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### Education

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Ph.D. Education, University of California at Berkeley, 2000  
MA Education, University of California at Berkeley, 1996  
BS Cognitive Science, University of California at San Diego, 1992

### Research

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Professor, Vanderbilt University 2018-present  
Professor, UCLA 2000 - 2018

Research addresses how people learn through social interaction and instructional conversations by:

- Identifying the elements of a classroom discourse and culture that lead to effective learning
- Designing and studying external representations—such as graphs, diagrams, and maps—that spark, support, and anchor productive learning conversations
- Investigating the connections between academic discourse and everyday discourse to create more effective and engaging learning opportunities for urban students from non-dominant cultural groups and linguistic minorities

### Works in Progress

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Kiefert, D., Enyedy, N., & Xiao, C. (in progress). Becoming the phenomenon. To be submitted to

Enyedy, N. and Stevens, R. (in progress). Analyzing Collaborative Discourse. In The Cambridge Handbook of the Learning Sciences Third Edition, Kieth Sawyer (Ed)

### Scholarly Articles Submitted to Refereed Journals

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\*Kiefert, D., Enyedy, N. Dahn, M. Lee, C, Lindberg, L. & Danish, J. (submitted). Tracing Bodies through Liminal Blends in a Mixed Reality Learning Environment. International Journal of Science Education.

DeLiema, D., Enyedy, N., Danish, J.A., & Steen, F. F. (submitted). Blending viewpoint and space: Gestures in conceptual integration and learning. *Cognition and Instruction*.

Dahn, M., Enyedy, N., & Danish, J. (submitted). Instructional improvisation for science learning: Zed's dead and the missing flower. *Journal of the Learning Sciences*.

### **Scholarly Articles Published in Refereed Journals** \_\_\_\_\_

Danish, J., Enyedy, N., Saleh, A., & Humberg, M. (accepted). The Science Through Technology Enhanced Play Project: Developing a Sociocultural Framework for Embodied Cognition. *International Journal of Computer-Supported Collaborative Learning*.

Davis, B., Tu, X., Georgen, C., Danish, J. A., & Enyedy, N. (2019). The impact of different play activity designs on students' embodied learning. *Information and Learning Sciences*.

Sandoval W., Enyedy N, Redman E, Xiao S. (2019). Organizing a culture of argumentation in elementary science. *International Journal of Science Education*. 41(13):1848-1869.

DeLiema, D., Enyedy, N., & Danish, J. A. (2019). Roles, rules, and keys: How different play configurations shape collaborative science inquiry. *Journal of the Learning Sciences*. 8(4- 5):513-555.

Dahn, M., DeLiema., D. & Enyedy, N. (2019). Art as a point of departure for storytelling about the experience of learning to code. *Teachers College Record*.

DeLiema, D., Dahn, M., Flood, V. J., Abrahamson, D., Enyedy, N., Steen, F. F. (2019). Debugging as a context for collaborative reflection on problem-solving processes. In E. Manolo (Eds.), *Deeper learning, communicative competence, and critical thinking: Innovative, research-based strategies for development in 21st century classrooms*. New York, NY: Routledge.

Enyedy, N., Danish, J. A., & DeLiema, D. (2015). Constructing liminal blends in a collaborative augmented-reality learning environment. *International Journal of Computer-Supported Collaborative Learning*, 10(1), 7-34.

Enyedy, N., Danish, J. A., Delacruz, G., & Kumar, M. (2012). Learning physics through play in an augmented reality environment. *International Journal of Computer-Supported Collaborative Learning*, 7(3), 347-378.

Danish, J. A., & Enyedy, N. (2014). Latour goes to kindergarten: Children marshaling allies in a spontaneous argument about what counts as science. *Learning, Culture and Social Interaction*.

Sengupta-Irving, T and Enyedy, N. (2015). Why designing for mathematical practices may explain stronger outcomes in affect and engagement than designing for proficiency: Comparing open versus guided inquiry. *Journal of the Learning Sciences*.

Sengupta-Irving, T. Redman, E. and Enyedy, N. (2013). Re-storying practice: Using

- stories about students to advance mathematics education reform. *Teaching and Teacher Education*, 31, 1–12
- Enyedy, N., Danish, J. A., Delacruz, G., & Kumar, M. (2012) Learning physics through play in an augmented reality environment. *International Journal of Computer Supported Collaborative Learning*, 7 (3) 347-378
- Fields, D. & Enyedy, N. (2013). Picking up the mantle of “expert”: Assigned roles, assertion of identity, and peer recognition within a programming class. *Mind, Culture, and Activity* 20(2) 113-131.
- Enyedy, N., Danish, J. A., & Fields, D. (2011). Negotiating the “Relevant” in culturally relevant mathematics. *Canadian Journal for Science, Mathematics, and Technology Education*, 11(3) 273-29.
- Goldberg, J., Enyedy, N., Welsh, K., & Galiani, K. (2009). Legitimacy and language in a science classroom. *English Teaching: Practice and Critique*, 8(2) 6-24.
- Enyedy, N., Franke, M., & Wischnia, S. (2008). Classroom discourse: Strategy and consensus conversations. *Journal of Educational Research*, 2 (2/3), 101-122.
- Enyedy, N., Rubel, L., Castellon, V., Mukhopadhyay, S., & Esmond, I. (2008). Revoicing in a multilingual classroom: Learning implications of discourse. *Mathematical Thinking and Learning*, 10(2), 134-162.
- Borgman, C., Wallis, J., & Enyedy, N. (2007). Little science confronts the data deluge: Habitat ecology, embedded sensor networks, and digital libraries. *International Journal on Digital Libraries*, 7, 17–30.
- Danish, J. & Enyedy, N. (2007). Negotiated Representational Mediators: How Young Children Decide What to Include in Their Science Representations. *Science Education*, 91, 1-35.
- Enyedy, N. & Mukhopadhyay, S. (2007). They don’t show anything I didn’t know: Emergent tensions between culturally relevant pedagogy and mathematics pedagogy. *The Journal of the Learning Sciences*, 16(2), 139–174.
- Rogers, J., Morrel, E. & Enyedy, N. (2007). Studying the struggle: Contexts for learning and identity development of urban youth. *American Behavioral Scientist*.
- Enyedy, N. & Hoadley, C. (2006). From dialogue to monologue and back: Middle spaces in computer-mediated learning. *International Journal of Computer Supported Collaborative Learning*, 1, 413-439.
- Enyedy, N., Goldberg, J., & Welsh K. (2006). Complex dilemmas of identity and practice. *Science Education*, 90(1) 68-93.
- Enyedy, N. (2005). Inventing Mapping: Creating cultural forms to solve collective problems. *Cognition and Instruction*, 23(4), 427 - 466.
- Enyedy, N., & Goldberg, J. (2004). Inquiry in interaction: Developing classroom communities for understanding through social interaction. *Journal for Research in Science Teaching*, 41, 905-935.

