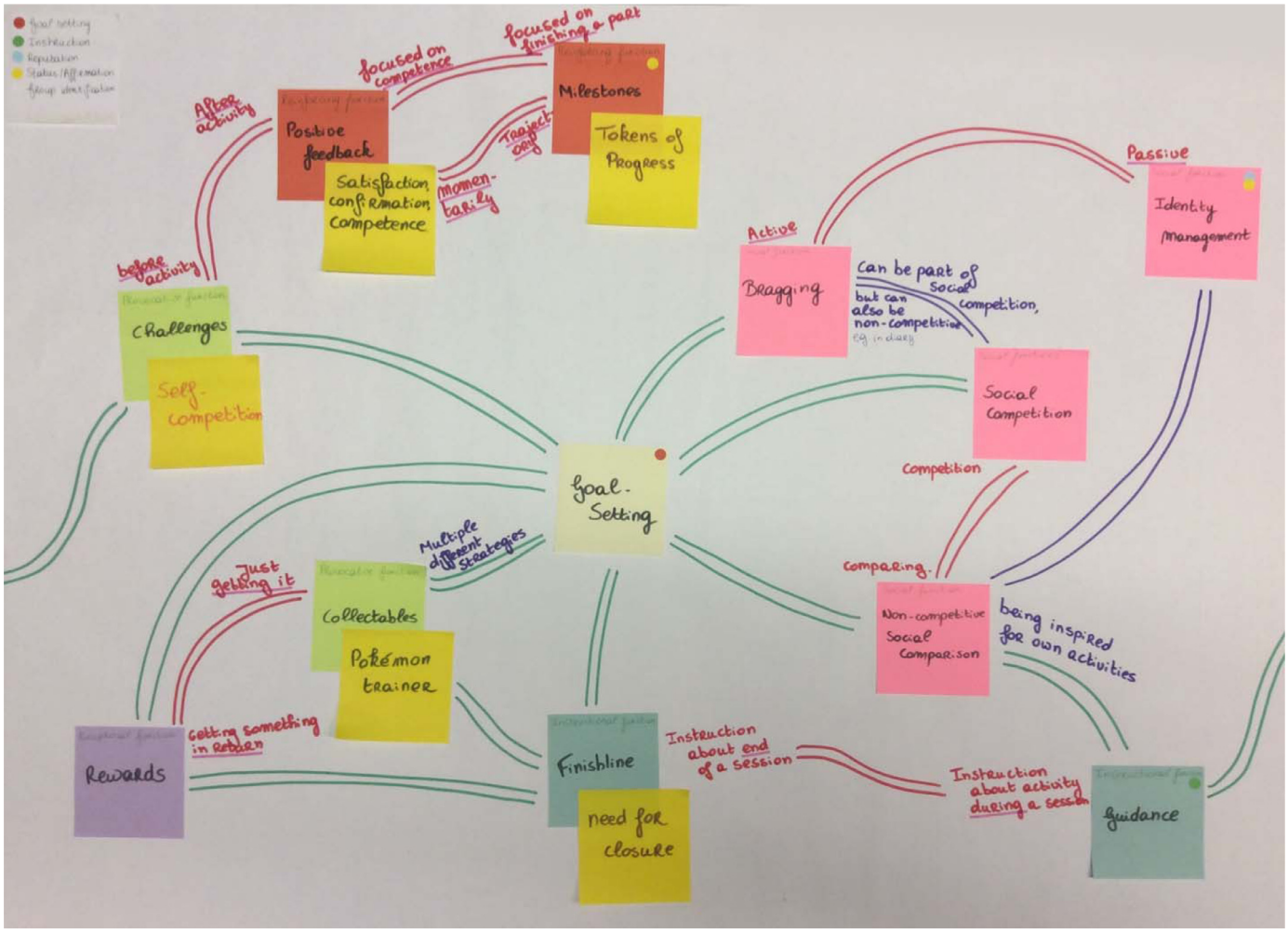


**Fig. 2.** Mind map used during data analysis.

presented at multiple venues, encouraging attendants to discuss and challenge them (van Roy et al., 2017a,b,c). All results and feedback were taken together in a group discussion between the authors. Some small changes to the naming or description of the different functionalisations were carried out for the sake of clarity.

For guarding internal validity, we checked all interview statements of a participant against the behaviours and experiences recorded in their diary entries. Furthermore, by triangulating diaries and interviews, we could contextualise the participant's statements during the interview against the whole body of their diary entries for internal consistency.

## 4. Results and interpretation

From data analysis, nine different functionalisations of badges emerged, which clustered in five overarching categories: (a) *rewarding*

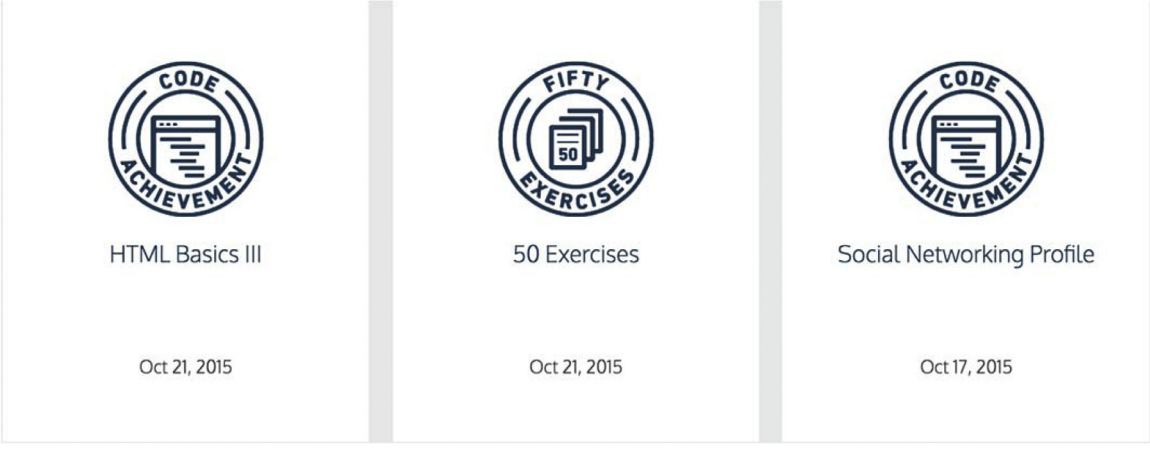


**Fig. 3.** Screenshot of three examples of badges on Codecademy ("Codecademy," 2018) .

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**Table 2**
Comparison of empirical and hypothesised functionalisations of badges.

| Empirical functionalisation | Theoretical functionalisations from gamification literature | Theoretical functionalisations from motivational literature |
|---|---|---|
| 1 Badges as rewards | | |
| 1.1 Contingent rewards | n/a | Incentive (Easley and Ghosh, 2016) |
| 2 Badges as goal-setting | | |
| 2.1 Collectables | n/a | Saving & order desires (Reiss, 2004) |
| 2.2 Challenges | Goal-setting (Antin and Churchill, 2011)<br>Goal-setting (Sailer et al., 2013) | Competence need satisfaction (Ryan and Deci, 2017)<br>Achievement Theory (Brunstein and Maier, 2005)<br>Goal-setting (Locke and Latham, 1990) |
| 2.3 Finish line | Goal-setting (Antin and Churchill, 2011)<br>Goal-setting (Sailer et al., 2013) | Goal-setting (Locke and Latham, 1990) |
| 2.4 Competition | n/a | Achievement Theory (Brunstein and Maier, 2005)<br>Goal-setting (Locke and Latham, 1990) |
| 3 Badges as social signalling | | |
| 3.1 Impression management | Status / Affirmation (Antin and Churchill, 2011)<br>Status symbols / Power (Sailer et al., 2013)<br>Status recognition (Gibson et al., 2015) | Impression management (Goffman, 1959) |
| 4 Badges as encouragement | | |
| 4.1 Positive feedback | Success/power, competence (Sailer et al., 2013) | Competence need satisfaction (Ryan and Deci, 2017)<br>Achievement Theory (Brunstein and Maier, 2005) |
| 4.2 Milestones | Success/power, competence (Sailer et al., 2013) | Competence need satisfaction (Ryan and Deci, 2017)<br>Achievement Theory (Brunstein and Maier, 2005) |
| 5 Badges as information | | |
| 5.1 Guidance | Instruction (Antin and Churchill, 2011) | Information processing (Kuhl, 1986) |
| n/a | Group identification (Antin and Churchill, 2011)<br>Affiliation (Sailer et al., 2013) | |
| n/a | Reputation (Antin and Churchill, 2011)<br>Evidence of achievement (Gibson et al., 2015) | |

*badges* (one functionalisation), (b) *goal-setting badges* (four functionalisations), (c) *social badges* (one functionalisation), (d) *encouraging badges* (two functionalisations) and (e) *informing badges* (one functionalisation) (see Table 2).

The following subsections will describe the five main categorisations with their corresponding functionalisations of badges, answering $RQ_1$. In each description, we also address $RQ_2$ when the data could sufficiently substantiate claims about the impact of the particular meaning-making on experience and behaviour. Since the results for both websites are very similar, we will present and discuss both simultaneously.

