



# Good badges, Evil badges?

An Empirical Inquiry into the Impact of Digital Badge Design  
on Goal Orientation and Learning

Report  
2013-2014 HASTAC Digital Media and Learning  
Research Grant Competition

December 2014

Melissa L. Biles  
Jan L. Plass  
*New York University*

Bruce D. Homer  
*The Graduate Center, CUNY*


## Research Process

There has been a lively debate recently among members of the badges community about the impact of badges on people's motivation. Some are concerned that badges might stifle students' intrinsic motivation and cause them to be more focused on winning new badges than on the work they are doing. Others support the use of badges, considering them superior to grades for evaluating student performance (OpenBadges, 2012). Yet whatever the differences, there seems to be agreement that the way badges are designed, and how they are interpreted by the learner, will ultimately determine the effects they will have on users. Dan Hickey refers to this as the purpose versus function of badges (Hickey, 2012), which mirrors similar ideas between the intentions of the designer versus the users' interpretation of the design by Norman (1988).

We collected evidence to inform the discourse on the purpose and function of badges, and to develop theory-based, empirically validated design patterns that will support badge designers and issuers in their design decisions. Our research agenda was composed of three main areas:



(A) When designing badge systems, game designers make conscious decisions about which types of accomplishments or skills to recognize via badges. These choices can affect how players perceive the function of those badges, relative to the game structure and their own personal goal orientation and other internal characteristics. In the present study, we were therefore interested in how game designers and game players perceived badges. For game designers, we are interested in what functions they attributed to incentive systems and badges, and what considerations they follow in



the design of these systems. For game players, we are interested in the value they place in badges and how their player style interacted with badges in a games-for-learning context.

(B) Develop a *Badges Impact Survey* (BIS) based on the results from Part 1 and a theoretical framework of situated learning, situational interest, and achievement motivation. This scale measures the effects of badges on goal orientation and perceived learning.

(C) Conduct experimental studies on the effects of badges on goal orientation and learning outcomes by modifying a geometry game to issue badges with specific designs and measuring their impact on these variables.



## Research Results

### PART A: INTERVIEW GAME DESIGNERS AND STUDENTS FROM THE TARGET AUDIENCE

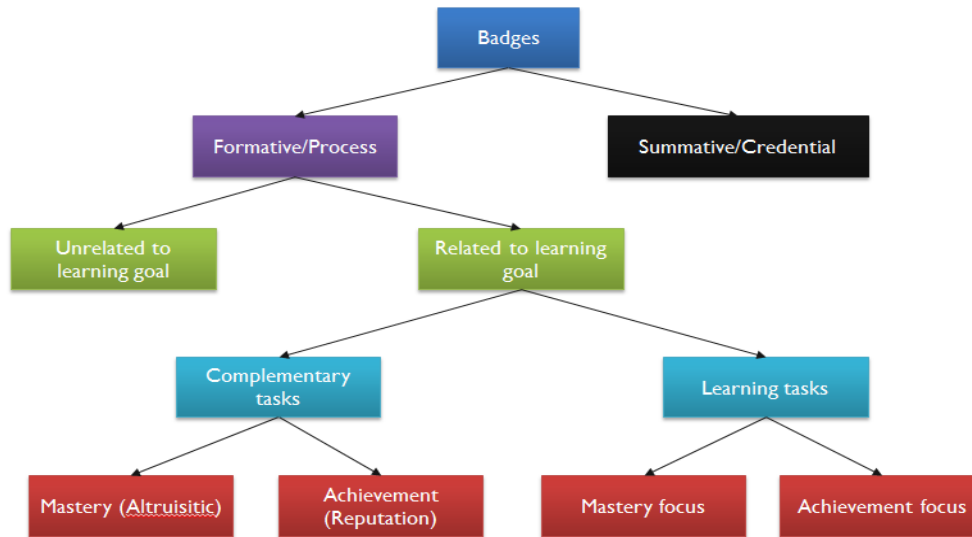
#### **Methods and Data**

Semi-structured interviews with game designers (N = 5) focused around questions regarding incentive systems in games, mastery indicators in games, badge/trophy functionality, and potential design principles for badges systems. Each game designer was interviewed for about one hour in a place of their choosing. Combined, the game designers have over 80 years of professional experience in game design and theory. Utilizing the main themes that emerged from both sets of interviews, an educational badge typology was created and refined during a focus group of educators, industry peers, and academics during a conference convened around the topic of educational badge research and design.

