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System Scientist — Human-Computer Interaction Institute — Carnegie Mellon University

I explore the idea of alignment between design intention and the reality of a product. In an educational context, this relationship is at the core of the efficacy of an educational intervention in that student learning is the goal of the design process. In games, respecting player agency introduces additional challenges to creating a product in line with a designer's vision. I work to develop smarter tools and processes that allow designers to interrogate their products and wrestle with how well they manifest designers' intentions.

*Research Interests:* Educational Games, Game User Research, Educational Data Mining, Learning Science, Usable Analytics

## Education

### **Carnegie Mellon University, 2011 – 2017**

MS / PhD Human-Computer Interaction

Advisor: Vincent Alevan

Committee: Jodi Forlizzi, Jessica Hammer, Sharon Carver, Jesse Schell

### **Illinois Institute of Technology, 2007 – 2011**

BS Psychology, minor Computer Science

### **Temple University Japan Campus, 2010**

Exchange Student

## Selected Honors, Awards, and Fellowships

- 2016 EDM Exemplary Paper Designation (top 15%) – C9  
First Place among Carnegie Mellon University teams, Microsoft College Puzzle Challenge
- 2015 CHIPLAY Best Paper Honorable Mention (top 5%) – C8
- 2014 First Place among Carnegie Mellon University teams, Microsoft College Puzzle Challenge
- 2013 CHI Best Paper Honorable Mention (top 5%) – C2
- 2011 Program for Interdisciplinary Education Research (PIER) Fellowship, Carnegie Mellon University
- 2010 Commendation of Merit in Collaboration & Co-Creation, as part of IIT Empowering Haiti IPRO Team, Society for New Communications Research
- 2009 College of Science and Letters Undergraduate Research Award, Researching and Redesigning IIT's CS General Education Requirements, Illinois Institute of Technology

## Publications

*Google Scholar:* <http://scholar.google.com/citations?user=9twQhIwAAAAJ>

### Thesis

**Erik Harpstead**, "Projective Replay Analysis: A Reflective Approach for Aligning Educational Games to their Goals," Tech Report: CMU-HCII-17-107, Defended August 4, 2017.

## Journal Papers

- [J1] Christopher J. MacLellan, **Erik Harpstead**, Vincent Alevan, and Kenneth R. Koedinger, "TRESTLE: A Model of Concept Formation in Structured Domains," *Advances in Cognitive Systems*, 4, 2016. pp. 131-150.