### 4.1. Rewards (41 mentions)

A first category of badge functionalisations is rewarding badges. It refers to instances where users understand badges as a reward for performing activities that align with the goal of the platform, but don't actively pursue badges. Users simply expect to receive them after putting a certain amount of effort in. This category contains the sole functionalisation of *badges as contingent rewards*.

#### 4.1.1. Contingent rewards (41 mentions)

Most participants talked about badges as being a reward for their performance and activity on the platform: with 41 mentions, it was the second most frequent functionalisation in the sample. Participant 7 (male, Codecademy), for example, talked about badges as being "a reward for everything I did [on the platform]". For this functionalisation, the concept of compensation – getting something in return for doing something – is essential.

> [Getting a badge] is fun because, yeah…, you get something in return, just for learning something (P17, male, Khan Academy)

Most participants talking about badges as rewards found them motivating and enjoyable. Participant 24 (female, Codecademy) described badges as little presents that encouraged her to continue her efforts. Participant 83 (male, Khan Academy) mentioned feeling "very happy" after receiving a badge, as "it is nice to be rewarded for the things you achieved on the platform". Some participants expressly viewed the positive feelings they connect to rewarding badges to be widely shared.

> I like it when you get rewarded – so to speak – for something that you did. […] Then I feel like, okay, nice! It's not for nothing, so to speak. I think that's just something humankind likes, getting rewarded for something. I think that's kind of motivating. (P74, male, Codecademy)

Some participants also linked badges as rewards to Pavlovian conditioning (Kalat, 2016), believing that the rewards served to reinforce their use of the platform. Participant 43 (male, Khan Academy) put it this way: "[getting badges as a reward is like] teaching a new trick to your dog. You can't do that in one go. You have to do it inch by inch while you give the dog cookies along the way." The data surfaced two conditions for inducing a reward functionalisation. First, the user has to perceive the badges as personally "valuable," "meaningful", or "real". This was the case for most participants:

> [The badges] really came across as real rewards […], although it is only something virtual of course. (P71, female, Codecademy)

For a minority, badges appeared to be of little value, which created disappointment in and dislike of both badges and platform.

> **Interviewer**: "In your diary, you've indicated that you didn't really like using the platform. Can you explain why you said this?"
>
> **P39**: "[…] I didn't really feel like I got something in return [for my efforts]. That is partly caused by the reward system that isn't really good, at least not for us. Because, I think, if I would have been rewarded with other things, like things that you can exchange for physical objects, or not even physical but like things online that are useful […] or things you can download, like that sort of stuff. I think I would have liked that more. I would have felt that I really was working for something." (P39, male, Khan Academy)

Such perceived value does not need to be material or functional: social-symbolic significance is just as important. Three participants labelled the badges as valueless because they were, to their eyes, childish. Again, as a result of this perceived lack of value, they felt the badges were demotivating rather than motivating.

> But I think, maybe, using [the badges] for our age… I think it was a

bit childish. I think… for kids it will probably be more effective than for adults. […] Basically, the little symbols [badges] are targeted on children, while the information is actually targeted on adults. That clashes. (P26, male, Khan Academy)

To adult users who associate badges with childishness and see the latter opposed to their valued identity as adults, badges are worse than valueless: they are an act of disregard. They signal that the designers implementing badges consider their users to be childish. To safeguard their adult identity, people therefore have to enact distance to their user role: overtly show that such 'childish' things are 'beneath' them (Deterding, 2018).

The second precondition for an effective reward functionalisation is that the required effort for receiving a badge is perceived as significant. Else, the badge loses value and thus becomes less motivating. Participant 41 (female, Codecademy) put it this way: "[badges] shouldn't be awarded too frequently. Otherwise, you will feel like 'every single time I do something, I get a reward', and in that case, it isn't worth the trouble." That said, once a participant understood a badge to be a contingent reward for a particular effort, not receiving a badge for a similar effort undermined previously existing motivation. Participant 55 (female, Khan Academy), for example, described that she felt all her efforts were for nothing when she didn't receive a badge after putting in the expected level of effort needed to unlock a badge. This aligns with the well-known *overjustification effect* of extrinsic incentives on intrinsic motivation (Lepper and Henderlong, 2000). Either way, participants' reports on badges as rewards are consistent with framing them as incentives from an SDT or rational actor perspective (Easley and Ghosh, 2016).

### 4.2. Goal-setting (88 mentions)

With 88 mentions, the most frequent category of badge functionalisation was *goal-setting*. Here, badges work as calls for performing certain actions to a certain standard or end state, either because this becomes an end in itself (*badges as collectables*), because attaining badges positively reflects on the user's competence (*badges as challenges*), because it signals the end of their session (*badges as a finish line*), or because they want to do better than others (*badges as competition*).

#### 4.2.1. Collectables (46 mentions)

With 46 mentions, the most frequent functionalisation across all categories was *collectables*. Here, participants stated that their goal on the website became to collect as many different badges as possible. Notably, both websites explicitly show badge counters (see Figs. 4 and 9) and overview pages with unlocked badges (see Figs. 5 and 11) as part of the users' profile pages. Khan Academy additionally showed possible but not yet unlocked badges on the overview page (see Fig. 11). This design pattern of achievement collections in games and metagame platforms and its presumed impact on engagement is well documented (see e.g., Jakobsson, 2011; Lewis, 2013).

Participant 42 (male, Khan Academy) compared his experience to being a "Pokémon trainer". After he acquired his first badge, he thought 'Ow, now let's collect some more [badges]'. Participants found collecting badges fun and a strong motivator:

I liked looking at [my collected badges]. […] I really think that it urges you to carry on, that you feel like 'I want to collect as many as possible'. (P41, female, Codecademy)

In particular, badges functionalised as collectables motivated users to prolong an ongoing session for longer than initially intended or even comfortable in order to receive a badge. As one stated with regard to the '$10^{4}$' badge:

**P64**: I already watched the clip of the next [chapter] so I would have 10 000 points, because I've seen that I could get a badge if I had 10 000 points. […]

**Interviewer**: Yes, so, and why did you feel it was important to collect that one extra [badge]?

**P64**: Err, that's some underlying principle, right? One always wants to obtain a badge, to win the medal. So in that case, when you're almost there, you continue for a little while until you get it. (P64, male, Khan Academy)

Participant 42 (male, Khan Academy) provides a nice illustration for the extent of this motivational power. During his last use-session, although he was tired from a recent trip, he persisted for more than one and a half hours and a lot of stress, only to get one extra badge. Participants who functionalised badges as collectables tended to pay more attention and be more focused while using the platform, as this increased their chances of getting new performance-related badges. Participant 81 (male, Codecademy) put it as follows: "I was definitely more concentrated and focused, just because I wanted more [badges]."

Data provided little deeper insight into why collecting became a motivating end. Some suggest *curiosity* in novel content as a potential underlying need (Hamari, 2017). Yet, while several participants did frame badges in terms of novelty, they also reported novelty to quickly wear out, which does not match engagement patterns and self-reports from participants functionalising badges as collectables:

**Interviewer**: Did the badges impact how long or how often you used the platform?

**P17**: Well, uh, the first time it did. That was when it almost exploded in your face that you received a thing [badge]. So the first time I did indeed make more exercises hoping I could unlock an extra badge, but afterwards I felt that a whole lot less already. (P17, male, Khan Academy)

Lewis (Lewis et al., 2012; Lewis, 2013) connects the motivational pull of collectables to Reiss's (2004) "basic desires" of "Saving" and "Order", but there are to our knowledge no empirical studies corroborating this, and our own data didn't provide supporting evidence either.

That said, we did find that participants who functionalised badges as collectables frequently shifted their goal focus from learning to collecting. In other words, website use became a means to the end of getting badges, while learning motivation faded to the background. This can be linked to educational research suggesting that learner goal orientation and assessment techniques shape learners' learning approaches. If learners have a *performance orientation* (wanting to demonstrate proficiency according to a predefined standard, such as a test), they are more likely to use shallow learning techniques and cheat, while a *mastery orientation* (wanting to grow their own mastery of the subject matter) results in the opposite (Simzar et al., 2015). Summative assessments of performance in turn have been found to often shift student orientation from mastery to performance, and from learning to 'passing the test' (Joughin, 2010). This results in *gaming the system* (Baker, 2011): strategically seeking out ways that rationally maximise on the measured performance goal, to the detriment of ultimate ends. Similar phenomena are reported in gaming and gamification (Fitz-Walter et al., 2014; van Roy and Zaman, 2015; Werbach and Hunter, 2012).

In our data, this manifested in different ways. First, participants who functionalised badges as collectables were inclined to structure and sequence their activity from badge to badge, not lesson to lesson.