Enyedy, N. (2003). Knowledge construction and collective practice: At the intersection of learning, talk, and social configurations in a computer-mediated mathematics classroom. *The Journal of the Learning Sciences*, 12(3), 361-408.

Vahey, P., Enyedy, N., & Gifford, B. (2000). The Probability Inquiry Environment: Learning probability using a collaborative, inquiry-based simulation environment. *Journal of Interactive Learning Research*, 11, 51-84.

### **Book Chapters**

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\* Levine, S., Keifert, D., Marin, A., & Enyedy, N. (in press). Hybrid Argumentation in Literature and Science for K-12 Classrooms. In Nasir, N.S., Lee, C. D, Pea, R, & de Royston, M.M. (Eds.) *Handbook on the Cultural Foundations of Learning*.

\* DeLiema, D., Dahn, M., Flood, V. J., Asuncion, A., Abrahamson, D., Enyedy, N., & Steen, F. (2019). Debugging as a context for fostering reflection on critical thinking and emotion. *Deeper Learning, Dialogic Learning, and Critical Thinking: Research-based Strategies for the Classroom*, 209.

Danish & Enyedy (in press). Constructionism with and through the body, in *Constructionism in Context* (Holbert, Berland & Kafai Eds). MIT Press

Enyedy & Danish (in press). Classrooms as designed spaces: What to break and what to build on in the nested activity systems of formal schooling in *Epistemological Conversations in the Learning Science: Emerging Ideas in Technology, Cognition, Design and Transdisciplinarity*, MarieClaire Shanahan, Beaumie Kim, Kim Koh, Armando Paulino PreciadoBabb, Miwa A. Takeuchi (Eds)

Enyedy & Yoon (press). Immersive Environments: Learning in Augmented, Mixed and Virtual Reality in *International Handbook for Computer Supported Collaborative Learning*, Ulrike Cress, Carolyn Rosé, Alyssa Wise, and Jun Oshima (Eds)

Enyedy, N. (2017) The zone of proximal development. In *The SAGE Encyclopedia of Out-of School Learning*, Kylie Peppler (Ed)

Danish, Enyedy, Lee & Saleh (2016). Designing for Activity, In *Untold story: Design as Scholarship in the Learning Sciences*. Vanessa Svihla & Richard Reeve (eds). P. 26-40. Routledge.

Danish, J. Parnafes, O. and Enyedy, N. (2016). Socializing Coordination Class Theory. In *Integrating Knowledge Analysis and Interactional Analysis* Marianna Levin and Orit Parnafes (eds) p. 160-181. Taylor & Francis.

DeLiema, D., Lee, V., Danish, J. Enyedy, N., and Brown, N. (2016). Micro Longitudinal Analysis. In *Integrating Knowledge Analysis and Interactional Analysis* Marianna Levin and Orit Parnafes (eds) p 133-159. Taylor & Francis.

- Enyedy, N. & Danish, J. (2016). Commentary: The need for the participant's perspective in a KAIA joint enterprise. In *Integrating Knowledge Analysis and Interactional Analysis* Marianna Levin and Orit Parnafes (eds) p. 447-457. Taylor & Francis.
- Enyedy, N. and Danish, J. (2015). Learning Physics through Play and Embodied Reflection in a mixed-reality learning environment in *Learning Technologies and the Body: Integration and Implementation* Victor Lee (Ed) p. 97-111. Routledge.
- Enyedy, N. and Stevens, R. (2014). Analyzing Collaborative Discourse. In *The Cambridge Handbook of the Learning Sciences*, Kieth Sawyer (ed) p. 191-212. Cambridge University Press.
- Enyedy, N., Franke, M., & Wischnia, S. (2008). Classroom discourse: Strategy and consensus conversations. In *Teaching Strategies, Innovations, and Problem Solving*. New York, NY: Nova Publishers.
- Goldberg, J. Welsh, K., & Enyedy, N. (2008). Negotiating classroom participation in a bilingual science classroom. In Katherine Bruna and Kimberley Gomez (Eds.) *Talking Science, Writing Science: The Work of Language in Multicultural Classrooms*. Mahwah, NJ, US: Lawrence Erlbaum Associates, Inc., Publishers.
- Borgman, C., Wallis, J. C., & Enyedy, N. (2006). Building digital libraries for scientific data: An exploratory study of data practices in habitat ecology. In *Research and Advanced Technology for Digital Libraries* (pp. 170-183). Springer Berlin Heidelberg.