The semi-structured interviews with middle school students, recruited from a large urban school district in the Northeastern United States (N = 26), focused on questions about their conceptualization of badges, their attitude toward badges, the impact of badges on their behavior, optimal badge design, and their goal orientation. The 15-minute interviews captured students from a wide variety of contexts and prior experience with badges ranging from after school programs utilizing badges to educational game-based badge experiences. Using the main themes and responses that emerged, a badges impact survey (BIS) was created by adapting and supplementing the initial interview questions. The BIS questions were iteratively validated (N = 16) using think aloud protocols and cognitive interviews through five versions. The BIS v.5 was implemented in an experimental study described in a separate report and found to be predictive of different geometry learning outcomes from gameplay (Biles, Homer & Plass, 2015).

#### **Results and Discussion**

Combining concepts from achievement goal theory and existing badge frameworks, we focused in on the types of badges linked to formative, process-based characteristics inherent to in-game activity, resulting in this Educational Badge Typology (EBT) framework (see Figure 1) that outlines our approach to framing the different functions of badges within learning games.



**Figure 1.** Educational Badge Typology (EBT)

Additional research should investigate types of badges that are of a summative nature, such as those used for credentialing.

### Interviews with Game Designers

Responses we received from game designers fit the incentive system role (ISR framework):

#### 1. *Signaling*

- Implicitly providing a tutorial for in-game activities by showing what aspects are important or not important to focus on in order to be successful within the game.
- Signaling experiences that others are having that might be of interest to you via methods like social sharing, peer rankings, or actions and modes of play that the game designer thinks are interesting.

#### 2. *Challenging*

- Presenting tasks that require particular levels of skill or persistence to achieve.
- Setting the bar for receiving that “5-star” or “100%” rating, pushing the player out of their comfort zone in.

### 3. *Affirming*

- Acknowledge what the player is doing by providing just-in-time affirmation of in-game actions so that the player feels like the game is paying attention to them (appropriate and relevant feedback).
- Help the player realize they are improving by giving them a standard to achieve that is considered a normative skill level needed to move on to the next challenge.

Game designers believed that the effectiveness of an incentive system depends on:

#### 1. *Taking into account different player types*

- “the thing that is extrinsic to you is intrinsic to someone else’s game”

#### 2. *Including multiple routes and incentives*

- “[I admire] systems that are clear but allow players to make their own decisions about what they find interesting and what they want their goal to be”

#### 3. *Designing based on target audience’s familiarity with game genre*

- “for someone who can speed run Super Mario Bros, getting to the last level is not a good incentive”

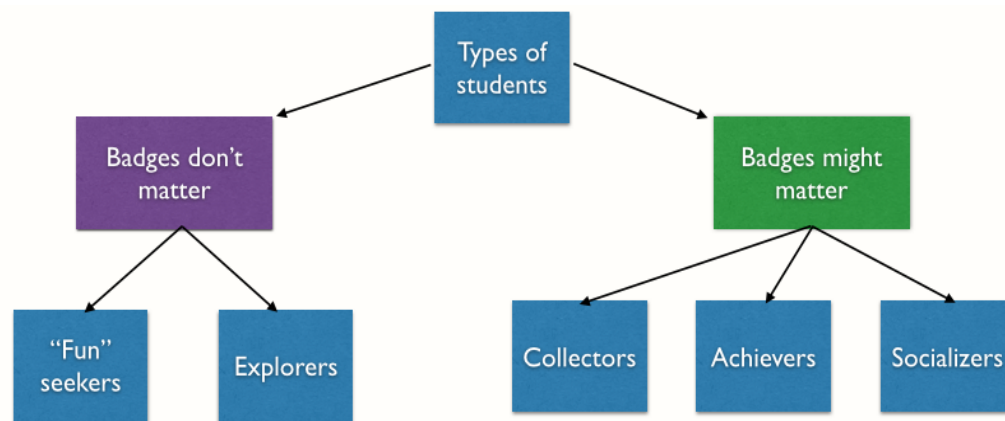
#### 4. *Integrating incentives from the beginning of the game design process*