I think, most of the time when I [was using the website], I was always thinking 'okay, now I'm going to [collect this badge]', and if I still had time afterwards, I thought 'oh, okay, then I'm going to collect another one.' But it was never like 'I'm just going to continue and see where I'll end up.' (P4, female, Codecademy)

Thus, participants actively developed and used strategies to discover

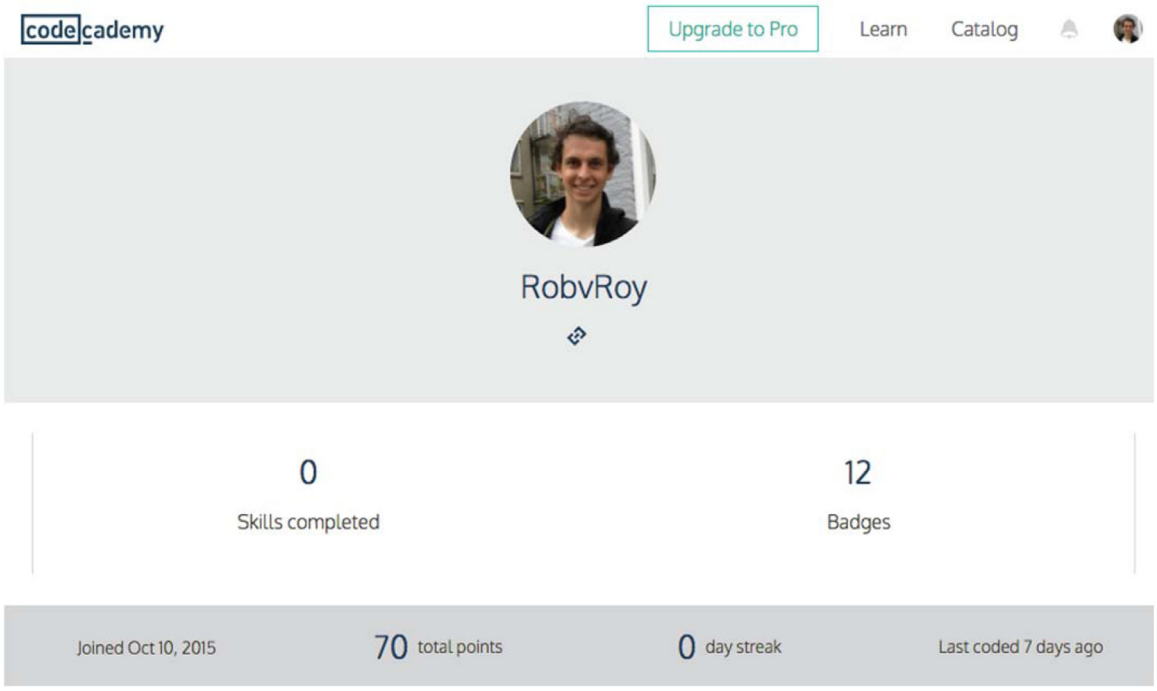


**Fig. 4.** Screenshot of profile page on Codecademy. Clicking on "12 Badges" will bring the user to the overview of the collected badges (see Fig. 5) ("Codecademy," 2018) .

and attain new badges, such as recompleting exercises, choosing and completing the easiest lessons and exercises first, randomly trying new things on the website, or, on Khan Academy, actively browsing the list of collectable badges (see Fig. 11) to select the easiest-to-unlock badges as their next goal and then only do what is necessary to receive that badge. Participant 73 (male, Khan Academy) for instance actively identified which exercises he had to (re)complete to unlock a badge, whereupon he "complete[d] them all in order to receive that badge." Participant 80 (female, Khan Academy) was one of the only respondents to complete the HTML/CSS course during the two-week diary phase. She decided to take and complete additional easy courses to quickly collect new badges, like the 'Early Math' course (targeted for children 2nd grade and under) or Economics, which is her educational background. Another participant functionalising badges as collectables reported

> to continue working for a while to collect [a particular] badge. Or to try something different, just because I might unlock a badge that way, eh? […] I first looked in the list to find the easiest [badges], those that seemed the easiest, but after I successfully collected them, I started doing things I otherwise wouldn't have done probably. Err, just purely to collect that badge. If they would have said 'watch the same clip four times in a row' or something like that, I might have considered to watch that clip four times. (P64, male, Khan Academy)

Participants expressed frustration when software glitches prevented badges from being awarded for activities participants deliberately undertook knowing they would unlock a new badge. For example, participant 63 (female, Khan Academy) explained that one time the platform didn't recognise a part as finished, although she had completed it. As a result, she didn't unlock the related badge, which made her feel frustrated and negative towards the platform overall. In most cases of such glitches, participants coped by trying to repeat the behaviour that should unlock the badge. When participant 8 (male, Khan Academy) for instance saw that the website didn't save and display recently completed exercises, he chose to redo them to unlock connected badges, rather than move on in the course. This frustrated him, as "You already finished it, you know what's it about, you are just theoretically fixing it."

Finally, some participants admitted to cheat or actively circumvent educational content to efficiently collect more badges. For instance, Khan Academy offers instructional video clips introducing new HTML and CSS elements between each course chapter, accompanied by a live, editable code. Here, participant 17 admitted he sometimes

> muted the clip and opened another [browser] tab or I opened the clip on a second screen [while doing other things on the first screen]. Afterwards I could just copy paste in order to receive the points and medals [badges] and stuff. (P17, male, Khan Academy)

#### 4.2.2. *Challenges (6 mentions)*

Three participants (six mentions) functionalised badges as *challenges*: they approached badges to prove to themselves that they had the competence required to attain the goal defined by the badges. In the words of participant 31 (male, Khan Academy), badges become part of a "competition with myself". That is, like collectables, the badge functions as a goal. Unlike collectables, that goal is not a desirable end in itself. Rather, it becomes a means to test and grow one's own mastery of the subject matter.

This can be linked to two theoretical constructs. One is competence need satisfaction in SDT: the intrinsically motivating experience that one can exert meaningful effect on the environment (Niemiec and Ryan, 2009). The other is achievement motivation, a learned "preference for affectively-rewarding experiences related to improving one's performance" (Pang, 2010, p. 30). Both SDT and achievement theory posit that humans are intrinsically motivated by experiences of 'performing well' against a standard. Achievement theory adds that beyond this basic implicit need, people also value and seek out such moments of achievement because they learn that other people value achievers. This social, self-worth-related dimension is referred to as the "self-attributed need to achieve" (Brunstein and Maier, 2005). Either theory is compatible with our data.

