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Taking badges to school: A school-based badge system and its impact on participating teachers



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ABSTRACT

While current research on badges typically examines the relationship between badges and learners' motivation, this study explores a badge system's impact on participating teachers. Through qualitative analysis, the data suggests that the badge system provides teachers with new information about students not readily available through typical school-based interactions. Additionally, while the badge system initiated new meetings and opportunities for teachers' joint work, the data did not suggest that these collaborative activities established a public practice of instruction for participating teachers nor did the teachers report changes in their instructional practice. The paper ends with implications and plans for future research.

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1. Introduction

Advocates of educational badges internationally suggest that badging and badge systems may support learning, learners' motivation and make public the accomplishments of learners (Gibson, Ostashevski, Flintoff, Grant, & Knight, 2013; Finkelstein, Knight, & Manning, 2013; Alliance for Excellent Education, 2013). Specifically, they draw comparisons between the traditional assessments of formal schooling and the badge-based assessments of informal learning and virtual settings. The suggestion is that the pedagogical advantages of scouting or game badge systems can be extended to other educational opportunities. For example, schools are beginning to explore the potential badges could play in enriching the learning experiences provided for students (Wardrip, Abramovich, Bathgate, & Kim, in press).

However, while offering opportunities for re-organizing students' educational experiences, badges also face the challenges of other innovations that have been 'brought to school.' For example, there is empirical evidence that suggests that educational games can help students build powerful epistemic frameworks (Shaffer, 2006). However, many schools, restricted by standardized testing or curricula, cannot implement the games as intended and consequently reduce or remove any educational value of a game. It is possible that as badges are incorporated into schools then their pedagogical could be similarly lessened or absent.

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In order to better understand how badges could be successfully implemented in schools, this work addresses two areas of research on badges that have yet to be developed. While the extent research literature on badges has primarily addressed the potential of badges in distributed digital environments (e.g. Abramovich, Schunn, & Higashi, 2013; Ahn, Butler, Alam, & Webster, 2013; Barker, 2013), this study will describe a functioning badge system in a school setting. In addition, although the current research on badges typically examines the relationship between badges and learners' motivation (Abramovich, Higashi, Hunkele, Schunn, & Shoop, 2011; Abramovich et al., 2013; Ahn et al., 2013), this study will describe the impact of a badge system on participating teachers (i.e., the teachers who facilitate the badge system in the school). By focusing on these two areas, this study begins the process of unpacking how badges function in formal learning environments by providing analysis that could lead to successful implementations of school-based badge system. The focus of our analysis is on practical implications for digital badges from our data as well as connecting those implications with extant, relevant learning research.

The findings of this study are drawn from a qualitative analysis of interviews from participating teachers, the principal, and students, as well as a review of badge-related documents from a school that completed two years of a badge system. The analysis applied a conceptual framework to address the ways in which the badge system provided teachers new information about students, the ways in which the badge system encouraged collaborative activity among teachers, and the ways in which it impacted the participating teachers' instructional practice.

There are several noteworthy findings from this study. First, the data suggests that the badge system did provide teachers with new information about students not readily available through typical school-based interactions. This information included students' interests and strengths as well as challenges students face outside of school. Additionally, while the badge system initiated new meetings and opportunities for joint work, the data did not suggest that these collaborative activities established a public practice of instruction for the participating teachers. Finally, most of the teachers did not acknowledge changes in their instructional practice related to their participation in the badge system.

While these findings originate from a focused study of only one school, the data offers implications for future school-based badge implementations. First, a badge system could be an element of an information infrastructure of teachers to support data-informed instruction. Explicitly accounting for student information in future designs could make teachers more aware of what they are learning about students. In addition, future badge system designs should consider norms of collaboration, such as protocols, to facilitate the potential of teacher collaborative work around the badge system. Finally, while the badge system presented the teachers with new elements of instructional practice, such as technological tools, rubrics, and disciplinary practices, future badge system designs should support the chance for new instructional practices to emerge.

2. Theoretical perspective

2.1. Background on badges for learning

Badges have a long history of documenting accomplishments (Halavais, 2012). Defined as "... a symbol or indicator of an accomplishment, skill, quality or interest" (Open Badges Working Paper, 2011), badges are public representations of what one has learned, accomplished and experienced (Gibson et al., 2013; Plori, Carley, & Foex, 2007). While much of the literature on badges characterizes them as digital or inhabiting digital spaces, badges can be both digital or tangible (Halavais, 2012). One of the most common referents for badges in communicating what they are is the tangible - merit badges that are awarded to scouts of the Boy Scouts of America,¹ the Girl Scouts of America,² or international Scout Associations.³

Another possible origin for the modern educational badges is from video and computer games. Built as "... secondary reward systems that have been developed for digital games" (Montola, Nummenmaa, Lucero, Boberg, & Korhonen, 2009, p. 94), these badges are designed to provide represent deeper levels of engagement and experience by providing more opportunity for players to receive feedback (De Paoli, De Uffici, & D'Andrea, 2012). They are viewed as optional reward structures that can scaffold a users' direction through a game as well as increase player motivation. Consequently, badges can be considered a game mechanic or a type of gamification (Deterding, Dixon, Khaled, Nacke, O'Hara & Dixon, 2011; Zichermann & Cunningham, 2011). Taken within this context, badges would be thought of as a way to shape the way a player plays a game.

2.2. Taking badges to school

By implementing a badge system in a school, the explicit goal is to positively influence student learning. However, efforts to innovatively improve teaching and learning in schools have a checkered history. As Ann Brown has written, "... successful interventions are a chimera or at least are extremely fleeting and fragile, not readily transportable to settings outside the innovator's control" (1992, p. 172). This is especially true with respect to technological innovations (Gomez, Gomez & Gifford, 2010).

Ultimately, innovations fail to impact the "core technology" of schools, which is classroom teaching and learning (Hawley & Valli, 1999). This core technology has been further specified for schools as the "instructional core," or the interrelationship

¹ <http://www.scouting.org/meritbadges.aspx>.