### **Policy Briefs, Editorials & Reports**

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- Enyedy, N and Hall, R. (2017). "Cognition and instruction in transition." *Cognition and Instruction*, 35(1), 1-3.
- Moher, T. & Enyedy, N. (2017). Classrooms as digital performance spaces. In J. Roschelle, W. Martin, J. Ahn, & P. Schank (Eds.), *Cyberlearning Community Report: The State of Cyberlearning and the Future of Learning with Technology* (pp. 27-34). Menlo Park CA: SRI International.
- Enyedy, Noel (2015). Personalized Instruction: New interest, old rhetoric, limited results—time for a new direction for computer-mediated learning. Commissioned by National Education Policy Center (NEPC).

### **Papers Published in Peer Reviewed Proceedings**

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- Tu, X., Danish, J., Georgen, C., Humburg, M., Davis, B., & Enyedy, N. (2019) Examining how scientific modeling emerges through collective embodied play. In Lund, K., Nicolai., G., Lavoue, E., Hmelo-Silver, C., Gwen, G., & Baker, M., (Ed.), *A Wide Lens: Combing Embodied, Enactive, Extended and Embedded Learning in Collaborative Settings: The 13<sup>th</sup> International Conference on Computer Supported Collaborative Learning* (Vol. 2.). Lyon, France: The International Society of the Learning Sciences.

- Georgen, C. (2019) "Can't nobody floss like this!": Exploring Embodied Science Learning in the Third Space. In Lund, K., Niccolai, G., Lavoue, E., Hmelo-Silver, C., Gwen, G., & Baker, M., (Ed.), *A Wide Lens: Combing Embodied, Enactive, Extended and Embedded Learning in Collaborative Settings: The 13<sup>th</sup> International Conference on Computer Supported Collaborative Learning* (Vol. 1.). Lyon, France: The International Society of the Learning Sciences.
- Danish, J., Enyedy, N., Humburg, M., Davis, B., & Tu, X., (2019) Collective embodied activity and how different concepts map to social exploration. In Lund, K., Niccolai, G., Lavoue, E., Hmelo-Silver, C., Gwen, G., & Baker, M., (Ed.), *A Wide Lens: Combing Embodied, Enactive, Extended and Embedded Learning in Collaborative Settings: The 13<sup>th</sup> International Conference on Computer Supported Collaborative Learning* (Vol. 2.). Lyon, France: The International Society of the Learning Sciences.
- Davis, B., Tu, X., Danish, J., & Enyedy, N. (2018). The Structures of Embodied Play Activities and Their Impact on Students' Exploration of the Particulate Nature of Matter. In J. Kay & R. Luckin (Eds.), *International Conference of the Learning Sciences*. <https://repository.isls.org/bitstream/1/846/1/494.pdf>
- Danish, J., Enyedy, N., Humburg, M., Saleh, A., Dahn, M., Lee, C., ... Georgen, C. (2018). STEP-Bees and the Role of Collective Embodiment in Supporting Learning Within a System. In J. Kay & R. Luckin (Eds.), *International Conference of the Learning Sciences*. <https://repository.isls.org/bitstream/1/600/1/272.pdf>
- Dahn, M., Enyedy, N., & Danish, J. (2018). How Teachers Use Instructional Improvisation to Organize Science Discourse and Learning in a Mixed Reality Environment. In J. Kay & R. Luckin (Eds.), *International Conference of the Learning Sciences*. <https://repository.isls.org/bitstream/1/915/1/8.pdf>
- Keifert, D., Enyedy, N., Danish, J., Lee, C., Dahn, M., & Lindberg, L. (2018). Tracing Bodies Through Liminal Blends during Play-based Inquiry in a Mixed Reality Environment. In J. Kay & R. Luckin (Eds.), *International Conference of the Learning Sciences*. <https://repository.isls.org/handle/1/662>
- Davis, B., Tu, X., Danish, J., & Enyedy, N. (2017). The Impact of the Structure of Play, Gesture and Teacher Prompts on Student Explanations About the Particulate Nature of Matter. In *12th International Conference on Computer Supported Collaborative Learning*.