- “you want to use badges in a way that increases appeal and doesn’t just replicate something the game has already done”

### Interviews with Game Players

Using Frye’s (2013) player profile framework as a guide, we identified five different types of players that emerged from the student interviews (see Figure 2). For the students that had little interest in badges to begin with, the reasons revolved around a lack of a common platform for sharing across games (*socializer*) and the desire for the badge to be linked to some sort of in-game reward (*achiever*) that has some degree of utility (e.g., power-up or money). Notably, within the context of educational games, some students reported that the learning content or the mechanic of the game required more focus and attention, and therefore the badges became secondary. The “*fun*” seekers (related to Frye’s (2013) *stimulation seeker*) were mainly focused on enjoying the graphics, story, or

characters, were more interested in attaining a flow state, and generally wanted easy, manageable levels that didn't require too much effort. The *explorers* wanted to investigate their environments, learn more about what was occurring within the game, and focused more on the mechanics of play. The *collectors* focused on challenges and achievements that they could acquire and admire, even admitting that they would play harder levels just to get all of the "things". The *achievers* looked for new, more challenging experiences that made them think or made them feel that they did something the average person could not. Lastly, the *socializers* focused on whether or not they could show off or share with their peers, where rankings created importance and drive to succeed.



**Figure 2.** Badging Player Profile (BPP). Student reactions to badge situations

The insights gained from these interviews demonstrate several useful frameworks that can serve as a jumping off point for both researchers and practitioners to guide their design and evaluation of different types of design principles for educational badges research. The ISR framework outlines the three main roles incentive systems can serve within games and the BPP framework outlines five useful player types to consider when designing badging systems in learning games. Combined with our educational badge typology (EBT) and badges impact survey (BIS), these tools can be used to guide future research in this field.

## PART B: DEVELOP BADGES IMPACT SURVEY (BIS)

The Badges Impact Survey (BIS) was developed and validated for middle school students. It can likely also be used with high school students. Other age groups would require further validation.

We tested 5 different iterations and validated using think aloud protocols and cognitive interviews. Items were revised after each iteration when the results of our research study showed that questions were unclear or ambiguous. The resulting v.5 of this Badges Impact Survey was found to be a good predictor of relevant learning outcomes (see our quantitative study below).

Below we include a general version of the BIS that is not geared to collect feedback on a specific badging experience. Should there be specific types of badges experiences under investigation, this survey can be adopted accordingly.

### **Badges Impact Survey (v. 5) – General version**

Here are some examples of badges:

*(If using BIS before participants have been exposed to the badging system you are testing, put a mix of badge graphics from PlayStation Network, Xbox Achievements, iOS Game Center, Steam Achievements, and your badging system)*

1. Let's say you met someone who has never seen a badge before in his/her life. How would you describe them to him/her?

2. Please select the areas in which you have personally experienced badges being used.

*(Select ALL that apply)*

- |  |  |
|--|--|
| <input type="checkbox"/> Console Video Games (PS3, Xbox, Wii)            | <input type="checkbox"/> Online Classes                                      |
| <input type="checkbox"/> Computer Video Games (PC, Mac)                  | <input type="checkbox"/> Classroom/School                                    |
| <input type="checkbox"/> Mobile Games (iPhone, Android)                  | <input type="checkbox"/> Extracurricular events (Clubs, Sports, Maker Fairs) |
| <input type="checkbox"/> Handheld Games (Leapfrog, PSP, PSVita, DS, 3DS) | <input type="checkbox"/> Other: _____  |