² www.girlscouts.org/program/basics/for_volunteers/where_to_place/junior.

³ <http://scouts.org.uk/what-we-do/badges-and-awards/>.

between teaching, the content, and student engagement (City, Elmore, Fiarman, & Teitel, 2009). The success of any school improvement effort is intimately tied to the instructional core. As City and colleagues write, “If you can’t see it in the core, it’s not there” (City et al., 2009, p. 4).

Project-based Learning (PBL) can serve as an example of how an innovation can be challenged in impacting the core technology of schools. PBL is an instructional approach that organizes learning around the doing of projects (Barron & Darling-Hammond, 2010; Mergendoller, Maxwell, & Bellisimo, 2006; Mergendoller & Thomas, 2000; Savery, 2006). Similar to badges, PBL requires that teachers and students engage in new and different classroom practices that are not easily achieved (Krajcik, Blumenfeld, Marx, & Soloway, 1994). And just like badge systems, PBL seeks to provide students with a degree of independence that is not often afforded in school and connect real-world applications with in-school learning.

While researchers have documented successful implementations of PBL in schools that result in increasing the implementation of projects by teachers (Blumenfeld, Kempler, & Krajcik, 2006) and gains in students’ performance on assessments (Geier et al., 2013), there is also documentation of challenges to the implementation of PBL such as, “a major hurdle in implementing project-based curricula is that they require simultaneous changes in curriculum, instruction and assessment practices—changes that are often foreign to the students as well as the teachers” (Barron et al., 1998).

Consequently, researchers sought a framework for assessing the usability or “fit” of PBL within schools (Blumenfeld, Fishman, Krajcik, Marx, & Soloway, 2000; Fishman, Marx, Blumenfeld, Krajcik, & Soloway, 2004). Consequently, the conceptual framework described in the next section of this paper is designed to act as the foundation for an eventual development of measures of usability or fit for badges.

2.3. Conceptual framework

The conceptual framework to examine the school-based badge system is based on three conjectures. These conjectures are drawn both from general trends in instructional reform as well as reasonable features of the badge system that align to these reforms.

- The badge system provides teachers with new information about students that may guide their support of students.
- The badge system provides teachers with new social arrangements to support collegiality and professional community.
- Teachers’ involvement in the badge system supports changes in teachers’ instructional practice.

First, it is worth noting that this conceptual framework intentionally directs the lens of this implementation on the teacher. While Blumenfeld, Fishman and colleagues point out the importance of other elements for implementation and scaling of innovations (Blumenfeld et al., 2000; Fishman et al., 2004), there is reason to focus on the role of the teacher. While some badges are issued in online systems through the moderation of users (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2013; Kriplean, Beschastnikh & McDonald, 2008; Oktay, Taylor & Jensen, 2010) or through the execution of a game system (Holopainen & Bjork, 2005; Moore, 2011), badges implemented in place-based learning settings depend on teachers or other facilitators for implementation and assessment. Because teachers play a key role in the success of a badge system in a school, it is important to understand how teachers interact with a badge system.

- *Conjecture #1:* The badge system provides teachers with new information about students that may guide their support of students.

An emerging body of research on data informed instruction suggests that using student data can be important for instructional and school improvement (Halverson, 2010; Hamilton et al., 2009; Mandinach, 2012; Marsh, 2012; Wayman, Cho, Jimerson, & Spikes, 2012). As an innovation, the badge system presents a choice-based learning environment for students: students choose to participate in the badge program, they choose the badge they intend to earn, and they choose the task or activity with which they may demonstrate their skill or competency in this work. Evidence of student choice in their badge related work or interactions with teachers’ supporting students progress through badges can reveal can potentially reveal such things as students’ interests, aspirations, and talents that may not be visible to teachers through their typical classroom interactions.

However, despite badges facilitating opportunity for students exercising choice and interacting with teachers does not ensure that teachers will glean new information about students. Being attuned to student information and being able to think about that information instructionally (i.e., translating that new information for instruction) is a challenging pedagogical skill and one that needs to be explicitly fostered (Mandinach, 2012; Mandinach & Gummer, 2013; Mandinach & Jackson, 2012).

- *Conjecture #2:* The badge system provides teachers with new social arrangements to support collegiality and professional community.

School has long been characterized as isolating teachers (Lortie, 2002). However, research over the past twenty years has suggested that de-privatizing instructional practice and building professional communities of teachers can be important for school improvement (DuFour, 2004; Grossman, Wineburg, & Woolworth, 2001; Louis, Kruse, & Bryk, 1995; McLaughlin &

Talbert, 2001; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006). One way that professional communities have been intentionally developed is through a focus on student learning (Louis et al., 1995) and through shared collaborative practices directed on that focus, such as looking at student work through critical friends groups (Little, Gearhart, Curry, & Kafka, 2003), teacher protocols (McDonald, Mohr, Dichter, & McDonald, 2013), or lesson study groups (Lewis, Perry, & Murata, 2006).

School based badge system, if similar to other badge systems, require implementation from a cadre of teachers. The result is a common activity around which teacher professional community could form. In addition, there are potential features of badge systems that suggest teacher collegiality may be impacted. For example, teachers could use regular meetings for facilitating specific badges as opportunities to also foster shared assessment practices.

Focusing on the potential to increase teacher collegiality through the implementation of an innovative program (i.e., badges) is important because research suggests that building professional community and collegiality within schools is complex (Moller, 2006; Supovitz, 2002; Wells & Feun, 2007). This is due, in part, to inhibiting factors such as the organizational structures of schools (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; Louis et al., 1995), the culture of schools (McLaughlin & Talbert, 2006), and the beliefs of teachers with respect to collegiality and public display of teaching (Darling-Hammond & McLaughlin, 1995; Thompson, Gregg, & Niska, 2004), all of which impact the extent to which a professional learning community and teacher collegiality builds within a school.