## Conference Papers

- [C11] Kelly Rivers, **Erik Harpstead**, and Kenneth R. Koedinger, "Learning Curve Analysis for Programming: Which Concepts do Students Struggle With?" *Proceedings of the International Computing Education Research Workshop – ICER '16*, Melbourne, Australia, September 8-12, 2016. pp. 143-151.
- [C10] Catherine Chase, **Erik Harpstead**, and Vincent Alevan, "Inciting out-of-game transfer: Adapting contrast-based instruction for educational games," *Proceedings of the Games+Learning+Society Conference 12.0 – GLS 12.0*. Madison, WI, August 17-19, 2016.
- [C9] Christopher J. MacLellan, **Erik Harpstead**, Rony Patel, and Kenneth R. Koedinger, "The Apprentice Learner Architecture: Closing the loop between learning theory and educational data," *Proceedings of the 9th International Conference on Educational Data Mining – EDM '16*, Raleigh, NC, June 29-July 2, 2016. pp. 151-158. **Exemplary Paper Designation**
- [C8] **Erik Harpstead**, and Vincent Alevan, "Using Empirical Learning Curve Analysis to Inform Design in an Educational Game," *Proceedings of the ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play – CHIPLAY '15*, London, UK, October 3-5, 2015. pp. 197-207. **Best Paper Honorable Mention Award**
- [C7] **Erik Harpstead**, Thomas Zimmermann, Nachiappan Nagapan, Jose Guajardo, Ryan Cooper, Tyson Solberg, and Dan Greenawalt, "What Drives People: Creating Engagement Profiles of Players from Game Log Data," *Proceedings of the ACM SIGCHI Annual Symposium on Computer-Human Interaction in Play – CHIPLAY '15*, London, UK, October 3-5, 2015. pp. 369-379.
- [C6] Christopher J. MacLellan, **Erik Harpstead**, Vincent Alevan, and Kenneth R. Koedinger, "TRESTLE: Incremental Learning in Structured Domains using Partial Matching and Categorization," *Proceedings of the 3rd Annual Conference on Advances in Cognitive Systems – ACS '15*, Atlanta, Georgia, May 28-31, 2015. p. 13.
- [C5] **Erik Harpstead**, Christopher J. MacLellan, Vincent Alevan, Brad A. Myers, "Using Extracted Features to Inform Alignment-Driven Design Ideas in an Educational Game," *Proceedings of the 32nd SIGCHI Conference on Human Factors in Computing Systems – CHI '14*, Toronto Canada, April 26-May 1, 2014. pp. 3329-3338.
- [C4] **Erik Harpstead**, Christopher J. MacLellan, Kenneth R. Koedinger, Vincent Alevan, Steven P. Dow, and Brad A. Myers, "Investigating the Solution Space of an Open-Ended Educational Game Using Conceptual Feature Extraction," *Proceedings of the 6th International Conference on Educational Data Mining – EDM '13*, Memphis, Tennessee, July 6-9, 2013. pp. 51-58.
- [C3] Vincent Alevan, Steven Dow, Michael Christel, Scott Stevens, Carolyn Rosé, Kenneth Koedinger, Brad Myers, Julia Brynn Flynn, Zane Hintzman, **Erik Harpstead**, Soyeon Hwang, Derek Lomas, Chris Reid, Mitra Fathollahpour, Amos Glenn, Jonathan Sewall, John Balash, Nora Bastida, Chandana Bhargava, Sean Brice, Matt Champer, Samantha Collier, Jingyi Feng, Danny Hausmann, Meng Hui Koh, Weiwei Huo, Qianru Ma, Bryan Maher, Weichuan Tian, and Xun Zhang, "Supporting Social-Emotional Development in Collaborative Inquiry Games for K-3 Science Learning", *Proceedings of the Games+Learning+Society Conference 9.0 – GLS 9.0*, Madison, WI, June 12-14, 2013. pp. 53-60.
- [C2] **Erik Harpstead**, Brad A. Myers, and Vincent Alevan, "In Search of Learning: Facilitating Data Analysis in Educational Games," *Proceedings of the 31st SIGCHI Conference on Human Factors in Computing Systems – CHI '13*, Paris, France, April 27-May 2, 2013. pp. 79-88. **Best Paper Honorable Mention Award**

- [C1] Mike G. Christel, Scott M. Stevens, Bryan S. Maher, Sean Brice, Matthew Champer, Luke Jayapalan, Qiaosi Chen, Jing Jin, Daniel Hausmann, Nora Bastida, Xun Zhang, Vincent Aleven, Kenneth R. Koedinger, Catherine Chase, **Erik Harpstead**, and Derek Lomas. "RumbleBlocks: Teaching Science Concepts to Young Children through a Unity Game," Proceedings of the 17th International Conference on Computer Games – CGames '12, Louisville, Kentucky, July 30-August 1, 2012. pp. 162-166.

## Book Chapters

- [B1] **Erik Harpstead**, Christopher J. MacLellan, Vincent Aleven, Brad A. Myers, "Replay analysis in open-ended educational games," Serious Game Analytics: Methodologies for Performance Measurement, Assessment, and Improvement. Christian S. Loh, Yanyan Sheng, and Dirk Ifenthaler (Eds.) 2015. pp. 381-399.