3. What types of messages do badges have? (Select ALL that apply)

- Describe what you did
- Acknowledge you did something special
- Make a joke
- Tell you what part you are at
- Tell you something you did not know
- Other: \_\_\_\_\_
- Tell you if you did something right

4. What does getting a badge mean? (Select ALL that apply)

- You completed something
- You discovered something
- You mastered something
- You are making progress
- You are better than someone else at something
- You are the best at something
- You are having fun
- Other: \_\_\_\_\_

5. Which ONE of these different meanings for badges is the most important to you? (Select ONE only)

- You completed something
- You are making progress
- You mastered something
- You are the best at something
- You are better than someone else at something
- Other: \_\_\_\_\_
- You are having fun
- You discovered something

6. Give an example of a badge you have earned: What was it called? What did you earn it for?

*Please check the box with the answer you feel best represents your opinion.*

7. Do you like getting badges?

No way	Maybe/Sort of	Neither yes or no	Yes	Definitely

**8. How important is it for you to earn badges in games?**

Not important	Sort of important	Neither important or not important	Important	Very important

**9. How important is it for you to earn badges in general?**

Not important	Sort of important	Neither important or not important	Important	Very important

**10. Do you compare which badges you have earned with your friends?**

Never	Rarely	Sometimes	Often	All the time

**11. Do your friends like to compare which badges they have earned with you?**

Never	Rarely	Sometimes	Often	All the time

**12. When badges are available to earn, do you try to get all the possible badges?**

Never	Rarely	Sometimes	Often	All the time

**13. In general, do badges make you want to try an activity?**

Never	Rarely	Sometimes	Often	All the time

**14. Before you start a game or activity do you look at what badges are available to be earned?**

Never	Rarely	Sometimes	Often	All the time



15. Have you ever chosen an activity based on the badges or achievements you could receive?

Never	Rarely	Sometimes	Often	All the time

15a. If so, what was so special about those badges to you?

16. In general, would you do things differently (or do something you wouldn't normally do) based on whether or not you'd get a badge?

Never	Rarely	Sometimes	Often	All the time

16a. If so, tell me about it. What types of things do those types of badges ask you to do?