- *Conjecture #3*: Teachers' involvement in the badge system supports changes in teachers' instructional practice.

As innovative programs are integrated in schools and require teachers to adopt new practices, they also provide embedded learning experiences for teachers (Bakkenes, Vermunt, & Wubbels, 2010). Therefore, understanding how a new program, tool, or activity impacts the instruction of teachers directly and indirectly can be useful. In the case of multi-faceted interventions like PBL, the impact on teachers' instruction can be multi-faceted and not entirely evident on first analysis, impacting assessment practices, classroom management, or content knowledge (Blumenfeld et al., 2006). In addition, if combined with reflective experiences, the enactment of new instructional approaches can serve as productive opportunities for teacher learning (Clarke & Hollingsworth, 2002; Shulman & Shulman, 2004; Tynjälä, 2008).

But the impact of an innovation in schools on teacher practice is elusive. While some studies attribute this to teachers misunderstanding a reform program (Cohen, 1988) or acclimating the innovation within their own mental models (Spillane, Reiser & Gomez, 2006), another reason may be that those in the classroom may be on a path of change that takes time. This is true for teachers (Messina, 2001; Shulman & Sherin, 2004; Simon & Tzur, 1999) as well as students (Bielaczyc & Blake, 2006; Herrenkohl & Mertl, 2010).

In summary, this study conceptualizes the role of the teachers in the implementation of a school-based badge system through three categories of impact. This includes gaining new information about students, working with colleagues, and experiencing changes in instruction. In the next section, I will describe the setting of the badge system implementation and the design of the study.

3. Methods

3.1. Description of the school-based badge system

The following description of the school-based badge system (SBBS) encompasses the main elements that existed during the first two years of its implementation. But before proceeding, it is important to note our intentionality of referring to the system instead of only the badges. Similar to what Cobb and Jackson refer to as an instructional system (2008, 2011), there are tasks, activities, tools, and discourses related to badges that are interdependent and together constitute the system. These are important to consider since this badge implementation does not simply include the awarding of badges, but also designed milestones and meetings between teachers and students that are intended to scaffold students along the way to earning their particular badge. Consequently, we suggest that the benefits of digital badges are not limited to just the badges but are also a product of the instructional system that creates, facilitates, and issues the badges.

The SBBS was designed through collaboration between the school's teachers, administrators, and an educational non-profit in order to support the development of knowledge and skills for the 21st century's participatory culture (Jenkins, 2009). During the first year of its implementation, students could choose to earn one of four different badges that represented mastery of information literacy, collaboration, acceptance, and empowered learning (Table 1). In addition, each of the badges was integrated with Jewish cultural identity to varying degrees.

The learning objectives were designed to target skills that are useful both in and out of formal education environments and are considered important for future success even though they are not traditionally part of formal educational curricula.

Participation was entirely noncompulsory and no grades or other traditional assessments were connected to performance in the badge system. Students first selected a badge and then, over a period of months, supplied evidence indicating completion of three distinct learning phases: **Recognize It**, **Talk About It**, and **Do It**. In the first year of implementation, students began selecting and working on badges in January of 2012. In the second year of the implementation (2012–2013), students began selecting and working on badges in November of 2012.

Table 1

The initial four badges in the system.

Badge name	Learning objectives
(Sergey) Brin Informational Literacy Badge	Badge-earner demonstrates ability to identify the need for information, use effective strategies to seek out information, parse significant information from less significant information, critically evaluate the credibility of information, and synthesize information from multiple sources.
(Elana) Kagen Empowered Learner Badge	Badge-earner demonstrates ability to learn independently through preparation, self-assessment, skill assessment, and perseverance.
Elie (Wiesel) Acceptance Badge	Badge-earner demonstrates ability to recognize one's values and beliefs, successfully negotiate a shared understanding with and fair treatment of those different from oneself, and standing up for targets of prejudicial treatment.
(Ruth) Messenger Collaborating Badge	Badge-earner demonstrates ability to collaborate within a group to develop creative solutions to complex challenges by employing the resources at hand and assuming varied roles while considering divergent points of view and negotiating for mutual benefit.

The **Recognize It** phase asked that students indicate understanding of the targeted skills of their selected badge. The **Talk About It** phase required students to show evidence of their ability to communicate effectively about the badge. The final phase, **Do It**, asked students to supply evidence of their mastery of the badge content. Each student's evidence was compiled digitally.

The school's teachers served as determiners of the quality of the evidence and whether a student passed each badge phase. To support the badge work, the teachers received professional development collectively during the Spring of 2011—the school year preceding the first year of implementation. This professional development was facilitated by an external provider with the lead teachers and served to discuss the overall badging system and explain how the elements of the system supported the process. Additional monthly meetings were scheduled for participating teachers to offer additional support of the implementation. In order to determine the quality of evidence that the students exhibited to demonstrate their achievement of a badge, the student would schedule and meet with a teacher and their work would be assessed with respect to the particular badge's rubric. While the majority of student-teacher interaction over badges was conducted in person, an online platform devoted to the badges was also used to further encourage student sharing of work and teacher feedback. However, this platform was not largely used and of only minimal value to our study.

Upon completion of each badge phase, students were rewarded for their success. The rewards included ceremonies where students received an indicator of their accomplishment in the form of a wearable badge. Non-tangible rewards were also associated with earning badges. These included additional in-school privileges such as unsupervised computer time or the ability to leave a class to work on completing the next badge phase and out-of-school privileges such as a fieldtrip related to their badge. Once earned, artifacts of the process were stored in digital archives for each student, which are then available to students, parent, and teachers.

Administration and teacher participation were key to the badge system's implementation and transparency. The SBBS had the support of both the head-of-school and the middle school's principal. Specific teachers were given the task of both participating in the design process and also the daily implementation of the badge system. The teachers' vigilance, in spite of several challenges of implementation, was crucial to the badge system's functionality.