- Enyedy, N., Danish, J., DeLiema, D., Saleh, A., Lee, C., Morris, N., and Illum, R. (2017). Social Affordances of Mixed Reality Learning Environments: A case from the Science through Technology Enhanced Play project. In the 50<sup>th</sup> *Proceedings of the Hawaii International Conference on System Science*. University of Hawaii, Honolulu, Hawaii: University of Hawaii Press.
- DeLiema, D., Saleh, A., Lee, C., Enyedy, N., Danish, J. A., Illum, R., Dahn, M., Humburg, M., & Mahoney, C. (2016). Blending play and inquiry in augmented reality: A comparison of playing a video game to playing within a participatory model. In C-K. Looi, J. Polman, U. Cress, & P. Reimann (Eds.) *Proceedings of the International Conference of the Learning Sciences* (pp. 450-457). Singapore: International Society of the Learning Sciences.
- Danish, J., Enyedy, N., Saleh, A., Lee, C., & Andrade, A. (2015). Science Through Technology Enhanced Play: Designing to Support Reflection Through Play and Embodiment. In O. Lindwall, Häkkinen, P., Koschman, T. Tchounikine, P. & Ludvigsen, S. (Ed.), *Exploring the Material Conditions of Learning: The Computer Supported Collaborative Learning (CSCL) Conference (Vol. 1)*. Gothenburg, Sweden: The International Society of the Learning Sciences.
- Saleh, A., Danish, J., Enyedy, N., & Lee, C. (2015). Assessing Young Children's Cognition through Multi-Modal Interviews. In O. Lindwall, Häkkinen, P., Koschman, T. Tchounikine, P. & Ludvigsen, S. (Ed.), *Exploring the Material Conditions of Learning: The Computer Supported Collaborative Learning (CSCL) Conference (Vol. 1)*. Gothenburg, Sweden: The International Society of the Learning Sciences.
- Enyedy, N. Burke, J., Wagmister, F., Bolling, A. and Fitz-Gibbon, T. (2014). Cybermural: Becoming artist activists and learning urban planning. In Enyedy (Chair) *Learning and Becoming Through Art-Making: Relationships among tools, phenomena, people, and communities in shaping youth identity development*, Symposium to be presented at the International Conference of the Learning Sciences, Boulder, CO.
- Enyedy, N. and Danish, J. (2014). Distributed acts of reflection: Embodied acts to focus and filter a jointly produced reflection. In Moher (Chair). *Becoming Reflective: Designing for Reflection on Physical Performances*, Symposium to be presented at the International Conference of the Learning Sciences, Boulder, CO.
- Cook, M. and Enyedy, N. (2014). The Role of Scientific and Social Academic Norms in Student Negotiations while Building Astronomy Models. Paper to be presented at the International Conference of the Learning Sciences, Boulder, CO.
- Danish, J., Enyedy, N., and Parnafes, O. (2014). Coordination class in interaction. In Levin & Parnafes (Chairs). *Is the sum greater than its parts? Reflections on the agenda of integrating analyses of cognition and learning*, Symposium to be presented at the International Conference of the Learning Sciences, Boulder, CO.

- Sengupta-Irving, T., and Enyedy, N (2014). Smiles Don't count: A Case Study Unifying Disciplinary Engagement with Dispositions in the Study of Mathematical Learning. . In Kumar (Chair). *Becoming More Mathematical: New Directions for Describing and Designing for Positive Dispositions Toward Mathematics*, Symposium to be presented at the International Conference of the Learning Sciences, Boulder, CO.
- Enyedy, N., Danish, J. A., DeLiema, D. (2013). Constructing and Deconstructing Materially-Anchored Conceptual Blends in an Augmented Reality Collaborative Learning Environment (full paper). In S. Puntambekar, N. Rummel, M. Kapur M. Nathan (Eds.), *Proceedings of the 10th International Conference on Computer Supported Collaborative Learning*. Madison, WI.
- Enyedy, N; Danish, J. A., Delacruz, G., Kumar, M., & Gentile, S. (2011). Play and augmented reality in learning physics: The SPASES Project. In H. Spada, G. Stahl, N. Miyake, and N. Law (Eds.) *Connecting Computer-Supported Collaborative Learning to Policy and Practice: CSCL2011 Conference Proceedings* (p. 216-223). International Society of the Learning Sciences (ISLS).
- Fields, D. A. & Enyedy, N. D. (2008). Culturally relevant mathematics: Students' cultural engagement with statistics. In V. Jonker , A. Lazonder, and C. Hoadley (Eds.) *Proceedings of the Eighth International Conference of the Learning Sciences*, Utrecht, Netherlands: University of Utrecht.
- Borgman, C., Wallis, J., & Enyedy, N. (2006). Building digital libraries for scientific data: An exploratory study of data architecture and practices in habitat biology. In J. Gonzalo, C. Thanos, M. Verdejo and Rafael Carrasco (Eds.) *10th European Conference on Research and Advanced Technology for Digital Libraries* (pp. 170-183). Berlin, Germany: Springer-Verlag.
- Danish, J., & Enyedy, N. (2006). Unpacking the cultural mediation of invented representations. In S. Barab, K. Hay, D. Hickey (Eds.) *Proceedings of the International Conference of the Learning Sciences*, (pp.113-119). Mahwah, NJ, US: Lawrence Erlbaum Associates, Inc., Publishers.
- Enyedy, N., Mukhopadhyay, S., & Danish, J. (2006). Emergent tensions between statistics education and culturally relevant pedagogies. In A. Rossman and B. Chance (Eds.) *Proceeding of the Seventh International Conference on Teaching Statistics*, (pp. 204-210). Salvador, Brazil.
- Enyedy, N., Mukhopadhyay, S., & Danish, J. (2005). At the intersection of classroom culture and culturally relevant pedagogy: What students' arguments around maps reveal about how to increase student achievement within our diverse society. Paper presented at the *First International Congress of the International Society for Cultural and Activity Research*, Seville, Spain.
- Danish, J., & Enyedy, N. (2005). The dialectic of task-based communities and communities of practice. Paper presented at the *First International Congress of the International Society for Cultural and Activity Research*, Seville, Spain.



