

Investigating High School Students' Perceptions of Digital Badges in Afterschool Learning

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ABSTRACT

This paper investigates high school students' perceptions of the opportunities and challenges of using digital badges to recognize and reward the skills and achievements they acquire in an afterschool science education program. Focus groups and usability tests were conducted with 10 students during the design of a badge system prototype for use in the program. We found that students recognized opportunities for personal empowerment in their use of badges, but also expressed concerns about sharing badges in various online contexts. The findings provide new insight into the values and goals that learners bring to discussions of digital badges in education. These insights hold relevance for designers of education-based badge systems as well as educators seeking to introduce badges into their practice.

Author Keywords

Digital Badges; Education; Gamification; Human Factors

ACM Classification Keywords

H.1.2. Human Factors; H.5.2. User Interfaces; K.3.1. Computer Uses in Education.

INTRODUCTION

Though once the purview of video games, digital badges are increasingly being used in non-gaming environments like MOOCs (e.g., edX), question and answer forums (e.g., oDesk), and consumer product purchases (e.g., American Express). There is growing interest in using badges to recognize and reward learning in a variety of education contexts, both formal and informal. As web-enabled digital icons containing metadata associated with specific learning goals, practices, and outcomes, digital badges represent an alternative credentialing system aimed not only at recognizing learning within particular settings, but also connecting learning across disparate settings [11].

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CHI 2015, April 18–23, 2015, Seoul, Republic of Korea.
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<http://dx.doi.org/10.1145/2702123.2702413>

Several major cities across the United States, including Chicago, Dallas, and Los Angeles, have implemented digital badges on a large scale across a variety of learning settings. However, the implementation of badges is growing considerably faster than research on their effectiveness at motivating, rewarding, and connecting learning [6]. In particular, we lack knowledge of students' attitudes toward badges in educational settings, insight that is critical to designing gameful systems that support learning [8].

This study examined high school students' perceptions of digital badges within the context of an afterschool science education program. We conducted focus groups and usability tests with students to inform the design of a digital badge system that recognizes the skills and achievements students acquire in the program (Figure 1). Our analyses identified specific ways that badges support student empowerment by putting them in control of their learning pathways. We also uncovered concerns that students expressed in relation to sharing badges outside the context in which they were earned. This investigation contributes new empirical findings that will support the design and implementation of badge systems in education.

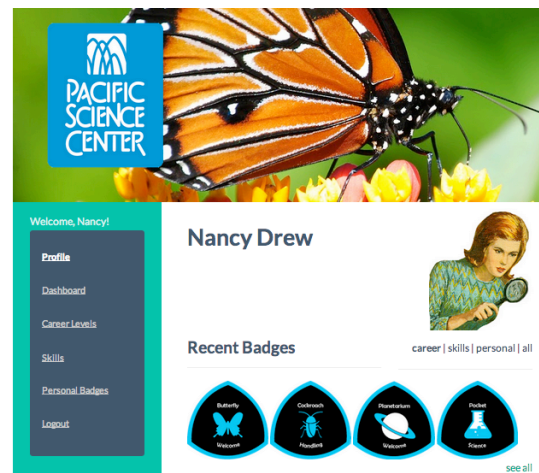


Figure 1. Badge system prototype developed to reward learning in an afterschool science education program.

PREVIOUS RESEARCH

Existing research on digital badges in education focuses on the motivational effects of badges within particular learning contexts. Denny [6] examined the impact of a badge-based achievement system on college students' engagement with an online learning tool. Badges increased the quantity of students' contributions and length of time they engaged without decreasing the quality of contributions. Students reported high levels of enjoyment and a preference for having badges incorporated into the online interface.

Abramovich et al. [1] examined the effects of using badges in an intelligent-tutor system for teaching applied mathematics to middle school students. The motivational effects differed across learners with different levels of prior knowledge. Researchers found a negative motivational effect of earning participatory badges (vs. skill badges) for learners with little prior subject knowledge. They suggest that designers of educational badge systems must take into account the characteristics of individual learners and how they might interact with different types of badge designs.