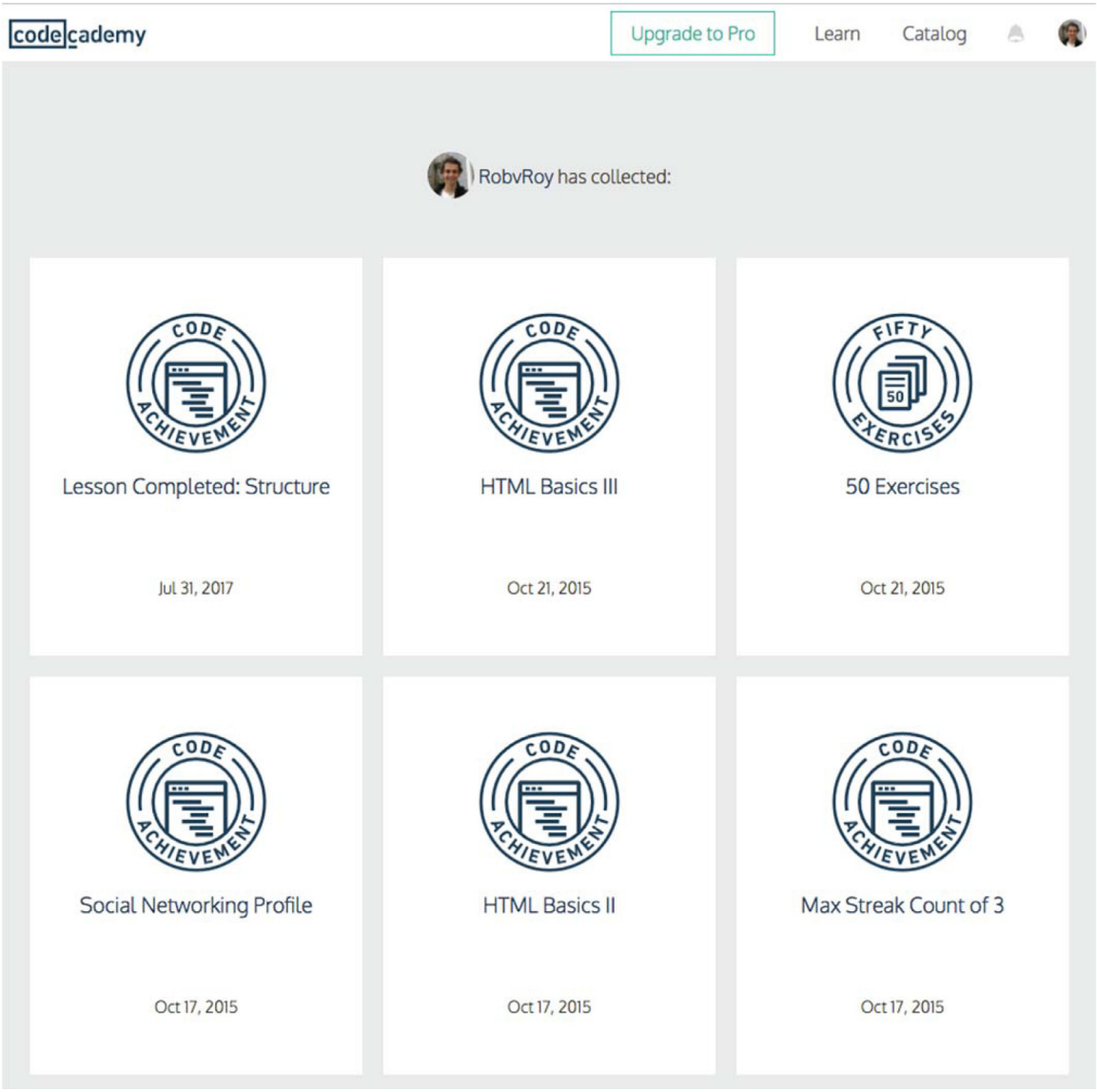


**Fig. 5.** Screenshot of page with badge overview on Codecademy. Badges aren't clickable ("Codecademy," 2018).

*4.2.3. Finish line (27 mentions)*

A further type of goal functionalisation treats a badge as the end-goal of a single session, which provides some form of closure (27 mentions). Participants functionalising badges this way would consciously aim for and continue to work until they unlocked one badge – or for some, two or three badges. Participant 44 (female, Codecademy) explained: "[When I received a badge] I felt like I completed enough exercises and then I quit. That was like always my objective, unlocking one badge." When participant 25 (male, Codecademy) unlocked a badge, he took that to mean that he had "worked well" and "now, I can go and do something else." To these participants, unlocking badges provided reassuring feelings of satisfaction, or as participant 82 (female, Codecademy) put it: "It provided a nice ending." Participant 74 agreed, explicitly drawing a parallel with games:

> If I received a badge, I often felt like, yeah I don't know… I always quit, but I definitely was feeling satisfied. Because, you know, if you wouldn't have received it, you would just randomly stop at some point […]. You know, the badges were like a checkpoint from games and stuff. You felt like 'I made it up till here, nice, tomorrow I will do the remainder [of the course]' (P74, male, Codecademy)

Working towards their 'finish line' often led students to work longer during a particular session than planned or intended. Participant 62 (female, Codecademy) for instance explained she often surprised herself by working longer than expected, because in consecutive sessions badges tended to unlock later and later. However, she also found this a double-edged sword, especially if the badge "came earlier than expected": "[A badge] indicates a timeframe that on the one hand triggers me to work on, but on the other hand also causes me to quit after I received it." (P62, female, Codecademy). This functionalisation matches a game design pattern Björk and Holopainen (2004, pp. 349–350) label "closure points", such as level endings or save points. Björk and Holopainen (2004) mainly emphasise downtime to experience the emotional payoff of goal completion as a function of closure points, but as can be seen, people also use them to structure and motivate their own activity.

*4.2.4. Competition (9 mentions)*

Although neither Khan Academy nor Codecademy host 'official' *competitions*, eight participants still functionalised badges as such (9 mentions). To them, badges worked as ready measures to compare progress on the website between users, and they found themselves motivated to unlock the most and 'coolest' badges compared to their peers:

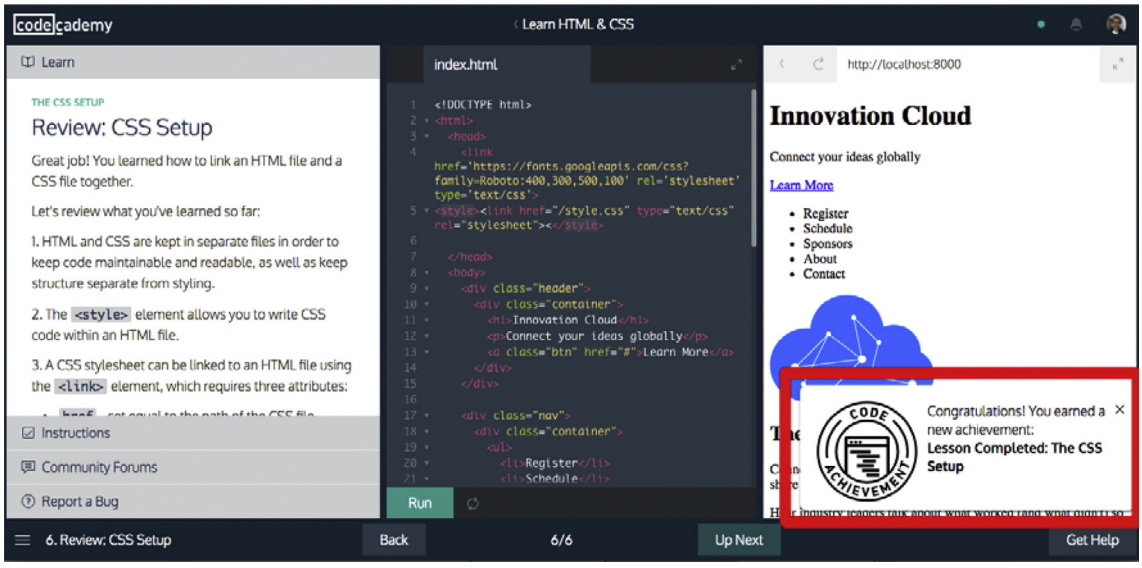


**Fig. 6.** Screenshot of badge notification on Codecademy. Clicking on the notification will make it disappear. (One rectangle added to image to draw attention to the notification) ("Codecademy," 2018).

> **Interviewer**: What did you think of the badges you unlocked?
>
> **P38**: They are kind of pleasant in itself, but yeah… A comparison with other people that are also using Codecademy… Like, he has already that many badges or something like that. To add a little competitiveness in it, that seems more fun to me. (P38, female, Codecademy)

Participant 43 (male, Khan Academy) likewise expressed a desire for a 'formal' badge competition, as it would motivate him to work harder due to his "competitive nature" and tendency to try to best his friends at their achievements.

A few inventive students found workarounds to still use badges as part of a competition. The case of participant 80 (female, Khan Academy) is telling. She encouraged her boyfriend, who was not participating in the study, to also join Khan Academy. Once he started using the platform, they regularly shared screenshots of their newly acquired badges, challenging each other to do better. Their competitive functionalisation not only impacted their motivation and behaviour, but also the platform, as users actively extend its default affordances, *co-constructing* the platform (Oudshoorn and Pinch, 2005). Furthermore, it illustrates a major facilitating condition for competitive functionalisation: a visible comparison between peers.

### 4.3. Social signalling (10 mentions)

Closely connected to competition is social signalling as a motivational function. Again, neither platform expressly affords social interaction around badges: Codecademy limits users strictly to their own profile. Khan Academy merely allows users to visit other users' profiles, although the only design support of social signalling are display settings on its profile pages (see Fig. 9): users can choose which information "widgets" are shown publicly (including the "badge count" widget), and the profile features a prominently placed "showcase" widget allowing users to choose up to five badges they want to show. Several participants indicated that this lack of social information and interaction limited the motivational appeal of badges to them:

> If you just, if you always get badges for yourself, but you can't really get something out of it for yourself or that kind of things… Then that isn't really fun. That's the same when you receive your school report in high school for example. If you got good grades, it's not those good grades that make you happy in the end. No, it's the reaction of your parents and all that sort of things, things you get in return for your good grades, like affection […]. So it's that kind of stuff that is rewarding. It's not just a badge that says 'congratulations, you did something good, just feel happy now'. That doesn't work as well, at least not for me. (P39, male, Khan Academy)

#### 4.3.1. Impression management (10 mentions)

Despite this lack of explicit social affordances, some participants still reported functionalising badges for *impression management* (10 mentions). Impression management can be defined as strategically shaping how one is perceived and evaluated by others (Goffman, 1959; see Bolino et al., 2016; Schlenker and Weigold, 1992 for reviews). In our study, three Khan Academy participants anticipated that others would check their badges on their profiles and therefore actively tailored what badges they sought out and displayed. For example, participant 64 (male, Khan Academy) repeatedly expressed the desire to unlock a badge that looked like a skull (although Khan Academy doesn't offer such badges), because he thought it would look "cool" on his profile. Participant 39 (male, Khan Academy) compared Khan Academy with Facebook, acknowledging that he "wouldn't invest time in my Facebook profile if I was the only one who saw it. I only update my Facebook profile because I know that others can come and see it". Applied to Khan Academy's badges, he explained to unlock new badges to "cheer up my profile page so other people see it".