3.2. Setting

The study was conducted at an independent school in a suburban metro area in the Southeastern United States. The school is a religiously based school that integrates Jewish themes and values into core content classes as well as offering separate classes related to Jewish history, culture, and the Hebrew language. The school services approximately 600 students in grades PK-8. This study focuses only on sixth and seventh grade students—the grades that were implementing the badge system.

The student population is homogenous in that 100% of the students identify as Jewish. While public test data and demographic data are not available, it is worth noting that many of the students were from high socio-economic backgrounds. This was alluded to by some of the teachers we spoke to and it is also reflected by the fact that the school is a tuition-based school costing approximately \$19,000 a year for sixth and seventh graders' attendance. However, less than 100% of the students can be classified as having a high socio-economic background and many students to receive tuition assistance.

The teachers interviewed in this study ranged in experience from 4 to over 25 years of teaching. Many of the teachers in the school do not teach full time and it is not uncommon for teachers to pick up extra responsibilities whether it be running a club, coaching, providing homework help or maintaining a homeroom. Despite many of the teachers being less than full time, turnover in teachers from year to year is approximately 8%.

It is worth noting that the setting provides some useful affordance as well as limitations for these studies. First, it presents an early opportunity to study an implementation of badges in a formal school setting. Second, as an independent school, this implementation provided some ideal aspects of infrastructure with respect to technology. For example, there was a technology teacher who was one of the co-leaders of the implementation. The school is adequately equipped with computers, and there is an additional person at the school who is in charge of IT support leaving the technology teacher available for supporting teachers and students' use of educational technologies, both in a teaching role and a coaching role. Consequently, this allowed teachers to focus more on the implementation of the badge system and less on the technology related challenges.

In addition the students often had engaged parents. The teachers informally remarked about the parent involvement as being great. For example, we observed a sixth-grade parent meeting that took place during the day that was attended by 42 parents and/or guardians. The parents have chosen to send their children to the school and the school is not obligated to keep students from year to year if the students are not reaching behavioral and academic expectations. In this respect, the school's students represent a potentially more motivated school population than a traditional public school.

It is not useful to characterize the site selection as purposive. At the time of the study, we were not aware of any other school site implementing a badge system. Nevertheless, considering that the school site is not typical for schools, this site serves as an existence proof (Magidson, 2005). Existence proofs have been thought of as appropriate first steps in studying how curricular innovations operate in school settings (Brown, 1992). This particular badge system represents an early attempt for the field at implementation within a school setting and provided the opportunity for us to investigate if badges can provide teachers with actionable information within an appropriate setting.

Despite these affordances of the study site, we are well aware of what the study site limits in our findings. Certainly, the site selection limits the generalizability of the findings. However, we believe the findings enable hypothesis generation that can be modified based on the specific site selection.

3.3. Teachers' work and the badge system

Teachers voluntarily selected to participate in the badge system. However, it is important to note that there are some reasons to question the totality of the teachers' decisions. First, all participating teachers said that they were asked to participate in the badge system program. And second, they were asked either by or at the request of the principal. However, because individual teacher participation varied with some teachers largely participating and others not, it is unclear to what degree of influence was the request of the principal. Consequently, while it is an important contextual detail that volunteers or semi-volunteers implemented the program, its indeterminate effect means that we have not included it as an aspect of our analysis.

Teacher participation resulted in several commitments. First, two teachers were assigned to each badge and were supposed to work together to facilitate each student's badge earning process. Teachers would meet with students together, separately, or provide online communication to shepherd them through the Recognize It, Talk About It, and Do It phases. Each of those phases served as milestones for earning the badge and students were dependent on the teacher allowing them to move on to the next phase. Teachers would determine if students could continue to the next phase by evaluating student provided evidence. The evidence was evaluated based on individual rubrics in each milestone. Teachers could also participate in monthly meetings after school to discuss the overall SBBS.

3.4. Data

For this study, we drew primarily on interview data with teachers. In the first year of data collection, we piloted a teacher interview protocol to explore the extent to which the badge system was providing teachers with useful information about students and the ways the badge system may have impacted their instruction. These pilot interviews were carried out with six participating teachers. These initial teacher interviews were transcribed and analyzed to identify salient themes that were emerging from their responses. The analyses served to inform a revised, semi-structured interview protocol for future teacher interviews.

Members of our research team interviewed eleven of the sixteen participating teachers. Two of the teachers were not selected for an interview because their badge did not have any participating students. The other three non-interviewed teachers were not available on the days we scheduled our data collection. The interviews took place in school offices or empty classrooms during the teachers' non-instructional periods during a three-day period in the Spring of 2013. Additionally, we interviewed the principal after all of the teacher interviews were completed. The interviews averaged approximately 45 min in length. While taking the approach of gathering interview data from teachers does not afford the opportunity to get a granular perspective of their instruction, interview data could afford the chance to identify big changes in instruction, collegiality and new student data, which may serve to guide future studies where to probe for more detailed influences of badge on teaching.

We also analyzed documents created in the design and implementation of the SBBS. This data served to provide important contextual information about the badge system, such as the elements of the rubrics. Teacher and staff interviews refer to the interviews with the teacher and staff who are directly involved in the badge implementation. A longer principal interview (~1 h) provided an additional check on the teachers' description of the badge implementation.

Finally, our research team conducted interviews with 29 students. Twenty-one of these students were students who were currently earning (or recently had earned) a badge at the time of the interview. The primary purpose of the student interviews was to continue a line of inquiry related to the student's motivations to earn a badge (Wardrip et al., in press). However, the student interviews also served to provide additional context to teachers' statements about meeting with students and the students' perspectives on the teachers' support for earning a badge.