These studies provide insight into the motivational effects of badges *within* systems. However, an important part of current discussions about digital badges relates to their ability to facilitate connections *across* systems so that skills and achievements gained in one setting can be recognized and used to unlock future opportunities in another setting [2,9,11]. By facilitating such connections, badges have the potential to support the visibility of learning pathways that span multiple contexts. To this end, Mozilla, developer of the Firefox browser, has developed an open standard to support the interoperability of badge systems [5]. Rughinis [12] observes that this interoperability makes it possible for badges to serve as "boundary objects" [3] that help to negotiate meaning across contexts. Yet, he notes that considerable interpretative work is required to make sense of badge collections, raising challenges related to validating the credibility of badges earned in diverse contexts.

To summarize, initial research into badges suggests beneficial effects on learners' motivation levels, but the ratio between speculation and empirical evidence remains high. As badges are introduced into more learning environments, there is a need for research on the value that users ascribe to badges within and across systems. By focusing on users' experiences, the current study investigated the research question: "What are students' perceptions of the opportunities and challenges of using digital badges to recognize learning in afterschool settings?"

METHODOLOGY

The study took place in January-May 2014. Inspired by design-based research [7], focus groups and usability tests were conducted before, during, and after the design of a digital badge system prototype intended to recognize the skills and achievements that students gain by participating in an afterschool science education program. The iterative input

from youth guided each stage of the design process and led to the articulation of two types of badges: those that are internal and those that are external to the program. Career badges were designed as a *within* system badge that mark students' progress through the various levels of the science program. Personal badges are another type of within system badge; students identify personal goals in the program and articulate corresponding badges that embody those goals. By contrast, skill badges were design as an *across* system badge documenting students' attainment of skills, such as public speaking, that would be of interest to external audiences like college admissions officers.

Context and Participants

Participants included 10 high school students in grades 9-12 who were current members of a science center-based youth development program intended to develop students' interest in science and promote their college and career readiness. Seven students took part in two focus groups (4 students in focus group #1, 3 students in focus group #2), and 6 students (3 of whom participated in focus group #2) took part in usability tests associated with the design of the badge system prototype.

Procedure

Focus groups were conducted during the design process as a method to elicit multiple viewpoints concurrently regarding students' pre-existing perspectives on and experiences with badges. Questions assessed students' prior knowledge of badging systems; their interest in earning digital badges to mark their progress in the program; and their thoughts on using science center badges in other contexts like college applications. Each group also went through a design exercise in which they were asked to consider the skills they gain in the program, and to identify one that might be a good candidate for a badge. This input guided the design and structure of the badge system prototype, which consisted of a website through which students could see their earned badges and track their progress in the program. The first usability test was conducted after completing the initial prototype. Students were invited to tour the badge website while narrating aloud their impressions as they encountered different design elements. The second usability test followed this format and was conducted after updating the prototype based on feedback from the first session.

Data Analysis

Data for the present analysis include verbatim transcripts of students' comments during focus groups and usability testing; researcher field notes; and collective notes recorded on chart paper during the focus groups. Two researchers worked collaboratively throughout the investigation to identify and document themes relating to participants' attitudes toward using badges inside and outside the science center. The themes were shared with the program staff and youth during and after the design of the badge system prototype. These "member checks" served as a means to

validate the findings reported below by confirming that the themes identified by the researchers aligned with participants' lived experiences [10].

RESULTS

Empowering Learner Pathways

Consistent with earlier research, youth participants affirmed the motivational aspect of digital badges, which they related in particular to a sense of empowerment associated with earning and displaying badges online. In the usability testing, participants commented on the usefulness of the progress bar that shows their progress toward earning particular badges as well as their overall progress through the program (Figure 2). One student contrasted this digital monitoring mechanism with the paper-and-pencil system currently used in the program: “[The progress bar] really helps...Right now I feel like I've completed all my [level 2] stuff, but I'm not [sure]...I think I completed it but nothing's happening. No one is telling me what I'm supposed to do...” This quote illustrates the desire expressed by several youth to take more ownership over their experience in the program by monitoring their progress independently without having to ask an adult supervisor how they are doing or what they should be doing next. A digital badge system consisting of a personal profile page for each student empowers youth to manage their experiences in the program and inquire about next steps rather than waiting to be told what to do by a program coordinator. Remarkably, one student in a usability test: “I like that, how it's laid out where you can see the specific, ‘Okay, here's what I need to do before moving on.’”

