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# *A digital badging dataset focused on performance, engagement and behavior-related variables from observations in web-based university courses*

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**Abstract**
This dataset contains participant data related to the use of badging (achievement) feedback in pedagogical design. Two sections each of web-based graphic design and web design undergraduate courses were offered at the University of Central Florida. A badging system for achievements was included in one section of each. Performance, engagement and behavior-related data were collected. The dataset comprises complete data from 44 undergraduate students. This paper includes a justification for data collection, methodology and preexisting usage of the data. It also discusses limitations of the dataset.

## Dataset

Identifier: doi:10.6084/m9.figshare.1177986
Creator: McDaniel, R. & Fanfarelli, J.
Collection Date: Spring 2014
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Format: Excel Spreadsheet (.xls) and Word Document (.doc)
Restrictions to use: None

## Introduction

Reward and feedback are powerful instructional tools when properly implemented. One meta-analysis, including 96 experimental studies, showed that reward is beneficial in a majority of situations (Cameron & Pierce, 1994). The authors concluded that negative effects elicited by reward are only prevalent in one specific circumstance—when expected tangible rewards are given for mere completion of a task. When these conditions are present, intrinsic motivation, or the motivation to complete a task for its own benefit, is decreased. Feedback was examined in another meta-analysis including 131 studies and 12,652 participants (Kluger & DeNisi, 1996). This meta-analysis concluded that feedback tends to be more effective when it is provided for correct responses instead of incorrect responses, and when it builds upon itself in response to corrective changes between trials. However, reward and feedback can be given in a multitude of forms—verbal, written, virtual, real, tangible, intangible, etc. This complicates the process of determining ideal forms of feedback and reward for specific pedagogical objectives. Further research is needed to identify the parameters in which specific types of feedback and reward are most effective.

Digital badging represents one such specific method for providing feedback and reward in the classroom. In this study, a badge was defined as a marker of achievement that exists in virtual space and is awarded for the completion of pre-specified criteria (Frederiksen, 2013). An educational badging system may be split into three distinct parts—the badges, the badge giver and the badge receiver. Simply put, the *badge giver* is typically the educator, whereas the *receiver* is the learner.

The role badges play within a learning environment can be more complex. Operationalizing the definition presented by Hamari and Eranti (2011), badges are goals, within a badging system, which are fulfilled through activities in a learning environment. While this definition classifies badges as goals, they can, and often do, simultaneously act as a reward or recognition (Blair, 2012). As a reward, a badge is a visual symbolic representation and recognition of achievement of pre-specified goals. Badges can be conceptualized as forms of extrinsic reward, or rewards that are external and not mediated within the reward earner (Deci, 1972). Although rewards can be beneficial, extrinsic rewards can be detrimental to motivation and performance. However, badges can also be examined through another paradigm, that of the feedback mechanism. *Feedback* is information that is provided to a learner, meant to enhance their understanding of their performance or comprehension (Hattie & Timperley, 2007). The key term is *information*. When badges begin to offer information about their performance on a task (eg, assignment or examination), they move beyond motivation-reducing extrinsic *reward* and transform into enhancing *feedback*.

It is important to begin considering how badges can be used, but research is necessary to identify if and when these uses of badges can be beneficial. Badging is becoming a focal point in commercially sponsored research (Grant, 2014), and the information acquired from this variety of study is useful, but empirical study is a necessary method in understanding if, when and how badges can be used most effectively. The information presented here achieves a step towards this goal. Specifically, this paper presents performance- and engagement-based data collected in response to the implementation of feedback-based badges within a university course setting.

**Research methodology**

Data were collected during the spring semester of 2014 from 44 (24 male and 20 female) undergraduate students at the University of Central Florida. Participants were recruited from two web-based web design course sections and two web-based graphic design course sections, offered as electives within the School of Visual Arts and Design. The courses targeted junior and senior level students, although some freshmen and sophomores participated. All sections had the same instructor and were similarly structured in terms of quizzes, exams and project-based assignments.

Both courses were designed as certification preparation courses for the Adobe Certified Expert Exam. Web design focused on Adobe Dreamweaver software, whereas Graphic Design placed emphasis on Adobe Photoshop. Both courses implemented project-based assignments, exams, quizzes and a cumulative final exam.

For each course, one section included badges and one did not. Twenty-two distinct badges were earnable (see Badge_List.xls), a few of which were exclusive to each course's subject matter, but only 18 were awarded because no students satisfied the criteria necessary to earn the other four. In accordance with best practices established by the literature, badges were almost entirely performance-based (Abramovich, Schunn & Higashi, 2013). Although badges were virtual and image based, their descriptions included written verbal elements. All badges were awarded and received through the course management interface and were stored in a page that was accessible from the course's home page. Specific badges were awarded for students earning high scores on the assignments, exhibiting work with exceptional effort or creativity, turning in assignments

early or completing work demonstrating other beneficial behaviors. The only exception was the starter badge that was given to everyone at the beginning of the course. This badge was provided to inform the students that a badging system was included in this course, while familiarizing them with the methodology for being awarded and viewing their badges. The criteria required for acquiring the badges were not listed. This was done to encourage exploration and discourage completing assignments for the sole purpose of earning badges (i.e., to mitigate reduction in intrinsic motivation), as suggested by Blair (2012).