3.5. Analysis

The analytic process began during the data collection. After each day of interviews, the four researchers facilitating the interviews wrote analytic memos to identify themes from their interviews as well as document their impressions and assumptions generated from the interviews. These analytic memos enabled us to clarify the dimensions of the coding categories (Corbin & Strauss, 2008). The memos served to refine the conjectures based on the data, for example, fundamentally questioning if and how the badge system was providing teachers with new information. These analytic memos were shared among the researchers and we discussed the memos with the researchers each day. All of the interviews were digitally recorded and transcribed verbatim.

Interview transcripts were uploaded to Dedoose. One of the researchers read through all of the transcriptions first and then began coding. The coding schemes were developed based on a grounded approach. Based on several reads of the transcripts of the interviews and discussions with the researchers, one of the researchers developed thematic categories to organize the kinds of new student information the teachers were claiming to know, how the teachers talked about moments of collaboration, and how the teachers perceived their instruction to be impacted.

Using a constant comparative method (Corbin & Strauss, 2008), the same researchers who developed the original coding scheme also re-read the transcripts to find disconfirming data and revised the codes based on these additional readings of the data and weekly discussions with the research team. With each subsequent coding of the data, we recorded our ongoing interpretations and inferences in analytic memos. In parallel to the coding process, we engaged in discussions with the research team. These discussions served as chances to test out codes and inferences drawn from the codes with the research team. All of the coded transcripts were available to all of the researchers. Once the data were coded, we consolidated the analyses into an organizational structure for writing the paper.

We sought credibility in our analysis through a number of strategies (Lincoln & Guba, 1985). First, we sought to maintain methodological consistency through our data collection and analysis (Morse, Barrett, Mayan, Olson, & Spiers, 2002). Therefore, our data and analysis were aligned with our research question and theoretical framework. This was not intended to constrain our analytic process but to ensure a “trustworthiness” (Lincoln, 1995) in that our point of inquiry, analytic approach, and analysis were carried out systematically and as intended. Second, we maintained regular open and critical discussions of our analysis within the research team. Data for discussion and the coding category was refined until consensus was reached. Third, as part of the research team, we shared a draft report with the funder, the principal and the participating teachers. While this report contained findings about the students as well as the teachers, findings about the teachers similar to those presented here were included in the report as well as additional teacher-related findings.

4. Findings

Overall, data suggests that the badge system does provide teachers with new information about students that was not readily available to the teachers. This new information consisted of students' strengths that exist outside of school, teachers' learning about difficulties that students faced in trying to be successful in school, and students' interests outside of school. The data also suggests that the badge system provided limited impact on the teachers' collegial interactions. While the teachers spoke about the regular monthly badge meetings, there were not substantive examples of teachers engaged in such aspects of collegial work as de-privatizing their practice or discussing student learning. Finally, there was very little evidence that the badge system had influenced the teachers' instructional practice. However, there was some evidence of teachers using new information about students that they had learned for instruction.

4.1. Teachers' learning new information about students

Three general themes characterize what teachers learned about their students. First, teachers were able to see students' strengths that may or may not have existed outside of school-related work. Second, teachers were made aware of what difficulties students faced in trying to be successful in school. And third, teachers were made aware of previously unknown students' interests. Ultimately, teachers suggested that the badge system afforded them the opportunity to gain a more complete understanding of their students.

4.1.1. Students' strengths

Teachers discussed the ways that students' badge work enabled them to recognize students' strengths. For example, one teacher stated,

“I think there's definitely kind of those techie students, if you want to put it that way, that perhaps in my classroom, because—we do use some [content related work], but because it's mostly hands-on and we're still doing [skill related work] and things, I've seen those students, their strengths, where maybe I wouldn't have realized that that was a strength for them had I not been involved in badges.”

In this case, the teacher is noting that some students are not able to demonstrate just how capable they are with technology within the regular constraints of classroom instruction. However, the opportunity of earning a badge does enable the students to show additional capabilities. Or as another teacher stated, referring to a students' badge work,

“... it's something that a teacher or somebody looks at and says, wow, you really did something on your own. This had nothing do with requirements. I see you have earned these badges.”

Through student submitted badge work, the teacher has additional opportunities to see artifacts of student learning which can lead to a better understanding of a student's skill or knowledge level.

Because of the badge system, students were able to show their teachers facets of their identity beyond specific skills. One teacher hinted that she was able to see beyond the persona that a student takes on in the classroom.

“I think for this one kid—this one [student] in particular who can be annoying because [they are] looking for attention and [they want] to be— [they've] got some anxiety and some rigidity to [them]. The teachers are able to see outside of just that scope of [the student] and they're able to see more of it.”

In this quote, the teacher suggests that if they limit their understanding of the particular student to traditional school-based interactions then they would consider them disruptive or challenging. Because of the student's badge work, the teacher now has a better understanding of the student's personality, and it is implied that future interactions between the student and teacher will be more productive.

Similarly, another teacher talked about how the badge system allowed them to focus on a student's creative talents where prior classroom interactions did not.

“... like I said, you see one side of students, and you're getting to know them at the same time. For example, [the student] sometimes has a few impulse control issues, which—but to be able to see the positive side of some of [the student's] impulse control issues and to see [their] creativity.”

The teacher notes that what was previously interpreted as disruptive classroom behavior (i.e., impulse control issues), when viewed through badge earning now becomes a positive, learning aptitude (i.e., creativity).

4.1.2. Students' difficulties

Teachers also noted that they were able to gain new understanding about difficulties that students may be facing that are outside of their regular class work. For example, one teacher mentioned a group of students that had a difficult time working together. By seeing the rubric for the collaboration badge, she gained a grammar for what constitutes collaboration which in turn let her see that students were not equipped with this skill in her class. She said,

“I realized they really—they have a very hard time collaborating. I see them now. I can remember this one child that really gave up. I know why that child gave up, because I see what [the child]—not that I knew it so much, but I see now. I thought, that showed me that's a very hard thing for [that child] to do.”