- Danish, J., & Enyedy, N. (2005). Mediation of students' ideas through representational activities. Paper presented at the *First International Congress of the International Society for Cultural and Activity Research*, Seville, Spain.
- Enyedy, N. (2002). Coordinating individual and collective processes of learning in design experiments. In Oers, Wardekker, Blom, Elbers, Pompert, and van der Veer (Eds.) *Proceedings of the Fifth Congress of the International Society for Cultural Research and Activity Theory*.
- Gifford, B., & Enyedy, N. (1999). Activity centered design: Towards a theoretical framework for CSCL. In C. Hoadley & J. Roschelle (Eds.), *Proceedings of the Third International Conference on Computer Support for Collaborative Learning* (pp. 189-196). Deerfield, IL: Unext.com.
- Hoadley, C., & Enyedy, N., (1999). Between information and communication: Middle spaces in computer media for learning. *Proceedings of the Third International Conference on Computer Support for Collaborative Learning* (pp. 242-251). Deerfield, IL: Unext.com.
- Vahey, P., Enyedy, N., & Gifford, B. (1999). The Probability Inquiry Environment: A collaborative, inquiry-based simulation environment. In C. Hoadley and J. Roschelle (Eds.), *Proceedings of the Thirty Second Annual Hawaii International Conference on Systems Sciences*, Piscataway, NJ: IEEE.
- Enyedy, N., Vahey, P., & Gifford, B. (1998). "...It's fair because they each have two." The development of a mathematical practice across two social contexts. *Proceedings of the International Conference of the Learning Sciences 98* (pp. 91-97). Atlanta, GA: AACE.
- Vahey, P., Enyedy, N., & Gifford, B. (1997). Beyond representativeness: Productive intuitions about probability. In M. Shafto and P. Langley (Eds.), *Proceedings of the Nineteenth Annual Conference of the Cognitive Science Society* (pp. 769-774). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Enyedy, N., Vahey, P., & Gifford, B. (1997). Active and supportive computer-mediated resources for student-to-student conversations. In R. Hall, N. Miyake and N. Enyedy (Eds.), *Proceedings of the Second International Conference on Computer Support for Collaborative Learning* (pp. 27-36). Toronto, Canada: University of Toronto Press.
- Enyedy, N., Vahey, P., & Gifford, B. (1997). Designing interactions for guided inquiry learning environments. In G. Salvendy, M. J. Smith and R. J. Koubek (Eds.), *Design of Computing Systems* (pp. 157-60). Amsterdam, The Netherlands: Elsevier.

#### **Papers Presented at Professional Meetings**\_\_\_\_\_

- Dahn, M., DeLiema, D., & Enyedy, N. (2019, April). Using art to tell stories about failure when learning to code. To be presented at the American Educational Research Association Annual Meeting, Toronto, Canada.
- DeLiema, D., Dahn, M., Enyedy, N., Abrahamson, D., Steen, F., Flood, V., Taylor, J. (2019, April). Debugging failure: 5<sup>th</sup>-10<sup>th</sup> grade students' journal reflections,

- coding, and artwork about broken code. To be presented at the American Educational Research Association Annual Meeting, Toronto, Canada.
- Keifert, D., Enyedy, N., Dahn, M., Lee, C., Lindberg, L., & Danish, J. (2019, April). Tracing bodies through liminal blends during play-based inquiry in a mixed reality environment. To be presented at the American Educational Research Association Annual Meeting, Toronto, Canada.
- Lee, C. & Enyedy, N. (2019, April). Recognizing joy in play: The impact of dual affect in learning science. To be presented at the American Educational Research Association Annual Meeting, Toronto, Canada.
- Danish, J., Keifert, D., Enyedy, N., Humburg, M., Tu, X., Davis, B., & Lee, C. (2018). Embodiment Within Computational Models: Explorations of Agency and Normativity. *Annual conference of the American Educational Research Association*.
- DeLiema, D., Abrahamson, D., Enyedy, N., Steen, F., Dahn, M., Flood, V J., Taylor, J., & Lee, L. (2018, April). Measuring debugging: How late elementary and middle school students handle broken code. Presented at the American Educational Research Association Annual Meeting, New York, NY.
- Gravell, J., Enyedy, N. (November 2018) Iterative Digital Art Making as Community Civic Engagement. College and University Faculty Assembly of the National Council of Social Studies. Chicago, IL.
- Humburg, M., Keifert, D., Georgen, C., Lee, C., Tu, X., Danish, J., & Enyedy, N. (2018). The Challenge of Consistency in Sensemaking Resources Across Play and Assessment for Young Science Learners. *Annual conference of the American Educational Research Association*.
- Danish, J., Enyedy, N., Saleh, A., Humburg, M., DeLiema, D., Dahn, M., & Lee, C. (2017, April). STEP-Bees: Coordinating embodied interaction with peers, teachers, and computer simulation to support learning. Paper presented at the American Educational Research Association Annual Meeting, San Antonio, TX.
- Danish, J., Humburg, M., Saleh, A., Lee, C., Dahn, M., Keifert, D., & Enyedy, N. (2017). A Socio-Cultural Framework for Embodied Cognition. Paper presented at the Annual Meeting of the Jean Piaget Society San Francisco, CA
- Hall, R., Marin, A., Taylor, K., Silvis, D., Pinkard, N., & Enyedy, N. (2017) Location-Aware Technologies and New Genre of Learning on the Move (LoM)? Paper presented at the Annual Meeting of the Jean Piaget Society San Francisco, CA
- Humburg, M., Danish, J., Enyedy, N., & Saleh, A. (2017). Problem solving in coordinated embodied activity: Emergent goals and solutions. *Annual conference of the American Educational Research Association*.
- Keifert, D., Enyedy, N., Danish, J., Lee, C., & Saleh, A. (2017) Two Kinds of Thought Experiments about Water Temperature during Young Children's Family and Technology-Enhanced Play. Paper presented at the Annual Meeting of the Jean Piaget Society San Francisco, CA
- Keifert, D., Lee, C., Dahn, M., Illum, R., DeLiema, D., Enyedy, N. & Danish, J. A. (2017, June). *Agency, embodiment, & affect during play in a mixed-reality*