## Workshop Papers

- [W6] **Erik Harpstead** "Projective Replay Analysis: Using Cognitive Systems to Drive Evaluation of Educational Games," 2nd Annual Students of Cognitive Systems Workshop at the Advances in Cognitive Systems Conference – SOCS '16, Evanston, IL, June 23, 2016.
- [W5] **Erik Harpstead**, Christopher J. MacLellan, and Vincent Aleven, "Discovering Knowledge Models in an Open-ended Educational Game using Concept Formation," *6th International Workshop on Intelligent Support in Exploratory and Open-Ended Learning Environments at the 17th International Conference on Artificial Intelligence in Education – AIED '15*, Madrid, Spain, June 22, 2015.
- [W4] Christopher J. MacLellan, **Erik Harpstead**, Elian Stampfer Wiese, Mengfan Zou, Noboru Matsuda, Vincent Aleven, and Kenneth R. Koedinger, "Authoring Tutors with Complex Solutions: A Comparative Analysis of Example Tracing and SimStudent," *Workshop on Simulated Learners at the 17th International Conference on Artificial Intelligence in Education – AIED '15*, Madrid, Spain, June 26, 2015.
- [W3] **Erik Harpstead**, Christopher J. MacLellan, Vincent Aleven, & Kenneth R. Koedinger, "Using Data to Explore the Differences between Instructional Vision and Student Performance," *Workshop on Learning Innovation at Scale at the 32nd SIGCHI Conference on Human Factors in Computing Systems – CHI '14*, Toronto, Canada, April 27, 2014.
- [W2] **Erik Harpstead**, "A Potential Future for Games: Appropriated Interfaces," *Game Jam at the 31st SIGCHI Conference on Human Factors in Computing Systems – CHI '13*, Paris, France, May 27-28, 2013.
- [W1] Derek Lomas and **Erik Harpstead**, "Design Space Sampling for the Optimization of Online Educational Games," *Workshop on Game User Research at the 30th SIGCHI Conference on Human Factors in Computing Systems – CHI '12*, Austin, Texas, May 5-6, 2012

## Posters

- [P3] **Erik Harpstead**, Christopher J. MacLellan, Vincent Aleven, Brad A. Myers, "Considering the Alignment of an Open-Ended Educational Game Using Representative Student Solutions." Poster presented at the 7th Annual Inter-Science of Learning Center Student and Post-Doc Conference – iSLC '14, 2014.
- [P2] **Erik Harpstead**, Jonathan Sewall, Martin Van Velsen, and Vincent Aleven, "Modeling Untutored Interactions in CTAT for use with Complex Interface Components." Poster presented at PSLC Summer Interns Poster Session, 2010.
- [P1] **Erik Harpstead**, and Ruthana Gordon "Relationships Between Time Perspective & Characteristics of Memories & Imagined Futures." Poster presented at 51st Annual Meeting of the Psychonomics Society, 2009.

## Professional Experience

2017 – Present    Carnegie Mellon University, Human-Computer Interaction Institute, Pittsburgh, PA  
System Scientist

- 2014            Microsoft Research, Redmond, WA  
Research Internship  
Mentors: Thomas Zimmermann & Nachiappan Nagappan
- 2010 – 2011    Carnegie Mellon University, Pittsburgh Science of Learning Center, Pittsburgh, PA  
Research Programmer on the Cognitive Tutor Authoring Tools (CTAT) Project  
Mentor: Vincent Aleven
- 2009            Museum of Science and Industry, Guest Programs, Chicago, IL  
Floor Presentations Intern

## Teaching Experience

- User Interface Lab – GUI Development, Carnegie Mellon University – 05-4/633-B  
*Fall 2014*, Supervisor: Anind Dey
- Educational Game Design Track, IPTSE Winter School  
*Winter 2013*, Co-Instructors: Amy Ogan (CMU), and Erin Walker (ASU)
- User Centered Research and Evaluation, Carnegie Mellon University – 05-4/610  
*Fall 2013*, Supervisors: Robert Kraut, and James Morris
- Introduction to Computer Programming with Media, Carnegie Mellon University  
*Summer 2013*
- Data Structures and Algorithms, Illinois Institute of Technology – CS 331  
*Spring 2011*, Supervisor: Mattox Beckman
- Accelerated Introduction to Computer Science, Illinois Institute of Technology – CS 201  
*Fall 2010*, Supervisor: Matthew Bauer
- Introduction to Computer Programming I, Illinois Institute of Technology – CS 105  
*Fall 2009*, Supervisor: Michael Saelee

## Professional Service

### Departmental Service

- 2016    Student Representative, HCII PhD Admissions Committee
- 2014    Student Representative, HCII-ETC Faculty Search Committee

### Conference Committees

- 2017    Co-Chair of Student Volunteering, ACM CHIPLAY Organizing Committee
- 2016    Co-Chair of Student Volunteering, ACM CHIPLAY Organizing Committee
- 2015    Committee Member, ACM CHI Works-in-Progress Program Committee

### Reviewer

- 2016    Journal of Computers and Education
- 2016    Journal of Information Visualization
- 2015    ACM TOCHI
- 2015    Journal Entertainment Computing
- 2015+   ACM CHIPLAY
- 2015+   GLS
- 2014+   ACM CHI, Full Papers and Works-in-Progress

2013    FDG

## Volunteer

2013    Student Volunteer, ACM UIST Program Committee Meeting