Participants would also spend dedicated time customising their profile's "showcase" badge widget to control how others see them. As

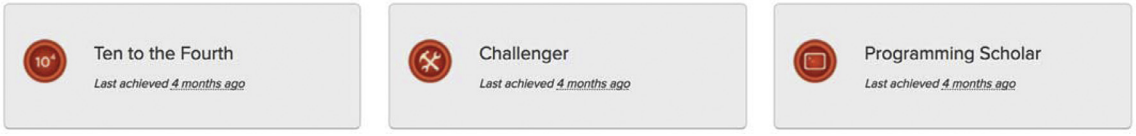


**Fig. 7.** Screenshot of three examples of badges on Khan Academy. ("Khan Academy," 2018).

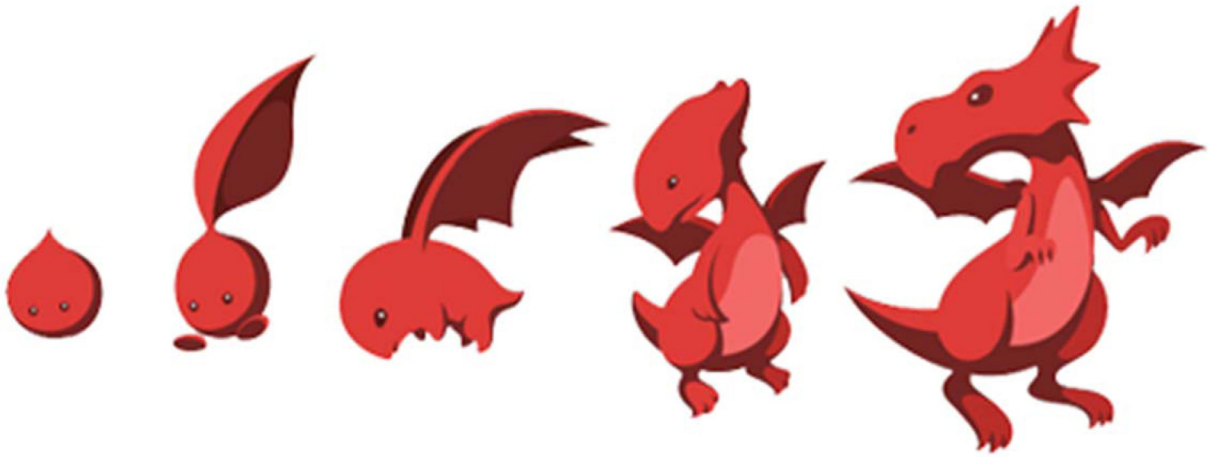

**Fig. 8.** Upgradable character on Khan Academy. ("Khan Academy," 2018).

participant 64 described it:

> Yeah, I really wanted to fill up that last empty slot, as you have five slots to showcase your collected badges. I had four so I really longed for filling up that last empty slot. And [that fifth badge] had to be something way cooler that just 'you watched a video' (P64, male, Khan Academy)

Impression management even manifested in interaction with peers beyond the platform, where participants actively reached out towards

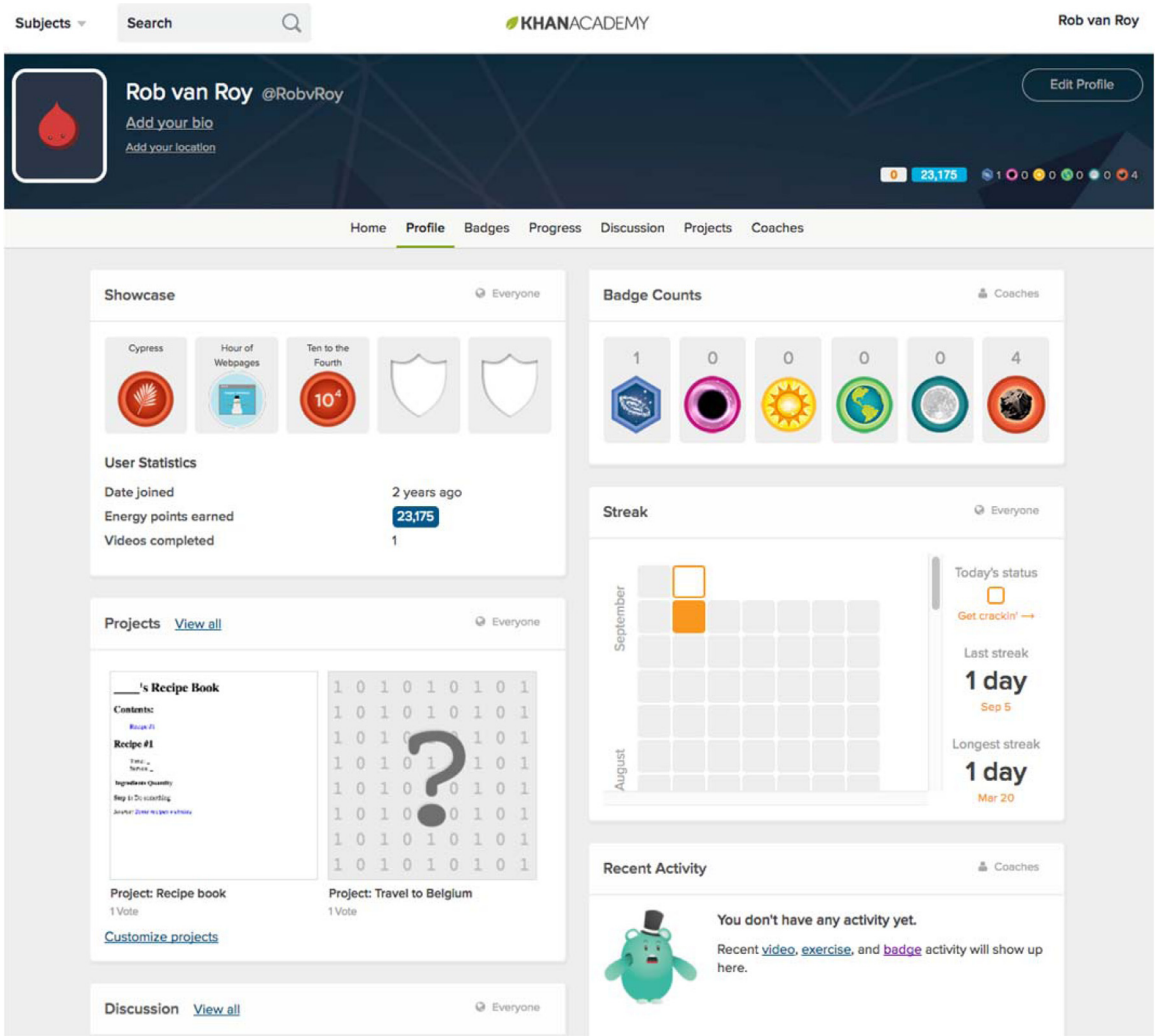


**Fig. 9.** Screenshot of profile page on Khan Academy. A user can access the overview of badges by clicking on the "badge"-tab in the upper menu. The showcase function is positioned in the upper left corner (for a detailed image, see Fig. 10), a badge count is conducted in the upper right corner ("Khan Academy," 2018).

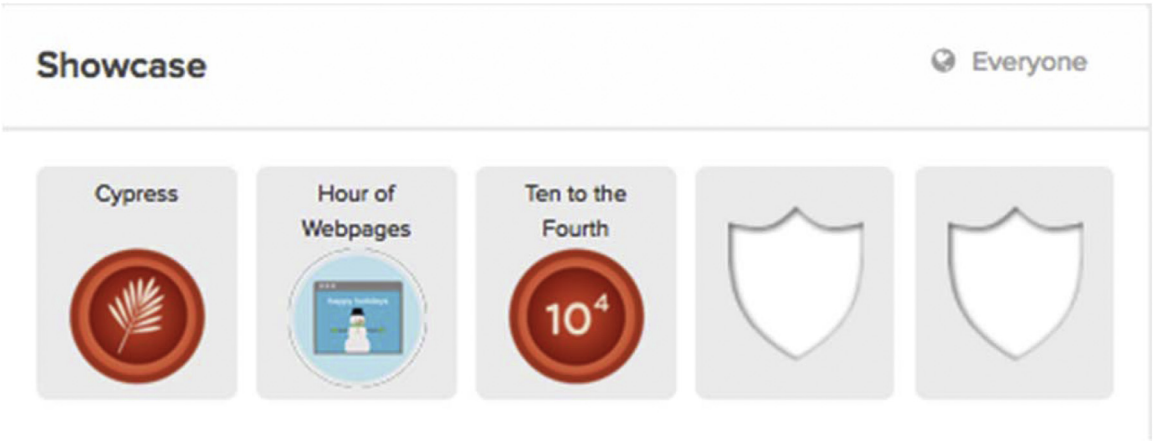


**Fig. 10.** Screenshot of Khan Academy's Showcase function. A user can choose up to five badges that are showcased prominently on their profile page (see Fig. 9). In this case three collected badges are showcased next to two empty slots ("Khan Academy," 2018).

others to boast about their achievements:

> **P48**: I hated that situation [in which I didn't receive any badges]. […] I thought 'Oh no, now I can't indicate in my diary [that I interacted with badges]'.
>
> **Interviewer**: But did you pursue the badges only so you could indicate it in your diary?
>
> **P48**: Yeah, I think so. It really played a part that I could talk about the positive feedback [I got] about things I did well [on the platform]. It motivates me when I can tell something positive about myself; it drives me to continue. (P48, female, Codecademy)