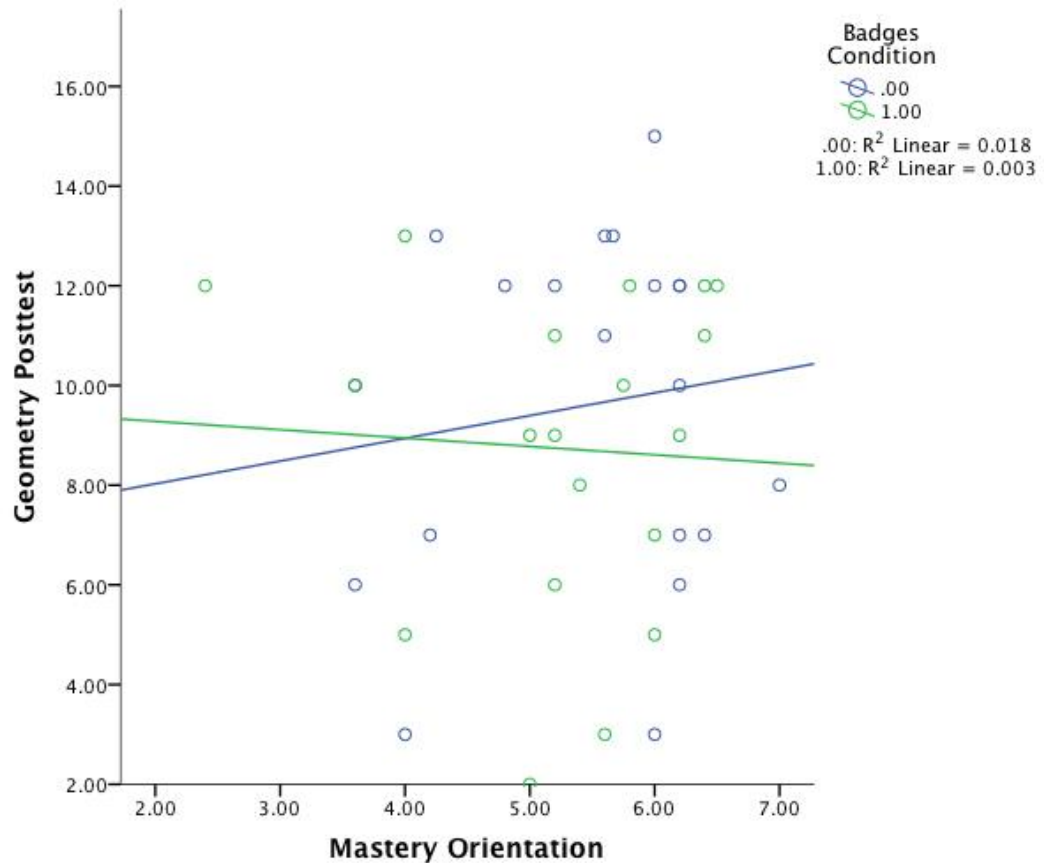
## PART C: EXPERIMENTAL STUDIES MANIPULATING BADGE FUNCTION AND DESIGN

*Badges*, markers of achievements within video games (Li, Huang, & Cavusoglu, 2012), can motivate learners (Amory, 1999; Kapp, 2012), but may decrease intrinsic motivation. *Achievement goal theory* was used to examine effects of badges on motivation and learning in an educational video game. *Achievement goal theory* postulates two primary goal types: *mastery*, which focus on learning and development of abilities, and *performance*, which focus on demonstrating or validating abilities relative to others (Dweck & Leggett, 1988). Feedback can influence goal orientation (Butler, 2000; O'Keefe, 2013), with mastery orientation generally associated with higher achievement (Harackiewicz et al., 2002). This suggests that in-game badges could affect goal orientation and students' learning and motivation.

### Study 1

The purpose of this study was to investigate the relation between badges and students' mastery goal orientation. Middle school students ( $N = 52$ ) completed a pretest of geometry and the mastery achievement goal orientation subscale from the *Patterns of Adaptive Learning Scales* (PALS; Midgley et al., 2000). Students were randomly assigned to play either the *badges* or *no-badges* version of *Noobs vs. Leets*, a digital game to teach geometry. After playing for ~25 minutes, a posttest of geometry was given.

*No-badges* group performed significantly better on the posttest than the *badges* group,  $F(1, 21) = 6.28, p = .018$ , partial eta squared = .17. This effect was mitigated by a condition by mastery goal interaction,  $F(1, 31), = 5.49, p = .03$ , partial eta squared = .15: Mastery orientation was positively correlated with posttest score in the no-badges condition, with no relation in the badges condition (see Figure 3). This suggests that badges can help students with low mastery goal orientation, but may hinder students with high mastery goal orientation.



**Figure 3.** Effects of Badges by Mastery Goal Orientation on Geometry Posttest Scores

## Study 2

This study examined effects of interest and badge design on learning outcomes. Middle school students ( $N = 85$ ) were randomly assigned to play a *performance*, *mastery* or *no badges* version of the geometry game. Pretest and posttest of geometry knowledge, and the *Situational Interest Survey* were given (Linnenbrink-Garcia et al., 2010).

Students in the performance badges condition performed significantly better on the posttest than students in the Mastery Badges condition ( $p = .007$ ); no-badges condition was not significantly different from either of the other conditions,  $F(2, 84) = 3.60$ ,  $p = .032$ , partial eta squared = .089. There was also a significant interaction between Badges and Situational Interest,  $F(1, 84) = 4.50$ ,  $p = .01$ , partial eta squared = .11. Learners with higher situational interest performed better with mastery badges; learners with low situation interest did worse with mastery badges. There was no

relation between situational interest and learning outcomes in the other conditions (see Figure 4).