In this response, the teacher highlights the fact that they were more aware of the challenges students were facing in class because their involvement with the collaboration badge resulted in a personal learning opportunity. The teacher is now able to formalize observations of their students' classroom behaviors using the learning objectives of the collaboration badge as a sense.

The badge system also provided some teachers the opportunity to recognize how busy their students are outside of school.

“They're just busy. They're incredibly busy. Just like just now, you asked me what I do here and I say all the things I do. Kids are the same way. What do you do? It's a long, long list. I think that's the biggest thing that I've learned about the kids is that they're incredibly busy.”

“It's like, they went to three bar and bat mitzvahs. They had a dance recital. I guess just things—just it's that they're really, really, really busy. It is amazing that some of these kids can actually do the badge thing and not—on top of everything because of the fact that—I don't know. I don't know. It just seems like they are—they're just busy. I don't know. That's kind of the biggest thing that I've taken away from it, I guess.”

We were not surprised to learn that students of this school are extremely busy meeting the demands of in-school, out-of-school, family, and social commitments. However, these quotes suggest that some teachers may be surprised by the number and depth of student commitments.

4.1.3. Students' interests

Teachers noted that the badge system created new opportunities to learn about students' interests. Teachers attributed this to the fact that, in class, they are focused on the curricular and learning goals of instruction. As previously mentioned, teachers often are not able to learn about their students outside of classroom work. One teacher shared this anecdote about a student,

“There's a synagogue here called [Synagogue Name] that was set up originally to cater to gay and lesbian couples, although it now kind of caters to everybody and gay and lesbian couples are included in their membership, but it's not solely for them. [A student] talked a lot in it about—in [their] thing, [they] talked about how [they] had gone to this synagogue once maybe just for a bar mitzvah or something like that and how the topic had really interested [them] and

how [they] became— after this experience, [they] had become very passionate about equal rights for all and things like that. It was an interesting—it's not something that would have come up in [content area] class.”

In this example, the teacher is sharing what a student chose to work on for their badge. It is not clear if the student's passion about equal rights for all existed prior to the badge work or was catalyzed by the badge work. However, with the newfound knowledge about the student, the teacher can now build additional choice based learning that would allow the student to continue pursuing a topic they are passionate about.

In a somewhat different way, another teacher shared how a small community of students sharing the same interest was catalyzed by their involvement in badges. The teacher stated,

“We've also found a group—just as an aside—of ‘Doctor Who’ fans, which may not sound very important to you, and it's really not part of badge except that they sort of found each other through these nerdy interests in badges. Now we have a group of kids that aren't in the same section of language arts, and includes an eighth grader who's sort of a little bit of an outsider, who all get together to discuss ‘Doctor Who’. It's a little group of geeks, but they discovered each other through sort of play and this common interest in doing these other things. Now, I get to discuss ‘Doctor Who’ with them one lunch period a week just for fun because that's what they enjoy doing.”

This quote is noteworthy for at least two reasons. First, the teacher notes that they learned about previously unknown student interest in Doctor Who. Second, the teacher suggests that the other students did not know about each other's interest until they got together through their badge work. A logical next step would be to find a project where the group of students and their teacher can catalyze their shared fandom into meeting a learning objective.

4.2. Collegial interactions

There was some evidence of teacher collaboration related to their work on the badge system. Six of the eleven teachers referred to the monthly meetings as settings where they have an opportunity to work with and talk to their colleagues about badge. When the teachers did talk about meeting and working together, they mentioned that the meetings were centered around problems or issues that the teachers were facing. When probed, concrete examples were not provided by many of the teachers except for technological problems that come up as the students shared their badge work with teachers. As one teacher stated, “Not everybody likes technology as much as Ms. L. and I do.”

However, only two of the teachers talked about working directly with their badge partner and three of the eleven teachers stated that they do not talk with other colleagues about the badge work. We found this initially surprising considering that the badge system had monthly teacher meetings and paired worked arrangements for allocating and supporting each badge. But teachers explained the lack of collaboration between each other from the ways to carry out their joint work separately. One teacher mentioned,

“I'm doing the collaboration badge along with Ms. F. We do it together. Pretty much, I review and comment. I don't typically meet individually with students. Usually, Ms. F. takes care of that because of scheduling issues.”

Another teacher spoke about how their partner teacher usually responds to students' work before they get a chance to.

“... like I said, usually, [they] gets to it before I have an—honestly, before I have an opportunity to really say anything, and the kid's already changed something according to what [they] stated. If there was that time for us to sit down together, and that planned time for us to sit down and look at those kids, I think that that would happen, that conversation of us. Wow, can you really see—and then it'd even be more celebrated, I think, what the kids are doing, if we had that opportunity built in.”

The teacher makes two relevant points in this quote. First, they and their partner teacher do not have to be in the same place or even work together to give feedback. Second, the teacher notes that partner badge time is not built into his schedule.

Unlike the monthly faculty badge meeting, teachers were individually responsible for finding time to fulfill their SBBS responsibilities. One teacher stated, “I hate to say it, but honestly, if there's not time scheduled for it, something else is gonna take the place of it.” Another mentioned, “It's just something else that we're trying to fit into our ridiculously overscheduled day.” Timing was also identified as a barrier for implementation by the principal, both because it was an added responsibility for teachers and because there were so many teachers at the school that were not full-time.

4.3. Impact on instruction

Five teachers confessed that the badge system did not have an impact on their instruction. Of the teachers who did claim that their instruction was influenced by elements of the badge system, their responses related to using new information they had learned about students. In addition, some teachers mentioned how the badge system could impact their instruction, but as of yet, had not.

When teachers talked about learning new things about students, they noted that they were able to draw on that new information to support instruction or provide assistance to students' learning and development. For example, one teacher said,

“One of them is also a reluctant reader, so I found this weekend that there is a graphic novel version of the Dalek Project and have suggested that maybe, even though he thinks all books are inherently bad, he ought to go look at this graphic novel put out—but again, all of this came up because of badge.”