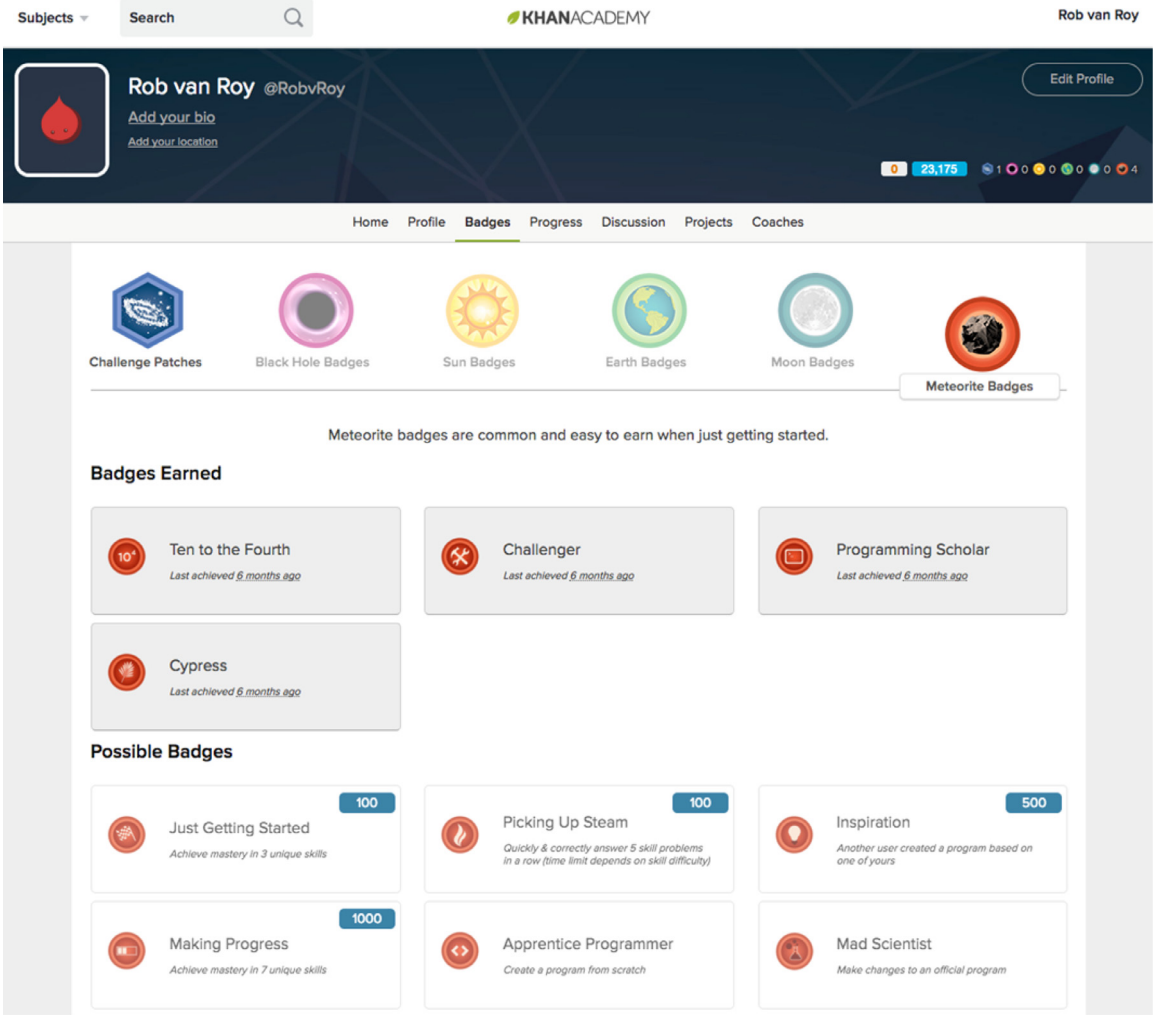


**Fig. 11.** Screenshot of page with badge overview on Khan Academy ("Khan Academy," 2018).

**Fig. 12.** Screenshot of badge notification on Khan Academy. Clicking the notification will bring the user to the badge overview (see Fig. 11) (3 rectangles added to image to draw attention to the notification) ("Khan Academy," 2018).

### 4.4. Encouragement (72 mentions)

A fourth category of functionalisations revolves around providing some kind of feedback that encourages the user to progress. Unlike *rewarding badges* (see Section 4.1), *encouraging badges* are interpreted as performance-contingent rewards, focussing on *successfully* completing an activity, whereas rewarding badges are seen as engagement-contingent (just putting effort in) or completion-contingent (completing an activity) rewards, regardless of the performance quality (see Deci et al., 2001; Houlfort et al., 2002).

Encouraging badges differ from *goal-setting badges* (see Section 4.2) in their temporality. Most goal-setting badges, with *badges as a finish line* as a noticeable exception, encourage to *start* an activity, whereas encouraging badges motivate to further *continue* an already started activity. In the case of badges as a finish line, the badge also encourages users to continue, but only until they receive the badge, not afterwards. From the interviews, we uncovered two different interpretations of badges with an encouraging function, namely (1) badges as positive feedback, and (2) badges as milestones.

#### 4.4.1. Positive feedback (40 mentions)

With 40 mentions, the third most frequent functionalisation is *positive feedback*, where participants talk about badges as direct positive feedback in immediate response to completing an exercise or a (sub-) section of the course. In these instances, receiving a badge "heightened […] feelings of self-esteem" as it indicated that "it was one extra thing I could successfully do" (P4, female, Codecademy). Participant statements clustering around badges as positive feedback supported both theoretical interpretations, which is why we labelled this functionalisation positive feedback, not competence nor achievement feedback.

Either way, badges as positive feedback not only resulted in positive self-affect, but also encouraged participants to continue: "You start to feel good about yourself and it's also very motivating when you receive a badge […] because it gives you the feeling of 'Yes, I can do this'" (P9, female, Codecademy). Unlike badges as rewards, badges as positive feedback were understood as and compared to (quasi-)verbal feedback from others:

> Yes, of course [getting a badge] is motivating to carry on. […] I think it always is encouraging if you're being told that you are doing well. […] That is a little supportive thing that makes you keep on pursuing your work. (P7, Male, Codecademy)

That said, not receiving a badge as positive feedback sometimes sparked frustration, especially when it was replaced with textual negative feedback (e.g. "Oh noes!" on Khan Academy or "Oops, try again" on Codecademy) because participants made an error. As participant 67 (female, Codecademy) put it: "I think when it gets more difficult and the system keeps on showing 'oops, oops, oops', you'll just throw the computer against the wall < *chuckles* > " This is consistent with both SDT and achievement theory, who predict negative affect and reduced motivation on receiving negative performance feedback (Brunstein and Maier, 2005; Ryan and Deci, 2017).

#### 4.4.2. Milestones (32 mentions)

Where unlocking an individual badge as positive feedback provides *immediate* encouragement in *direct* response to succeeding at a task, several participants also engaged with their collected badges as an overview of progress made (32 mentions). This can be linked to Rigby and Ryan's (2011) distinction of "granular" versus "cumulative competence feedback" in games: the former captures immediate success feedback like sounds and animation on collecting a coin, the latter features like progress bars, item collections, skill trees, or quest logs, which all track cumulative progress over time. This puts badges as milestones in close neighbourhood with badges as collectables. The difference is that badges as collectables are functionalised as desirable ends in themselves, while badges as milestones are seen and used as indicators of competence and achievement. Participant 65 (male, Codecademy) described this as follows: "You can check your unlocked badges on your profile, and so it provides you a little overview of all the things you've already accomplished." Participant 8 (male, Khan Academy) added that such an overview is a clear indication of the different skills one already mastered since they started using the platform. Also unlike badges as collectables, participants perceiving badges as milestones did not necessarily actively seek out particular badges. Some even voiced pleasant surprise on reviewing them:

> I had no clear idea about how many skills I'd mastered, how many minutes I was watching clips. And then a badge emerged and then I could check: 'Wow, I did this and that, ow, I've already gained than many skills!' I really thought it was interesting to be surprised by how much I've did already. (P80, female, Khan academy)

Participants who treated badges as milestones tended to feel

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enthusiastic and proud about their progress. For example, participant 9 (female, Codecademy) described the milestones as "great", nudging her towards a "positive mindset". This positive sense of progress motivated them to continue their efforts on the course itself, rather than their effort to collect badges:

> [When receiving a badge] you notice 'Ah, I received a badge for this, that's my progress, I've improved'. And that motivates you to continue to the next section. […] So, that has a really positive impact on the learning experience, the fact that you can see that you are progressing, that's an extra boost. (P40, male, Khan Academy)

As this quote also demonstrates, while profile overview pages appear to facilitate functionalising badges as milestones (most of the 32 mentions occurred in the context of discussing badge overview pages), they are not necessary: the perceived sequence of badges over time suffices to afford a sense of progress.

### 4.5. Informing (5 mentions)

#### 4.5.1. Guidance (5 mentions)

The least frequently mentioned category is *informing badges*, entailing only one functionalisation: using badges as *guidance* how to use the platform. The five mentions grouped under this function described checking unlockable badges to get information and instructions about the different things they could do on the platform:

> [When checking the overview of collectable badges], you know what you can still achieve and then you can see something and think 'ah, that's also something I want to be able to do.' And then you see that badge and on it there is 'you have to complete this and this' and then you receive that badge. So that's extra information. […] So by looking at the badges, you see everything that's possible [on the platform]. (P8, male, Khan Academy)

Some Khan Academy participants indicated a social dimension to this: seeing what badges their friends have unlocked would inform and inspire their next actions. Participant 39 exemplified this function in requesting additional features to support it:

> If the site would be more like Facebook or other social media where you could like easily see what people from your circle of friends are unlocking or how they are updating their profiles, then I think the [badges] would be more useful by nature. Because than you would feel like 'oh, they've unlocked that, and he has a nice account, she has a nice icon [badge] or something the like, that is something I want to unlock myself too. (P39, male, Khan Academy)

Information about the environment is a fundamental component of any (cognitive) motivation theory, but precisely because of its ubiquitous and global role in motivational processes, it is not conceptualised and called out as a specific construct with specific function (though see Kuhl, 1986).