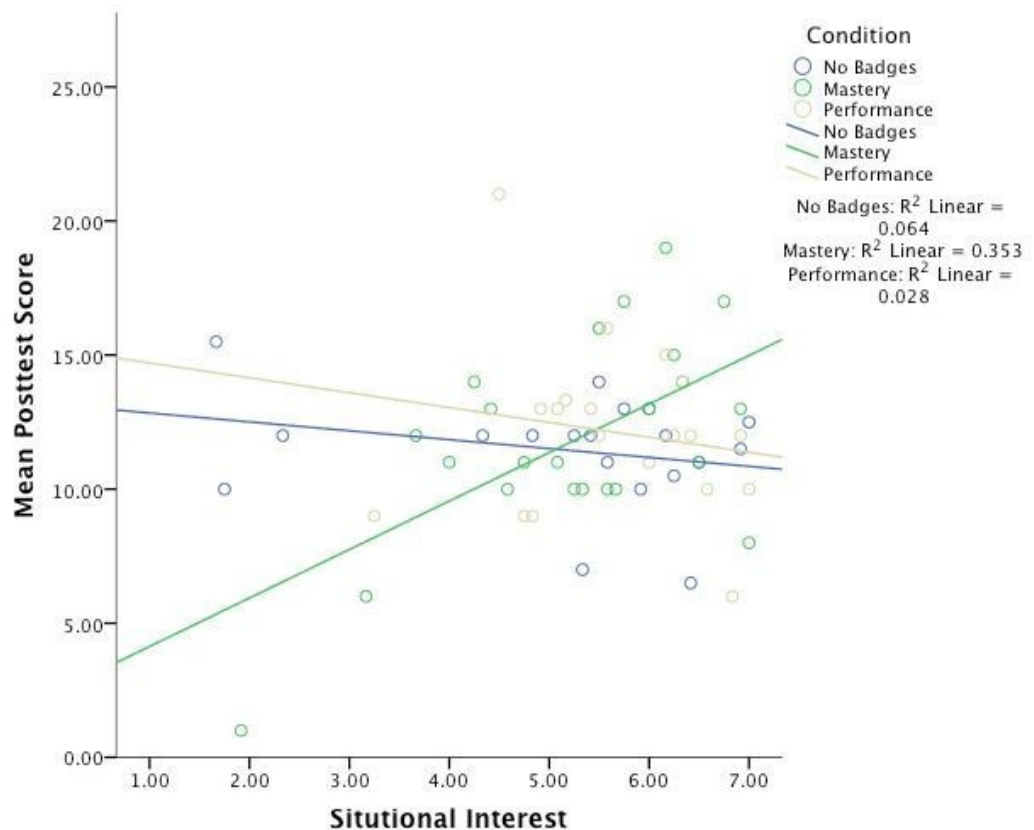



Figure 2. Interaction of Prior Knowledge, Situational Interest, and Badges Condition on Posttest Score

### Discussion

Taken together, these results suggest badges do not always help in educational video games: Types of badges interact with students' interest and motivation to affect learning. This is consistent with more general findings on external rewards in learning. Future research will need to be conducted to generalize our findings to other badge ecosystems, other learner populations, and other subject matters.

### Study 3

This study is examining the effects of the badge's purpose on interest and learning outcomes. Middle school students were randomly assigned to play a *no badges*, *aligned badges*, or *random badges* version of the geometry game. Aligned badges were designed based on the ISR framework



to signal, challenge, or affirm the player in order to reinforce the underlying learning goals. Random badges are earned at the same rate as the aligned badges, but were designed to be unrelated to any of the content or in-game goals. Participants completed pretest and posttest of geometry knowledge, and the *Situational Interest Survey* (Linnenbrink-Garcia et al., 2010). Results are expected to be finalized in the spring of 2015.