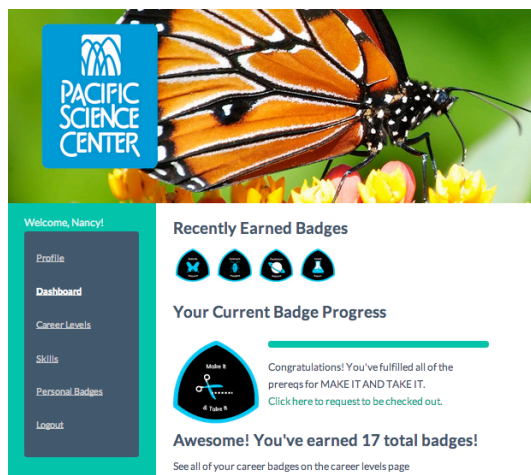


Figure 2. Dashboard page showing user progress.

In light of the fact that profile pages are visible to other program members, youth commented on the value of being able to look at their peers' progress as well as their own. One youth observed: “From where I am right now, I would definitely like [to see other people's profiles], so, if I had any questions on something I'm learning, I could see whoever knew, or who's an expert. I could ask them.” This quote points to the value associated with being able to look at

others' profiles in order to help youth visualize their own pathways to success in the program.

Consistent with the theme of personal empowerment, several of the focus group participants asked if—or assumed that—they would have the ability to self-assign badges for personally defined skills they felt they had gained. As a result of this input, designers developed a personal badge component that recognizes the individual goals and achievements of students.

Connecting Contexts

Though connecting skills and experiences across learning contexts is a major emphasis of Mozilla's open standard for digital badges, all but one student in the present study were uninterested in using badges to link their afterschool science activities more closely with their school lives. This sentiment is likely related to the fact that youth participants said they rarely talk to their friends or parents about what they do at the science center, and they do not typically consider or perceive topical connections across these contexts. Students value this separation because it allows them to carve out an experience distinct from their friends and family; they derive a sense of autonomy from knowing their participation in the afterschool program is theirs alone.

Similarly, with one exception, the teens expressed a resistance to linking a professional badging system to their personal social media profiles such as Twitter, Instagram, and Facebook. Several students alluded to the idea of not wanting to “brag” about their extracurricular accomplishments to their peers. They also said that constant online updates would likely get “annoying” to their friends. These sentiments reinforce earlier research showing that teens value the ability to keep certain of their social contexts separate from each other [4].

The one external connection that students unanimously endorsed was using badges to help gain access to college, or college credit. Students pointed to the opportunity for badges to recognize “soft” skills like public speaking and leadership that are difficult to measure and communicate to external audiences. One student commented on the value of being able to share these skills on a college application: “I think it would be a good idea if we could show colleges or other people things you know. But if it were just, ‘Oh I have these badges on this one site,’ and no one else uses it, it's not going to be as effective.”

Embedded in the previous statement is the recognition that in order for badges to unlock opportunities such as college admissions, they must be widely available and recognizable as holding a particular value outside their original context. Indeed, all focus group participants raised concerns about standardization of digital badges. When a badge is awarded, it is necessarily based on the judgment of an individual or group of individuals. Students wondered how the rigor behind badges could be compared across institutions, and how the credibility of the awarder could be established.