- learning environment*. Paper presented at the Interaction Design and Children conference, Palo Alto, California.
- Saleh, A., Danish, J., Humburg, M., & Enyedy, N. (2017). How body-based actions support elementary students' science explanations about the particulate nature of matter. *Annual conference of the American Educational Research Association*.
- Dahn, M., Lee, C., Enyedy, N., Gravell, J., Burke, J., Illum, R., Avetisian, H., Paul, L., Gomez, T., & Torres, R. (2016, April). The Cybermural digital art making process for early childhood science inquiry. Paper presented at the UCLA Research & Inquiry Conference, Los Angeles, CA.
- Dahn, M., Lee, C., Enyedy, N., Gravell, J., Burke, J., Illum, R., Avetisian, H., Paul, L., Gomez, T., & Torres, R. (2016, April). The Cybermural digital art making process for early childhood science inquiry. Paper presented at the American Educational Research Association Annual Meeting, Washington, D.C.
- Enyedy, N., Danish, J. A., Lee, C. D., DeLiema, D., Saleh, A., Dahn, M., & Illum, R. (2016). Learning About States of Matter Through Multiple Correspondences Among the Body, Abstractions, and Reality. Paper presented at the Annual Meeting of the American Educational Research Association Washington, DC.
- Enyedy, N., Lee, C., DeLiema, D., Danish, J., Saleh, A., Dahn, M., Peters, K., Morris, N., Thomas, C., Torres, R., Cardenas, G., Creek, C., Love, M., Burke, J., Illum, R., Wagmister, C., Horn, A., Munaro, M., and Rusu, R. (2016, April). Learning About States of Matter Through Multiple Correspondences Among the Body, Abstractions, and Reality. Paper presented at the American Educational Research Association Annual Meeting, Washington, D.C.
- Lee, C., DeLiema, D., & Enyedy, N. (2016, July). *Learning through physical action and gestural reflection in a first-person augmented reality science simulation*. Paper presented at the International Society of Gesture Studies conference, Paris, France.
- Danish, J. A., Enyedy, N., & Peppler, K. (2015). Collective and Participatory Embodiment: Science through Technology Enhanced Play (STEP) & BioSim. Paper presented at the Association of Science and Technology Centers (ASTC) Annual Conference, Montreal, CA.
- Danish, J. A., Enyedy, N., Saleh, A., Andrade-Lotero, A., & Lee, C. (2015). Science Through Technology Enhanced Play: Using Play and Embodiment to Promote Reflection About States of Matter. Paper presented at the Annual Meeting of the American Educational Research Association Chicago, IL.
- Enyedy, N., Danish, J., DeLiema, D., Lee, C., Illum, R., Saleh, A., Dahn, M., Peters, K., Morris, N., Thomas, C., Torres, J., Cardenas, G., Creek, C., Love, M., Burke, J., Wagmister, C., Horn, A., Munaro, M., Rusu, R. (2015). Science through technology enhanced play. Talk presented at the National Center for Research on Evaluation, Standards, and Student Testing, Redondo Beach, CA.

- Enyedy, N., & Kumar, M. (2013). The public body & student generated representations. In O. Parnafes (Chair), A. A. diSessa (discussant). Drawing scientific ideas: Student-generated representations (SGR) as means of sense-making, communicating ideas, and meta-representational competence. Symposium presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
- Brown, J. S. N, Danish, J., Deliema, D., Engle, R., Enyedy, N., Lee, R. V., Parnafes, O. (2012). Representationally anchored and socially constructed understanding: a model for integrating seemingly divergent frameworks for the analysis of knowledge in use. In M. Levin (chair), Sherin, B. & Stevens, R. (discussants). Integrating issues of knowledge and interaction in analyses of cognition and learning. Symposium presented at the annual meeting of the American Educational Research Association, Vancouver, Canada.
- Enyedy, N., Redman, E., & Sandoval, W. (2011). Towards a cultural ecology of argument in school science: Everyday arguments, school arguments and enculturation into scientific practice. Paper presented at the annual meeting of the Jean Piaget Society, Berkeley, CA.
- Sengupta-Irving, T., Redman, E., & Enyedy, N. (2011). *Learning from doing: What happens when an accomplished elementary teacher tries a new way of teaching?* Paper presented at the Association of Math Teacher Educators Annual Conference, Irvine, CA.
- Redman, E., Sandoval, W., & Enyedy, N. (2011). *A comparison of teaching strategies for promoting argumentation in elementary science.* Paper presented at the National Association for Research in Science Teaching Annual Conference, Orlando, FL.
- Enyedy, N., Danish, J. A., & Delacruz, G. (2010). Play and augmented reality in learning physics: The SPASES project. Paper presented at the annual meeting of the American Educational Research Association, Denver, CO.
- Enyedy, N., Danish, J. A., Fields, D., Kao, L., Hart, M., & Mukhopadhyay, S. (2009). Negotiating the "relevant" in culturally relevant mathematics: The Community Mapping Project. Paper presented at the annual meeting of the American Educational Research Association.
- Redman, E., Sandoval, W., & Enyedy, N. (2009). *Spontaneous student science arguments in a primary grades classroom.* Paper presented at the American Educational Research Association Annual Conference, San Diego, CA.
- Redman, E., Sandoval, B., & Enyedy, N. (2009). *Promoting argumentation within elementary science inquiry.* Presented at the National Association for Research in Science Teaching Annual Conference, Garden Grove, CA.
- Danish, J. A., & Enyedy, N. (2008). CHAT and Actor Network Theory (ANT) Perspectives on how kindergarten and first grade students co-construct science in action. Presented at the ISCAR.