## Badges Workshop

The CREATE Lab hosted the *Digital Badges and Learning Workshop: Discussing Function, Impact, and a Research Agenda* at New York University on May 16<sup>th</sup>, 2014.

### Goals

The goal of the workshop was to convene researchers and practitioners in the area of Badges for Learning in order to review and discuss existing research in the area and set an agenda for future research.

*Specific topics discussed were:*

- What is the (potential) function of badges in the learning process?
- What would a typology of *badges for learning* look like?
- What empirical evidence exists for the impact of badges on motivational and cognitive processes and outcomes in learning?
- What are the big questions that should be addressed in a future research agenda on badges for learning?

### Outcomes

- Workshop Report
- Participant feedback on our research conducted for the HASTAC grant
- Refined Badges Typology
- Ideas for joint research projects and collaboration



## Workshop Agenda

11:00 am Welcome, Introductions, Workshop Goals

11:15 am Presentations

Jim Diamond, EDC

**Digital badges for teacher professional development: There might not be a there, there (yet)**

Michael Preston, NYC DOE; Leah Gilliam, Mozilla; and Rob DiRenzo, NYC DOE

**Designing a federated badge system for recognizing 21C skills and evidence**

Cathy Tran, UI

**Design Principles for Recognizing, Assessing, Motivating, and Studying Learning with Digital Badges**

Jan L. Plass, NYU; Melissa Biles, NYU; and Bruce Homer, CUNY GC

**Motivational and Cognitive Impact of Badges on Learning in a Middle School Geometry Game**

12:30 pm Networking Lunch

1:15 pm Breakout Groups

*–What is the (potential) function of badges in the learning process?*

*–What would a typology of badges for learning look like?*

2:00 pm Discussion

*–Summary of Breakout group discussions*

*–Feedback on CREATE research results (incl. Badges Impact Survey)*

3:15 pm Coffee break

3:30 pm Breakout Groups

*–What empirical evidence exists for the impact of badges on motivational and cognitive processes and outcomes in learning?*

*–What are the big questions that should be addressed in a future research agenda on badges for learning?*

4:30 pm Coffee Break

4:45 pm Conclusion and Next Steps

*–Summary of Breakout Group Discussion: Research Agenda*

*–Report, Collaborations*

6:00 pm Workshop Dinner (Corkbuzz, 13 East 13th St., btw 5<sup>th</sup> Ave and University Place)



### **Workshop Attendees**

Jan Plass (NYU)

Bruce Homer (CUNY Graduate Center)

Melissa Biles (NYU)

Kathy Yu Burek (Classroom Inc.)

Girlye Delacruz (CRESST, UCLA)

James Diamond (EDC/CCT)

Rob DiRenzo (NYC DOE, Digital Ready)

Barry Fishman (University of Michigan)

Leah Gilliam (Mozilla/Hive NYC)

Ulas Kaplan (NYU)

Marc Lesser (MOUSE)

Christina Oliver (Classroom Inc.)

Michael D. Preston (NYC DOE)

Cathy Tran (UC Irvine)

