

I work to develop smarter tools and processes that allow designers to interrogate their products and wrestle with how well they manifest designers' intentions. My work explores 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.

*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 Aleven

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%) – P10
- 2015 CHIPLAY Best Paper Honorable Mention (top 5%) – P8
- 2013 CHI Best Paper Honorable Mention (top 5%) – P2
- 2011 Program for Interdisciplinary Education Research (PIER) Fellowship, Carnegie Mellon University

## Academic Publications

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

### Thesis

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

### Conference and Journal Papers

- [P14] Christopher J. MacLellan, **Erik Harpstead**, Robert P. Marinier III, and Kenneth R. Koedinger, [A Framework for Natural Cognitive System Training Interactions](#), *Proceedings of the Sixth Annual Conference on Advances in Cognitive Systems – ACS '18*, Stanford, CA, August 18-20, 2018. (to appear).
- [P13] Huy Nguyen, **Erik Harpstead**, Yeyu Wang, Bruce M McLaren, [Student Agency and Game-Based Learning: A Study Comparing Low and High Agency](#), *Proceedings of the 19th International Conference on Artificial Intelligence in Education – AIED '18*, London, UK, June 25-30, 2018.
- [P12] 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.

- [P11] 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.
- [P10] 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**
- [P9] 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.
- [P8] **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**
- [P7] **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.
- [P6] 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.
- [P5] **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.
- [P4] **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.
- [P3] 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.
- [P2] **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**
- [P1] 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 Alevan, 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.

## Professional Experience

2014	<b>Microsoft Research</b> Redmond, WA, USA Research Internship <i>Mentors:</i> Thomas Zimmermann & Nachiappan Nagappan	Analyzed a large-scale dataset of gameplay data to understand common types of players in a popular racing game.
2010 – 2011	<b>Carnegie Mellon University</b> Pittsburgh, PA, USA Research Programmer <i>Mentor:</i> Vincent Aleven	Contributed to the Cognitive Tutor Authoring Tools (CTAT) project including a full re-architecting of its Flash UI toolkit.
2009	<b>Museum of Science and Industry</b> Chicago, IL, USA Floor Presentations Intern	Ran interactive floor presentation carts for guests

## Teaching Experience

Design of Educational Games, Carnegie Mellon University – 05-418/818  
*Spring Semester 2018, Instructor of Record*

User Interface Lab – GUI Development, Carnegie Mellon University – 05-433/633-B  
*Fall Semester 2014, TAsupervised by: Anind Dey*

Educational Game Design Track, IPTSE Winter School, Bangalore, India  
*2 Week Winter Workshop 2013, Co-Instructors: Amy Ogan (CMU), and Erin Walker (ASU)*

User Centered Research and Evaluation, Carnegie Mellon University – 05-410/610  
*Fall Semester 2013, TAsupervised by Robert Kraut, and James Morris*

Introduction to Computer Programming with Media, Carnegie Mellon University  
*Online Preparatory Course Summer 2013, Instructor*

Data Structures and Algorithms, Illinois Institute of Technology – CS 331  
*Spring Semester 2011, TAsupervised by Mattox Beckman*

Accelerated Introduction to Computer Science, Illinois Institute of Technology – CS 201  
*Fall Semester 2010, TAsupervised by: Matthew Bauer*

Introduction to Computer Programming I, Illinois Institute of Technology – CS 105  
*Fall Semester 2009, TAsupervised by Michael Saelee*

## Professional Service

### Conference Organizing Committees

2017 ACM CHIPLAY (Co-Chair of Student Volunteering)  
2016 ACM CHIPLAY (Co-Chair of Student Volunteering)

## Invited Program Committees

- 2019 ACM CHI (Associate Chair; Learning, Education, & Families subcommittee)
- 2018 ACM CHI Play (Associate Chair)
- 2015 ACM CHI Works-in-Progress (Committee Member)

## External Reviewer

- 2018 Journal of Human-Computer Studies
- 2016+ Journal of Information Visualization, Journal of Computers and Education
- 2015+ ACM CHI Play, Journal Entertainment Computing, ACM TOCHI, GLS
- 2014+ ACM CHI
- 2013 FDG

## Extended Honors, Awards, and Fellowships

- 2016 First Place among Carnegie Mellon University teams, Microsoft College Puzzle Challenge
- 2014 First Place among Carnegie Mellon University teams, Microsoft College Puzzle Challenge
- 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

## Other Publications

### Workshop Papers

- [W7] **Erik Harpstead**, Christopher J. MacLellan, Robert P. Marinier III, and Kenneth R. Koedinger, Towards Natural Cognitive System Training Interactions: A Preliminary Framework, Designing the User Experience of Artificial Intelligence as part of the 2018 AAI Spring Symposium. Stanford, CA, forthcoming.
- [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 32<sup>nd</sup> 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

## Invited Talks

[T5] An AI That Learns Like Students Do: Developing a Computational Theory of Human Learning in Tutoring Environments. *Simon Initiative LearnLab Summer School, August 2018*.

[T4] Seeing Experience from Many Angles: Educational Game Design as a Data-Informed Craft. *Microsoft Research, April 2017*. <https://www.youtube.com/watch?v=D6zGEEdIb8z0>

[T3] Projective Replay Analysis in Educational Games. *Soar Technology, Inc., March 2017*.

[T2] Computational Theory and Educational Game Design. *Northwestern University, March 2017*.

[T1] Seeing Experience from Many Angles: Educational Game Design as a Data-Informed Craft. *Virginia Polytechnic Institute and State University Department of Computer Science, February 2017*.

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