- Danish, J., & Enyedy, N. (2007). Negotiating goals and roles for participation in a middle school science classroom. Paper presented at the *American Educational Research Association*, Chicago IL.
- Danish, J., & Enyedy, N. (2007). Agency and accountability: Two necessary components in science classrooms utilizing invented representations and their impact upon students' activities. Paper Discussion presented at the *American Educational Research Association*, Chicago IL.
- Enyedy, N. (2007). Navigating tensions between different theories of how people learn: A learning scientist's struggle to design and study culturally relevant learning environments. Invited talk presented at the *American Educational Research Association*, Chicago IL.
- Castellon, V., & Enyedy, N. (2006). The role of gesture in bilingual mathematics instruction. Paper presented at the *American Educational Research Association*, San Francisco, CA.
- Danish, J., & Enyedy, N. (2006). Negotiated representational mediators: An approach to meta-representational competence grounded in practice. Paper presented at the *American Educational Research Association*, San Francisco, CA.
- Enyedy, N., Franke, M., & Wischnia, S. (2006). Classroom discourse: Strategy and consensus conversations. Paper presented at the *American Educational Research Association*, San Francisco, CA.
- Baras, F., Enyedy, N., & Bailey, A. (2005). Language disconnects between small group problem solving and whole class discussions. Symposium paper presented at the *American Educational Research Association*, Montréal, Québec, Canada.
- Borgman, C., & Enyedy, N. (2005). Interoperability: Beyond standards. Symposium at the 30<sup>th</sup> Annual Conference of the Society for Social Studies of Science. Pasadena, California.
- Enyedy, N. (2005). Gesture and embodied activity in the construction of a collective problem. Symposium paper presented at the *American Educational Research Association* Montréal, Québec, Canada.
- Enyedy, N. (2003). Inventing mapping. Symposium paper presented at *The Fourteenth Annual Winter Conference on Discourse, Text and Cognition*, Jackson Hole, WM.
- Enyedy, N., Franke, M., Saxe, G., Secada, W., Brown, G. Castellon, V., & Spencer, J. (2003). Possible and actual social and linguistic resources that support student participation in a bilingual mathematics classroom. Symposium paper presented at the *American Educational Research Association*, Chicago, IL.
- Goldberg, J., & Enyedy, N. (2003). Interaction and classroom communities: The implications of classroom rules, roles and objectives for scientific inquiry. Paper presented at the *American Educational Research Association*, Chicago, IL.
- Enyedy, N., Kim, H., Goldberg, J., & Muir K. (2002). Teacher identity and variation in implementing GLOBE. Symposium paper presented at the *American Educational Research Association*, New Orleans, LA.

- Goldberg, J., Kim, H., & Enyedy, N. (2002). Critical choices and outcomes in inquiry science classrooms: Video comparisons of different classroom practices for environmental science. Symposium paper presented at the *American Educational Research Association*, New Orleans, LA.
- Muir, K., & Enyedy, N. (2002). No simple answers, the complex contradictions of identity and practice: Interviews with teachers about who they are and how they teach. Symposium paper presented at the *American Educational Research Association*, New Orleans, LA.
- Enyedy, N. (2001). Building on what we know: Probability and middle school students. Symposium paper presented at the *American Educational Research Association*, Seattle, WA.
- Enyedy, N. (2000). Locating probabilistic reasoning: Mental heuristics or representational practices? Conference paper presented at the *American Educational Research Association*, New Orleans, LA.
- Enyedy, N. (2000). Principles for activity centered design: Trajectories of representations and trajectories of learning. Symposium paper presented at the *American Educational Research Association*, New Orleans, LA.
- Vahey, P., & Enyedy, N. (1999). Building on productive student conceptions of probability: The Probability Inquiry Environment. Symposium paper presented at the *American Educational Research Association*, Montreal, Canada.
- Enyedy, N. (1997). Constructing understanding: The role of animation in interpreting representations. Symposium paper presented at the *American Educational Research Association*, Chicago, IL.
- Enyedy, N., & Vahey, P. (1996). *A theory of instruction for an elementary school probability environment*. Symposium paper presented at the *American Educational Research Association*, New York, NY.

### **Invited Talks**\_\_\_\_\_

- Teaching and learning with visualization in early elementary school. Visualization in Science and Education Gordon Research Conference (2019). Bates College in Lewiston, ME.
- Science through technology enhanced play. (2015). International Forum for Innovation and Education (FIED), Buenos Aires, Argentina (with Lee, C., Illum, R., Cardenas, G.)
- Collaborative learning (2015). The Shanghai Association of Educational Sciences
- Embodied learning. (2015) The Shanghai Association of Educational Sciences
- Science through technology enhanced play (2015). The Shanghai Association of Educational Sciences
- Multidisciplinary Advances in Reading and Writing for Science Education (2015), Columbia University

Scientific Modeling, and Digital Technologies: A Case Study of Learning Physics Through Pretend Play (2014) UC Davis.