### 4.6. Non-engagement with badges

Despite most participants reporting one or even several functionalisations, 29 participants did not engage with badges at all. Four of them simply didn't notice the badges. They voiced surprise during the interviews when they learned that they might have unlocked badges:

> **Interviewer:** Did you know that you could earn badges?
>
> **P11:** No! I didn't know of the badges. […] Oh well, a badge in itself… Yeah, I just wanted to learn how to make a website and I didn't know that I would receive badges for that. (P11, male, Codecademy)

These participants further reasoned that they wouldn't have been interested in badges anyways, but still suggested implementing them more prominently. Says participant 33 (female, Khan Academy): "I think the badges are not being displayed well right now. That's not bothering me as I won't be motivated more or less if I would receive such badges, but for others who do think this is important, it is difficult to notice."

A second group (25 participants) actively ignored the badges. Their reasons mostly revolved around scepticism regarding the badges' effectiveness to motivate them. Participant 3's response is telling in this respect:

> **Interviewer:** After completing exercises, you often received badges. Do you still remember for which activities you received badges?
>
> **P3:** Nope. […] I have absolutely no idea. When I received them, I wasn't interested in them *at all*. So when I saw them, I immediately closed them, just because it has no meaning whatsoever. […]
>
> **Interviewer:** And what did you think about the badges you received?
>
> **P3:** Well… In the end… Well I personally think that's just irrelevant. Come on, badges…
>
> **Interviewer:** And why do you think those badges are irrelevant?
>
> **P3:** Why I think they are irrelevant? Well, I don't know. Yeah, I don't know, um, let me put it this way: I think those badges are nonsense. If you have a certain skill, you know yourself that you are able to do that. […] So a badge doesn't really have any meaning. (P3, male, Codecademy, *respondent's emphasis*)

Several participants echoed a similar lack of perceived relevance. Participant 32 (female, Khan Academy) worded it as follows: "I'm just here to learn, so learning is my goal and all those supplementary things surrounding the learning [like badges], that's not necessary for me […], it's just redundant." This manifest denigration of and self-distancing from badges could be read again as a form of impression management, only this time as an individual who is self-determined and 'properly' motivated enough to not require badges – akin to the participants who functionalised badges as rewards only to distance themselves from their 'childishness.' A few ascribed their disinterest to not understanding the badging system, neither why it was implemented nor how to unlock badges. Says participant 36 (female, Codecademy): "I couldn't get my head around the badges… It was like some sort of reward, but you don't know what for."

Nevertheless, all participants not engaging with badges stated that they should be kept on the platform as they would motivate others. Participant 33 (female, Khan Academy) found that "for me personally, badges could be left out. […] But not for others, as some of them will definitely get something out of [the badges]." This could be a potential third-person effect (Davison, 1983): people believing that media affect others, not themselves.

## 5. Discussion

### 5.1. How functionalisation works

Our first research question asked how students functionalise badges on a gamified educational platform. Here, our data entails five key findings.

*5.1.1 Badges are not motivationally functionalised by every person*

Several participants reported incidentally or even actively ignoring badges because they didn't understand them or found them irrelevant. While the latter could be discounted as impression management, we read the surprise of participants not noticing badges as an honest signal. One reason may have been a lack of gaming literacy, as some participants stated not understanding the badging system. Existing literature assumes degrees of gaming literacy to be linked to generations (Gerling and Masuch, 2011; Mollick and Rothbard, 2014), but our young student

sample suggests differently.

*5.1.2 There are at least nine different ways of functionalising badges on educational platforms* This empirically supports previous theoretical work hypothesising badges (and game design elements more broadly) have multiple possible and actual motivational functions (Antin and Churchill, 2011; Deterding, 2014; Gibson et al., 2015; Sailer et al., 2013). Our empirically grounded functionalisations only partially overlap with previously hypothesised ones (Table 2).

Our data fits predictions by Antin and Churchill (2011) and Sailer et al. (2013) that badges function as *goal-setting*, most purely as a *finish line* or as a *challenge* satisfying competence or achievement needs. Data also revealed *collectables* and *competition* as additional goal-setting functions that align with Reissian basic desires for saving and order (2004) and achievement theory (Brunstein and Maier, 2005), but weren't predicted by prior work. The functionalisation of *impression management* was likewise strongly predicted by prior work, and variously connected to social status (Antin and Churchill, 2011), status recognition (Gibson et al., 2015), or status symbols feeding power – the social, learned need for experiencing control over others (Sailer et al., 2013). Sailer et al., (2013) also correctly predicted an immediate *positive feedback* function of receiving badges, connected to competence and power needs. Our data qualified this in two respects: first, there is a related but distinct progress feedback functionalisation of badges as *milestones*; second, participant statements didn't support a connection to power needs, but were congruent with both competence needs and achievement needs. Finally, we found evidence that badges can be functionalised as *guidance*, as predicted by Antin and Churchill (2011).

We found strong evidence for badges being functionalised as *contingent rewards*, whereas prior work predicted this function for points, not for badges. On the other hand, we found no evidence for badges functioning as *reputation markers* (Antin and Churchill, 2011) or *status recognition* (Gibson et al., 2015). While these may appear identical to impression management, they actually point at a different instrumental utility: demonstrating one's trustworthiness and expertise to others in exchanges like applying for a job or looking for trustworthy information. The lack of evidence on these functions is all the more surprising given that both studied platforms and courses revolve around desirable, career-relevant skills students would likely want to credential. It may be that this function was not salient because Khan Academy and Codecademy are primarily learning platforms, not platforms for instrumental exchanges (such as eBay or Stackoverflow) where badges could gain such direct reputational value. Finally, we found no evidence for badges being functionalised as a means of *group identification* (Antin and Churchill, 2011), which may be due to the reduced social features of the studied platforms. Overall, our results support that different functionalisations exist and connect to different underlying motives, as suggested in our theoretical model (see Fig. 1).

*5.1.3 Different people functionalise the same badges differently, and the same person functionalises the same badges differently* Our participants took the same courses on the same two platforms and thus, on average, unlocked the same badges in the same sequence, yet reported different functionalisations. Numerous *individual* participants reported different functionalisations for themselves. Put differently, there are inter- and intra-individual differences in how people make sense of and functionalise badges. In the case of badges as *contingent rewards*, we also saw that their function depended on users ascribing value to the badge. Unfortunately, our data showed no patterns of particular user characteristics (states or traits) correlating with particular functionalisations. That said, where participants ignored or actively ridiculed badges, potential user characteristics emerged: one is the users' own valued identity and cultural interpretation of badges, evident in participants actively distancing themselves from the perceived childishness of badges. The other is gaming literacy (or the lack thereof), potentially resulting in a lack of understanding of or attention for badges.

*5.1.4 Badge design features can support and thwart but don't initiate or determine functionalisation* Our data revealed several features that support or thwart particular functionalisations: badges as contingent rewards are fostered by a balanced challenge relative to user skill; badges as collectables and milestones were realised when the platform provided a visual overview of unlocked and locked badges; badges as impression management or competition require that other people can see one's badges (and vice versa). This suggests that when it comes to the motivational function of game design elements, even small details of the game elements' design matter. It also underlines that game design elements as currently taxonomised are *under-specified* to reliably cause and predict particular motivational effects.

While we found design details to support/thwart particular functions, our data suggests that it is users who initiate and actively co-construct a given functionalisation, even 'against the grain' of design details, e.g. creating a competition by sharing badge screenshots because the platform doesn't support easy mutual visibility of unlocked badges. Design characteristics alone do not determine the motivational function of badges.

*5.1.5 The impact of context on badge functionalisation remains unclear* Although there is evidence that contexts affect functional significance (Deci and Ryan, 2008), and although our diary form and interview guide (Annexes 3, 4) prompted participants to report on contexts, we did not find stable correlations between particular usage contexts and functionalisations.

### 5.2. How functionalisation impacts experience and behaviour

Our second research question asked how functionalisations impact experience and behaviour. Here, we can summarise our results into two findings.

*5.2.1 Functionalisations can lead to positive or negative experiences and can harm or foster motivation depending on how well the situational encounter caters to them* When participants functionalised badges as contingent rewards, for instance, they liked or disliked badges and were motivated or demotivated depending on whether they perceived the badges to have a meaningful value and require meaningful effort. Participants functionalising badges as positive competence or achievement feedback meanwhile reported negative affect and demotivation when they failed to unlock a badge. In contrast, if participants saw badges as a finish line, not unlocking a badge motivated continued effort until a badge was unlocked. Again, we can see that design features support but don't determine a specific functionalisation, how it plays out, and its resulting effects.