## Publications & Presentations

- Amory, A., Naicker, K., Vincent, J., & Adams, C. (1999). The use of computer games as an educational tool: Identification of appropriate game types and game elements. *British Journal of Educational Technology*, 30(4), 311-321.
- Biles, M., Homer, B., & Plass, J. (2015, January). *Mastery vs achievement oriented badges: Effects on motivation and learning in a middle school geometry video game*. Poster presented at the annual meeting of the Subway Summit On Cognition and Educational Research, New York, NY.
- Butler, R. (2000). What learners want to know: The role of achievement goals in shaping information seeking, learning, and interest. In C. Sansone & J. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 161-194). San Diego: Academic Press.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological review*, 95(2), 256-273.
- Frye, J. M. (2013). *Video game player profiles: Bridging industry, game studies and social science perspectives* (Doctoral dissertation). Retrieved from ProQuest Digital Dissertations. (UMI 3599871)
- Harackiewicz, J. M., Barron, K. E., Pintrich, P. R., Elliot, A. J., & Thrash, T. M. (2002). Revision of achievement goal theory: Necessary and illuminating. *Journal of Educational Psychology*, 94, 638-645.
- Hickey, D. (2012, September 9). Intended purposes versus actual functions of digital badges. Retrieved February 11, 2015, from <http://remediatingassessment.blogspot.com/2012/09/intended-purposes-versus-actual.html>
- Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. San Francisco: John Wiley & Sons.
- Li, Z., Huang, K. W., & Cavusoglu, H. (2012). Quantifying the impact of badges on user engagement in online Q&A communities.
- Linnenbrink-Garcia, L., Durik, A. M., Conley, A. M., Barron, K. E., Tauer, J. M., Karabenick, S. A., & Harackiewicz, J. M. (2010). Measuring situational interest in academic domains. *Educational and Psychological Measurement*, 70(4), 647-671.
- Midgley, C., Maehr, M. L., Huda, L. Z., Anderman, E., Anderman, L., Freeman, K. E., & Urdan, T. (2000). Manual for the patterns of adaptive learning scales. *Ann Arbor*, 1001, 48109-1259.
- Norman, D. A. (1988). *The psychology of everyday things*. New York: Basic books.
- O'Keefe, P. A. (2013). Mindsets and self-evaluation: How beliefs about intelligence can create a preference for growth over defensiveness. In S. B. Kaufman (Ed.), *The complexity of greatness: Beyond talent or practice*. Oxford: Oxford University Press.
- OpenBadges [Online discussion group]. (2012, January 1). Retrieved February 10, 2015, from <https://groups.google.com/forum/m/#!forum/openbadges>



## Publications & Presentations of Outcomes of our Research Activities

- Plass, J.L., O’Keefe, P, Biles, M.L., Frye, J. & Homer, B.D. (2014, April). *Badges in games for learning and their motivational and cognitive impact*. Poster presented at the Annual Meeting of the American Educational Research Association, Philadelphia, PA. Division C: Learning and Instruction Outstanding Poster Award.
- Biles, M.L., Lucas, M.D., & Plass, J.L. (under review). Good badges, evil badges? The impact of badge design on cognitive and motivational outcomes. In L. Muilenburg & Z. Berge (Eds.), *Digital badges in education: Trends, issues, and cases*. Routledge.
- Biles, M.L. & Plass, J.L. (2015, April). *Figuring out the when, where, and why: An educational badge typology and badges impact survey*. Paper to be presented at Annual Meeting of the American Educational Research Association, Chicago, IL.
- Biles, M.L., Plass, J.L., & Homer, B.D. (2014, March). *Good badges, evil badges? An empirical inquiry into the impact of badge design on goal orientation and learning*. Presented at the Pre-Conference Workshop, What should we ask about badges? Framing a research agenda for the field. Digital Media and Learning Conference, Boston, MA.



## About CREATE

CREATE is the *Consortium for Research and Evaluation of Advanced Technologies in Education*, housed in NYU's Steinhardt School of Culture, Education, and Human Development. Its members and affiliates engage in research on the design, critique, and evaluation of wide-ranging advanced digital technologies for learning. CREATE's research has focused on identifying elements for the effective design of technology-based materials, based on principles derived from theoretically sound foundations. Projects housed in the consortium typically involve interdisciplinary teams of scholars and developers who bridge basic and applied research, development, and evaluation. CREATE fosters collaboration among scholars within NYU and partnering institutions, nationally and internationally. Members of the consortium specialize in cognitive science, developmental psychology, educational psychology, design of multimedia environments, game based learning, and education. The team at CREATE has conducted extensive research and design projects on the use of technology for learning, specifically investigating the design of games for Science, Technology, Engineering, and Mathematics (STEM) learning.

Visit [create.nyu.edu](http://create.nyu.edu) for more information & access to digital learning tools developed by CREATE.