Here the teacher uses knowledge gained from interacting with the student through the badge systems (i.e., the student likes science fiction) and uses that to recommend reading material (i.e., the graphic novel) that could motivate the student to read. While this teacher might have eventually tried to determine student interests in order to recommended reading material, the badge system provided the same valuable information as a by-product of its own learning objectives.

Similarly, another teacher talked about knowing students who are good with technology based on her observations of their work on badges. She said,

“There’s times where I’m having a technical problem in my classroom and I’ll be like, does anyone know how to solve this? There’s a lot of times where the more technologically literate kids can step up and be like, oh, yeah. Here’s how you do it. They’re teaching me. Being aware of the kids who have those strengths helps me to learn and grow. They love it because, obviously, they’re getting recognition for something that they’re really good at and like, oh, cool.”

In this example, the teacher is noting that she is able to call upon students with technological know-how to support the work in the classroom. She also notes that it is a way that she can recognize the students’ strengths within the classroom that might otherwise go unnoticed.

While these brief examples offer some insight to how the badge system influenced instruction in a limited way, it is worth noting that two teachers suggested how the badge system might impact instructional practice in the future. One of the teachers mentioned that they would like to see badges as part of their content-area class.

“We’re still not there, and it’s—it should be there where part of earning a badge is—it’d be nice if the—almost instead of taking a test and getting an A on it, what if it was—what if your [content area] class was badge-centered? What if you did earn your [content related skill] badge or something like that?”

This quote was in response to whether the badge system had impact on their instructional practice. Their response notes that it could have an impact by taking the place of some less-effective traditional assessment practices.

Other types of educator (i.e., non-teachers) also mentioned how the SBBS could impact the way students are supported instructionally. For example, a support staff member spoke about how there are students who do not qualify for the gifted program because they do not meet the achievement requirements. However,

“I’d like to find other ways for those kids who we know would be eligible for enrichment if they actually did their basic work in class, to find ways for them to get more involved with this.”

Here, the staff person is noting that the badge system could provide opportunity for students that may not be typically engaged by traditional school activities.

5. Discussion

As an ongoing intervention, the SBBS represents the perspective of “What could work” rather than “What works” (Roschelle, Tatar, & Kaput, 2008). The data suggests that badging systems could serve to provide additional information about students to teachers. This holds several implications. First, this potentially extends the role and purpose of badges within learning environments beyond the ways in which badges are typically directed toward the learner as a credential or assessment (Bowen & Thomas, 2014; Hickey, Itow, Rehak, Schenke, & Tran, 2013).

Second, as badge systems collect and store data through student work and interactions with teachers, they could potentially facilitate new types of data-informed instruction. Students’ interests have not typically been considered part of the corpus of data in the data-driven instruction literature (e.g. Knapp, Copland, & Swinnerton, 2007; Marsh, 2012). Badge-based student data could provide a way for teachers to know student interests and use that data to make instructional decisions.

Additionally, we conclude that the SBBS echoes points from the literature on formative assessment (Wardrip, Gomez, & Gomez, 2015; Wiliam, 2006). The data available to teachers through the badge system occurred through the flow of the teachers’ work and was not necessarily housed within a data system. Student data systems are currently the primary tool for providing teachers with access and analysis of student data. An opportunity for the future may be to integrate the badge system with other data systems that a school is using. This integration could provide a richer view of students’ needs and achievements. Interoperability of data systems has been a significant goal of school improvement efforts (Collins & Fruth, 2007; Fox, Schaffhauser, Fletcher, & Levin, 2013).

However, we are less sure of what are the direct implications of badge-based student information for teachers’ instruction. While some of the data suggested that there are instructional implications, such as the example of the teacher leveraging students’ interests to guide recommendation of books for students to read, it is not clear if this support is useful for the students’ learning and development. Future research may investigate a variety of instructional courses of action based on different categories of data gained. This link of teachers’ sense-making about data and productive instructional consequences of data has been identified by other researchers as significant for supporting the effective use of student data (Mandinach, 2012; Mandinach & Gummer, 2013; Moss, 2013).

This study also provides little evidence that the badge system facilitated collaboration or collegiality among the participating teachers. Previous research has documented how teacher collaboration is difficult to facilitate (McLaughlin & Talbert, 2001, 2006; Vescio, Ross, & Adams, 2008). This challenge is no doubt linked, at least in part, to the time that teachers have or do not have to meet with colleagues and complete joint work (Collinson & Cook, 2001). If badges are closely connected to classroom learning experiences, the teachers (and students) may more easily integrate their badge work with their regular practice. Teachers' comments from this study suggest that the lack of set-aside time was an inhibiting factor for their collaborative work. This is consequential both for the formal interactions that take place during the planned meetings as well as the informal interactions that also support teacher professional learning (Penuel, Sun, Frank, & Gallagher, 2012).

In addition to the constraint of teachers' time, the badge system did not exhibit structured supports to facilitate teacher collaboration. Once teachers are brought together, prior research suggests that the actual joint work must be facilitated (Wood, 2007). As the field has learned from teacher protocols (McDonald et al., 2013), lesson study (Lewis et al., 2006), and teacher work circles (Kwon, Wardrip, & Gomez, 2014; Wardrip et al., 2015; Shrader et al., 1999), teachers need guidance in order to engage in meaningful collaboration. This is similar to extensive findings from computer supported collaborative learning that suggests the scaffolding of scripts to establish norms of language, group behaviors and individual roles (Dillenbourg, 2006; Stahl, 2006). In other words, scripts can establish the logistics of learners' joint work and take the burden of coordination away from the learners (Scanlon, Anastopoulou, Kerawalla, & Mulholland, 2011; Weinberger, 2011).