*5.2.2 Functionalisation goes along with purposeful function-oriented behaviour* For instance, participants who functionalised badges as collectables structured and ended their play sessions around unlocking badges and not around completing lessons. Furthermore, they developed strategies to attain new badges with neutral or even negative consequences for their original learning intent, such as targeting easy exercises that would unlock a badge, redoing completed exercises just because the first run didn't unlock a badge, or even cheating. In contrast, players functionalising badges as milestones or challenges reported focusing attention and effort on the course content itself instead of badges unlocked. More generally, our data supports that functionalisations shape motivation which in turn shape experience, behaviour, and ultimate learning outcomes (see Fig. 1). Specifically, depending on the functionalisation of the badge, participants either focused on learning as the ultimate end of engaging with the platform, or this learning goal was crowded out by badges as the ultimate end (collectables) or means to another end (impression management).

### 5.3. Research implications

These results have several ramifications for research. Firstly, they support the main relations of our theoretical framework (Fig. 1) grounded in the concept of *functional significance* (Ryan and Deci, 2017): functionalisation is a differential interpretation process

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that plays an important role in whether and how gamification works, including but going beyond motivation. Functionalisations can impact behaviour and connected (learning) outcomes directly too. It is likely to result in deliberate strategic behaviour that optimises for the sought-after function, even beyond what the gamified system affords, like gaming the system, cheating, or hacking. While prior research has highlighted gaming the system as a potential unintended consequence of gamification (Werbach and Hunter, 2012), our results suggest a predictable mechanism determining whether and why gaming the system occurs, namely how people functionalise the system in use. We also found that details in badge design can foster certain functionalisations or frustrate and demotivate users if sought functionalisations are not well-supported. Therefore, our results support that the contemporary view of user experience as highly situated (Deterding, 2015; Hassenzahl, 2010) holds for gamification as well. Experiences can't be designed, only designed *for*. In extension, gamification design *as such* only provides affordances for people's functionalisation, which ultimately determines their user experience (see Seaborn and Fels, 2015; or van Roy and Zaman, 2017 for similar arguments).

Secondly, this puts a question mark behind the way in which contemporary gamification research taxonomises and studies game design elements. If a seemingly simple design element like a badge does not reliably produce one specific motivational effect, but potentially holds diverse motivational functions, even the current wave of 'mature' gamification research (Nacke and Deterding, 2017) explicitly testing isolated element-motivation links is bound to produce conflicting results. Maybe even more importantly, the very construct 'badge' is underspecified to lead to reliable, replicable effect directions. One way of rectifying this is to differentiate current design elements into more functionally tailored subtypes, like SDT differentiated extrinsic rewards into verbal versus tangible, unexpected versus expected etc. to make sense of the data (Deci et al., 1999). We further need more differentiated and holistic models that capture the design, user, and possibly, context characteristics that work together to spur a particular functionalisation mediating particular, differential motives, experiences, and behaviours.

Lastly, our results shed new light on the mixed effects of gamification in education. We found that learning-supportive or learning-unsupportive motivations and behaviours reliably arose from participants' functionalisations. Badges as challenges, positive feedback, or milestones motivated while keeping the focus on the educational activity. Badges as collectables encouraged students to find loopholes and refocus effort from learning to the badges themselves. These results underline that educational gamification research similarly should move from studies of 'blanket' effects of gamification or individual design elements to more detailed studies of how particular design, user, and context characteristics afford particular motivational and behavioural effects (Cruz et al., 2017; Deterding, 2014; van Roy and Zaman, 2017).

### 5.4. Design implications

For designers, our results yield a number of practical implications. First, specific functionalisations lead to specific motives, experiences, and behaviours. Designers should therefore try to evoke and support functionalisations that support the ultimate purpose of the gamified system – for example, support badges as challenges, milestones, or positive feedback if learning is the intended ulterior outcome. Second, designers should implement design details that support their desired functionalisation to avoid user demotivation. For example, badges as rewards require a sweet spot of required effort and need to be perceived as having some meaningful value. The same design feature may support multiple functionalisations, some of which may be more desirable than others. So even at this level, more granular design details presumably matter. In the absence of mature, validated patterns supporting particular functionalisations, designers can still take functionalisations as their "experiential northstars": eliciting through stakeholder and user research what functionalisations are desirable, and then going through a playcentric design process of iteratively prototyping, playtesting, and revising to slowly close the delta between desired and realised motivational functions (Fullerton, 2008).

### 5.5. Limitations

While our study holds interesting implications for research and design, these are qualified by limitations. Data-wise, a handful of respondents mentioned during their interviews that they forgot to fill out the diary at least once when they used the platform. In addition, "badges" and other game-related language used in the study may have been interpreted differently by participants. During the interviews, participants for instance used different expressions to refer to badges: "stars", "achievements", "pictures" or "little circles". As a result, some participants may again have overlooked interactions with badges and failed to report them during the diary phase. However, since gauging actual use was not the goal of this study, we feel the impact of missing data points on the validity of our findings is limited.

Second, the mother tongue of participants was Dutch. At the time of the study, neither *Khan Academy* nor *Codecademy* provided a Dutch version. Participants were asked to use the English version of either as university students in Belgium are supposed to have sufficient control of English. Nevertheless, nine participants indicated a language barrier to some extent, not understanding everything on the platform. This likely had a negative impact on their experience with the platform, potentially confounding the results. We tried to control for this during the analysis of interviews and diary entries of participants reporting language issues.

Third, reported experiences might be affected by a social desirability bias. We found evidence that some participants voiced active dislike for badges because they are perceived as childish, matching previous work on adults engaging with games and gamification (Cross et al., 2014; De Schutter, 2011; Deterding, 2018). Furthermore, some functionalisations might be less stigmatised than others. For example, impression management was mentioned only sporadically as a function. This can be due to actual low prevalence, but also a result of Western societies actively devaluing overt impression management. As stated in our method section, we took care to ground people's reports in their actual, privately recorded, lived experience to mitigate these effects as much as possible. Still, functionalisations and their positive and negative effects may have been over- or under-reported.

Last, *Codecademy* and *Khan Academy* present very specific badge implementations within a very particular usage content (online learning), studied with a very particular user group (Belgian university students). It is unclear to what extent our results generalise to other badge designs, contexts, or user groups, let alone other game design elements. For instance, the fact that badges operated within a learning not transaction context may have facilitated the use of badges as milestones but thwarted the hypothesised function of reputation to emerge.

### 5.6. Avenues for future research

This limitation leads us immediately to possible future research. If situational, personal, and design characteristics indeed all impact the functionalisation of badges, future empirical work needs to scrutinise badge functionalisations in different contexts and with different user groups. And if our findings hold for badges, similar explorations of functionalisations of other types of game design elements appear in order, which may over time result in different and more differentiated ways of modelling, operationalising, and categorising game design elements. Our interviews held anecdotal data that other game design elements serve functions similar to those of badges. However, as these were not the focus of this study, insufficient data was collected to make any valid conclusions.

Furthermore, although some functions were mentioned more frequently than others, as a qualitative study, our results cannot speak to the potential overall prevalence of functionalisations in different contexts or user groups. Beyond strengthening the validity of our inferences, quantitative studies could shed light on the utility of badges in educational contexts, since some functionalisations were more learning-conducive than others. Connected research into user preferences and designer intentions regarding motivational functions could support more effective gamification design for specific domains like learning.

Since this study was one of the first to empirically probe functional significance in gamification, our findings obviously require replication. As stated, our results paint a far from clear picture what user, context, and design characteristics reliably afford a particular functionalisation. Also, our categorisation of functionalisations is very much initial and open for revision and extension: new functionalisations may emerge in different contexts or with different designs. Similarly, our data often aligned with multiple possible alternative motivational constructs – data in badges as challenges for instance was congruent with both SDT and achievement theory, and badges as a competition might also be interpreted as a challenge with an external rather than internal standard.

Last, this study did not directly assess the link between functionalisation and learning. Therefore, further research should examine this link.

## 6. Conclusion

Do game design elements like badges have a single, fixed motivational effect or multiple, varied ones, depending on how users appraise them? To answer this question, this qualitative study elicited students' functionalisations of badges in two online gamified learning environments and how they affect experience and behaviour. Triangulating an in-the-wild diary study with follow-up interviews, our study found that different people functionalise the same badges differently, with at least nine different functionalisations that partly but not fully match prior theory. Additionally, badges were not motivationally functionalised by every person. Badge design features support but don't initiate or determine specific functionalisations. Functionalisations lead to positive or negative experience and harm or foster motivation depending on how well the situational encounter caters to it. Finally, functionalisation goes along with purposeful function-oriented behaviour: people strategically and effortfully change their behaviour and environment to realise a function that the platform doesn't even afford.

Overall, these findings support that game design has multiple potential motivational functions that depend on how users interpret and use them. Therefore, current game design elements like badges are relevant but underspecified: *relevant* because for many (but not all) users, they do partake in a plethora of motivational functions; *underspecified* because the mere use of a specific type of game design element alone does not reliably bring forth some (let alone some specific) motivational function in all users. As such, this paper opens up a new lens from which to study, interpret and design gamification.

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## Conflicts of interest

None.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijhcs.2018.09.003.

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