Badges were awarded in one of two ways: automatically, by the course management system, or manually, by the instructor. Badges that used a strict performance requirement, such as earning 100% on a project, were awarded automatically by the system. Badges that required human subjective evaluation (e.g., A badge that was awarded for exceptional effort on a project) were awarded by the instructor. To maintain consistency, no teaching assistants participated in the course. All grading and badge evaluations were conducted by the instructor. A list of all badges and their criterion are included in the repository.

**Data collection**

All questionnaires were completed online through a reputable commercial survey collection website (Qualtrics). Questionnaires were made available 3 weeks before the end of the course to provide ample time for completion. Although the demographics questionnaire was developed by the authors to assess specific information of interest, all other questionnaires are not the authors' original work. The following questionnaires were used:

*Demographics questionnaire*

The Demographics questionnaire acquired information about gender, experience with video games, web-based courses and badging systems. This also included questions to assess prior experience with badging in video games to account for bias that may be inherent in the digital media student population. The development of these questions did not follow a singular model but were written to imitate Likert scale questions common in human subjects research.

*Engagement measure*

The Engagement measure (Charlton & Danforth, 2005) measured the construct of engagement. Although the measure has not yet received formal validation, it has received repeated use for the purpose of measuring engagement in video games and simulations (eg, Ortiz, Maraj, Salcedo, Lackey & Hudson, 2013; Peters & Malesky, 2008). Student engagement can facilitate the learning process by improving student effort, time on task and otherwise enabling students to want to take an active role in the educational process (Kuh, 2009).

*Interest/enjoyment subscale of the intrinsic motivation inventory (IMI)*

The Interest/enjoyment subscale of the IMI (Ryan, 1982) is a validated (McAuley, Duncan & Tammen, 1987; Mohammad, 2011) instrument used to assess intrinsic motivation. As badges can be considered extrinsic rewards, and as extrinsic rewards can have a negative effect on intrinsic motivation, examining this construct enabled a deeper understanding of the role badges actually played within the learning environment.

*Long-Dziuban reactive behavior checklist*

The Long-Dziuban reactive behavior checklist (Dziuban & Dziuban, 1998) is a validated (Cioffi, 1995; Long, 1985) instrument used to assess reactive behavior type and associated traits. This instrument enabled a closer examination of the impact of learner individual differences on badging effectiveness.

*National survey for student engagement (NSSE)*

The NSSE (NSSE, 2014) is a validated (Pike, 2006) tool used to assess factors related to student engagement, including collaborative learning, reflective and integrative learning, student faculty

interaction, higher order learning, effective teaching practices, learning strategies and student satisfaction. Some questions were removed to better suit the structure of the course. For example, a question was removed that assessed course presentations because students never gave presentations in the course. The complete modified questionnaire is included in the repository. Including the NSSE enabled an examination of the specific facets of engagement that were affected by badging.

Additionally, final percentage grade (as determined by traditional 0–100% grading on assignments and quizzes) and total number of badges earned were collected for each participant, along with a breakdown of which badges each participant earned.

**Data processing and use**

Eighty-nine participants initially consented to participation in this study. However, only 44 participants had complete datasets. Datasets were considered complete only when a participant had fully answered the questions on all questionnaires. Participants were asked to complete the questionnaires online. Participants completed them during their free time with no reward incentive; in response, several participants never completed any of the questionnaires, whereas many other participants completed some, but not others. No discernible patterns of differences were observed in the available data between complete and incomplete datasets. Incomplete datasets were thus discarded instead of imputed, bringing the total number of datasets to 44.

Data from questionnaires were exported from the website in Microsoft Excel format. These data were then aggregated and organized into a new Microsoft Excel file. Data were checked against their original source, multiple times, to ensure error-free transfer. Comments have been included with most of the headings to facilitate comprehension of the data in each column. Also, associated columns were color matched to signify unity and improve readability.

These data were originally collected for three primary purposes. First, these data were used to evaluate individual differences in the collected performance and engagement variables. Individual differences were assessed between Long-Dziuban reactive behavior types and traits (individual types and traits, grouped by aggressive *vs.* passive types, and grouped by independent *vs.* dependent types), frequency of interaction with badging systems (high *vs.* low), perceived importance of badges (high *vs.* low) and gender (male *vs.* female). Second, correlations were assessed, both globally, and in conjunction with the categorizations listed for individual differences. Finally, after establishing correlations, badges were assessed for their ability to predict final grade.

Researchers may find value in aggregating this data with other datasets to draw broader conclusions, or simply to increase sample size and improve statistical power. These data may also serve a similar role to a pilot study; although the sample size is smaller, it contains data that may lend insight that would enable more informed design of future experiments. A particular strength of this dataset is its breadth. Several different measures were used on the same population. The combination of the results of these measures is likely to raise more questions that would be interesting to explore in future studies.

**Ethical considerations**

All data collection was approved by the University of Central Florida's Institutional Review Board. No minors or other special populations were targeted for this study.

**Limitations**

This study examined students in a natural setting, asked to participate only after enrolling in the course. As a result, the sample size is not as large as would be desirable. Therefore, aggregating data from this dataset with other datasets, obtained under similar conditions, may yield results that are more robust to experimental replication than solitary use of this dataset.

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