Finally, there was only minimal evidence of teachers' participation in the SBBS influencing their instruction. There was evidence of teachers using new information for instruction, but the information was likely used for established instructional practices - the information was new but the practice was not. As noted above, using student data for instruction has been identified as a challenge for teachers, a competency that needs to be developed (Mandinach, 2012). Similarly, there is interpretive work necessary to make sense of badges and collections of badges (Rughinis, 2013). As a badging system can potentially offer teachers new perspectives on their students, alternative practices should be considered through a line of research.

However, it may be the case that the interviewed teachers were not aware of smaller changes to their instruction. The teachers might have been unable to describe smaller changes in instruction or changes that happened sporadically. To investigate the badge systems impact on instruction at a smaller level of change, future research could employ a strategy for monitoring an ongoing teachers' perception data, such as teacher logs (Rowan & Correnti, 2009). By having teachers reflect on their instruction on a regular basis throughout the course of the school year, their responses may reveal smaller, but influential changes to instruction.

Other elements of the badge system, such as the use of technology, rubrics, or the badges themselves did not seem to influence teachers' practice except in an aspirational sense. Prior research suggests that teacher learning from innovations can lead to shifts in knowledge, beliefs, and emotions that lead to delayed but eventual shifts in instructional practice (Bakkenes, Vermunt, & Wubbels, 2010). Therefore, it may be too early to look for impacts on instructional practice. Instead, a future study of a school based badge system may choose to examine teachers' changes in knowledge, beliefs and/or emotions due to their involvement in badges.

We understand that there are several limitations to the findings from this study. This study focused only one school. Therefore, additional research will be necessary to establish how representative this school site is with respect to the implementation of a badge system and where meaningful variability lays. Similarly, because the badge system is only in its second full year of implementation and the school is relatively small, the amount of students each teacher involved had to support is small. It is not clear if the intensity of student interactions increased, if teachers would be more likely to collaborate or if their instructional practice would be more influenced. Also, while teacher interviews are a meaningful method of pursuing teachers' perceptions of their successes and challenges with respect to various programs (e.g. Desimone, 2011), it is possible that the teachers do not provide a clearly catalogued inventory of their collaborative moments with colleagues, their instructional practice, or new categories of student data made available through their work in the badge system. Additional studies of teacher meetings and teacher practice could potentially identify more nuanced elements of their badge-related practices.

6. Conclusion: implications for research and practice

The following are some design considerations that may guide the design and implementation of future school-based badging systems based on this work. Design considerations can serve as guideposts for the design and development of a system or program. While not prescribing design parameters, design considerations can suggest implementation in the spirit of the intended program and avoid the "replica trap," (Wiske & Perkins, 2005), the misleading approach of trying to duplicate what has worked in some location without taking into account the variations in local contexts and demands. These considerations are provided in the form of a question.

6.1. What are the designer's explicit assumptions about badge earners' motivations for earning a badge?

Motivating learners is one of the prevalent reasons for adding badges to learning environments. While it may not be important for a badging system designer to state their theoretical perspective that is guiding their assumptions as to why a learner would participate in the system, the designer could be explicit about the motivational assumptions that go into the

design of the badging system. By documenting the assumptions about badge earners' motivations for earning a badge, there may be several potential benefits for the design, research and evaluation of the badging systems. Documenting the rationale for design decisions—including the assumptions of users' use and behaviors related to a design—can aid in the cumulative improvements of designs (Fischer, Lemke, McCall, & Morch, 1991; Lee, 1997; Moran & Carroll, 1996). Making explicit the motivational assumptions of a badging system afford an opportunity to evaluate the system based on what it ostensibly intends to do. If the badging system is created to provide chances for learners to make personal connections to the badge and the badge-related activities, the system can be assessed based on this intention.

6.2. What is the social infrastructure to support the implementation of the badging system?

Prior research suggests that social supports can facilitate the implementation of reform efforts (e.g. Stoll et al., 2006). It is not enough to bring teachers together for a monthly meeting or partnering teachers for badges. While these structures may be productive first steps, the data from this study suggest that more supports may be needed to support the collaboration and sharing of teachers in their badging work.

6.3. What are the intended models of use for the badging system?

Similar to what the field has learned from implementing project-based learning in schools, the demands on students and teachers can be foreign to what they know and expect from school-based learning experiences (e.g. Barron et al., 1998). Therefore, specifying not only the design rationale mentioned prior, particular practices for carrying out the work in the badging system could serve to guide the users. This notion dovetails with idea of specifying goals and teaching practices to support the teachers' use of curriculum materials (Ball & Cohen, 1996). By making some intended practices explicit as well as why these practices may be important, the users of the system, the teachers and students, can more realistically realize the potential of the badging system.

Ultimately, these design considerations serve as starting points for future research and design. Bielaczyc (2013) argues that design-based research ought to focus attention on the “problems of practical implementation” as an important step between the establishment of existence proofs and scaling up of an innovation. She argues that this includes understanding how designs for social infrastructure support the implementation of a learning activity. The data from this study suggest that understanding the implementation paths (Bielaczyc, 2006; Collins, Joseph & Bielaczyc, 2004) may be significant for effective implementation of school-based badging systems (or other place-based badging systems for that matter).

6.4. Summary

In summary, we believe that the data from this study provides evidence that suggests that educational badging systems can provide teachers with new information about students that is not easily available to teachers. Although we acknowledge the limitations of our analyses, we still conclude that badges can inform teachers of students' strengths and interests outside of school in novel ways.

In addition, we believe that our findings on badges gives support to other alternative assessment practices. Research of Makerspaces, Games, similar badges (e.g., Military badges) and other interest-driven student learning opportunities could also investigate whether these types of learning opportunities provide new data about students to teachers. If so, then those findings could eventually help teachers improve other aspects of their interactions with students.

Much more research is required to verify our findings and unpack the total and lasting impact of badging systems on teacher practice. Still, we believe that this study provides ample cause to continue investigating how badges and badging systems can be an important pedagogical tool for teachers. Perhaps, in the near future, badges and badging systems will be an everyday part of teacher practice.

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