DISCUSSION

The findings support and extend earlier work pointing to the potential for badges to motivate learners [1,6,11]. Students valued the ability to take control of and track their progress through the afterschool science program; examine their peers' progress in order to visualize future pathways; and use personal badges to shape an individualized learning experience. Collectively, these themes suggest that a key motivational element of badges is the empowerment that students experience when they are placed in control of their learning. This insight represents a new empirical contribution to our understanding of the potential of badges from the learner's perspective. Designers of educational badge systems can make use of this insight by seeking ways to design for personal empowerment, for example, by including a progress bar on users' profile pages and making it possible for users to design and create their own badges based on personal goals and achievements.

Proponents of digital badges celebrate their transportability, which is thought to help learners connect their skills and achievements across contexts [9]. However, the youth participants in the current investigation were not interested in using badges to connect their science center experiences with their school lives, and they did not want to share these experiences with their friends or family members. They did value the ability to use their badges in the college admissions process, but they raised concerns that such external audiences may find it difficult to assess the worth of a particular badge without some level of standardization in the badge awarding process.

These findings suggest that designers must take into account the values that students bring to discussions and uses of digital badges in education. Specifically, they must consider the particular contexts in which students do and do not wish to display their badges based on their specific educational, social, and personal goals.

CONCLUSION AND FUTURE WORK

The findings from this study provide new and needed insight into learners' perceptions of the opportunities and challenges of using digital badges in education. Students were attracted by the ability to take personal control of their learning, but they were wary of sharing their badges across social contexts they experience as distinct. Students also wanted to know that their badges would have value to external audiences like college admissions officers, suggesting the ongoing discussion among designers about standardization, validation, and credibility of badges is one that is also of importance to the badge earner [5,11].

In future work, we will use the insights gained from this study to further refine and implement a fully functional badge system for use in the science center program. Upon

implementation, we will track students' evolving experiences with and perspectives on the badge system. The results will provide needed insight into whether the opportunities and challenges identified in the current study bear out as students use the badge system on a daily basis.

ACKNOWLEDGMENTS

The authors would like to thank the staff and students of the afterschool science program for their support of and participation in this research.

REFERENCES

1. Abramovich, S., Schunn, C., & Higashi, R.M. Are badges useful in education? it depends upon the type of badge and expertise of learner. *Education Tech Research Development* 61, 2 (2013), 217-232.
2. Antin, J. & Churchill, E. Badges in social media: a social psychological perspective. *SIGCHI 2011*, ACM (2011), 1-4.
3. Bowker, B. & Starr, S. *Sorting things out: classification and its consequences*. MIT Press, Cambridge. 2000.
4. boyd, d. *It's complicated: the social lives of networked teens*. Yale University Press, New Haven. 2014.
5. Casilli, C. Mozilla Open Badges: the ecosystem begins to take shape. 2012. <http://carlacasilli.wordpress.com/2012/07/31/mozilla-open-badges-the-ecosystem-begins-to-take-shape/>
6. Denny, P. The effect of virtual achievements on student engagement. *SIGCHI 2013*, ACM (2013), 763-772.
7. Design-Based Research Collective. Design-based research: an emerging paradigm for educational inquiry. *Educational Researcher* 32, 1 (2003), 5-8.
8. Deterding, S., Dixon, D., Khaled, R., and Nacke, L. From game design elements to gamefulness: defining "gamification". *Proc. MindTrek '11*, ACM (2011), 9-15.
9. Ito, M., Gutiérrez, K., Livingstone, et al. *Connected learning: an agenda for research and design*. 2013. http://dmlhub.net/sites/default/files/ConnectedLearning_report.pdf
10. Lincoln, Y. S., & Guba, E. G. *Naturalistic inquiry*. Sage, Beverly Hills. 1985.
11. Riconscente, M.M., Kamarainen, A., & Honey, M. STEM Badges: current terrain and the road ahead. New York Hall of Science. 2013. http://badgesnysci.files.wordpress.com/2013/08/nsf_stem_badges_final_report.pdf
12. Rughinis, R. Talkative objects in need of interpretation: re-thinking digital badges in education. *SIGCHI 2013 Extended Abstracts*, ACM (2013), 2099-2108.