**Grants and Extramural Support**

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* Key Personnel: ENGAGE AI Institute for Human Learning National Science Foundation CISE \$20,000,000	Submitted
PI: Generalized Embodied Modeling to support Science through Technology Enhanced Play National Science Foundation DRK12 \$2,800,511	2019-2023
Co-PI: Teacher Cognition and Learning about Incorporating Science Representations in Elementary Classrooms, McDonnell Foundation, \$2,500,000	2018-2023
PI: Interactive Science Through Technology Enhanced Play (iSTEP) NSF IIS- 1628918 \$1,500,00	2016-2019
Co-PI: Promoting Learning through Annotation of Embodiment (PLAE) NSF IIS- 1522945 \$554,030	2015-2018
PI: Science Through Technology Enhanced Play(STEP) NSF IIS- 1323767 \$1,000,000	2013-2017
Co-PI: Cyber Mural, NSF IIS-1256227 \$250,000	2011-2012
Co-PI: Neuroscience of Role-Mediated Learning. UCLA OVCR-COR award A1118 \$25,000	2012-2013
PI: Semiotic Pivots and Activity Spaces for Elementary Science, National Science Foundation DRL-0733218 \$285,101	2007-2009
Co-PI: Making Science, National Science Foundation \$265,000	2007-2010
Co-PI: The Classroom Ecosystem Explorer: Developing and testing a multimedia tool to support early grades. National Science Foundation # 20051248. \$370,000	2006-2009
PI: At the Intersection of Classroom Culture and Culturally Relevant Pedagogy: What students' arguments around maps reveal about how to increase student achievement within our diverse society, NAE/Spencer Post-Doctoral Fellowship #200500159 \$55,000	2005-2008
Co-PI: GLOBE in the City: Communities of Research, NSF#0223053, \$450,647	2002-2006

Co-PI: Diversity in Mathematics Education: Building Infrastructure for Learning and Teaching Mathematics with Understanding, NSF \$11,068,724	2002-2007
Co-PI: GLOBE in the City, NSF, \$186, 901	2000-2002
PI: Probability Inquiry Environment in English Language Learner Classrooms, Microsoft Gift \$30,000 (subcontract with School Management Project)	2001-2002
PI: Using maps to ground environmental science, Microsoft Gift, \$41,000 (subcontract with School Management Project)	2000-2001

### **Technical Innovations**

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#### **The Science through Technology Enhanced Play platform (STEP, PLAE & iSTEP)** <http://sttep.org/>

STEP uses computer-enhanced, embodied play in an augmented reality environment—a new genre of computer technology that combines digital information and animations with the physical world—as a means for children to uncover the hidden rules of the physical and biological world. We use technology to support play because play is a nascent form of scientific modeling—a scientific practice emphasized in the new Next Generation Science Standards. The defining feature of pretend play is not that it is fun (although it often is). The defining feature of play is that play has both an imaginary situation and a set of rules that govern the imaginary situation. It is this focus on a set of rules that makes play a nascent form of scientific modeling. Like play, the physical world (and computer models of science systems) follow a set of rules.

#### **Learning Physics through Play funded by the grant Semiotic Pivots and Activity Spaces for Education (SPASES)**

SPASES was the predecessor to STEP. Using computer vision, Wii remotes, RFID tags, and other sensing technologies, this project engaged first and second grade students in learning the physics of force and motion. This proof of concept project is where we first developed an augmented reality system that used students' physical actions in the world as an interface to a computer simulation making complex force and motion ideas accessible to first and second grade students.

#### **CyberMural**

The Cyber Mural system was developed using the same motion tracking system as STEP, but instead places the emphasis on students creating their own creation digital media. The “cybermural” itself is a digital collage of photographs, drawings, and text produced by students that changes in response to an observer's motion. However, from the



standpoint of pedagogy and learning it is the authoring process, and not just the end-product, that is important. It is during the authoring process where by students create art, understanding, and themselves in relation to the world around them. This process includes: exploring their community and/or the environment around them, creating media, assigning folksonomy keywords and weights, constructing a number of static murals, and mapping interaction to media responses via folksonomy concepts. The CyberMural has been tested with High School Students in the context of urban planning 6and with kindergarten students studying the inter-relations between animals and their habitats.

CyberMural media coverage can be found here:

See <http://dailybruin.com/2014/04/09/cyber-mural-combines-art-and-science-for-interactive-education/>

<http://ampersand.gseis.ucla.edu/noel-enyedy-motion-tracking-technology-enhances-k-12-learning/>

### **Classroom-Ecosystem Explorer (CEE)**

The Classroom-Ecosystem Explorer (CEE) is an online application designed to help teachers create engaging, effective instruction for K-3 science. It is currently housed on the UCLA Lab School website: <http://cee.labschool.ucla.edu/> Through video and other materials developed in classrooms, on the playground, and in teacher meeting rooms, at the UCLA Lab School CEE gives an in-depth look at the Classroom-Ecosystem Approach, which views the learning environment as a dynamic ecosystem made up of interdependent components. CEE goes behind the scenes of teachers' practice to explore how the components of teaching and learning can be maximized to engage children's natural curiosity, challenge children and teachers to think critically and creatively, and integrate assessment to help ensure every student gains a rich understanding of science.

### **Professional Memberships**

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Member of the American Educational Research Association (AERA)

Member of the International Society for the Learning Sciences (ISLS)

Member of the National Council of Teachers of Mathematics (NCTM)

### **Honors and Awards**

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Best Research Paper Award 50th Hawaiian International Conference on System Science	2016
Bobbie and Mark Greenfield Faculty Award for Applied Research in Learning and Achievement	2013
Best Design Paper International Conference for Computer Supported Collaborative Learning	2011
American Educational Research Association Division C Jan Hawkins Early Career Award for Contributions to Humanistic Research and Scholarship in Learning Technologies	2006
National Academy of Education, Spencer Postdoctoral Fellowship	2005-2008
Haytin Award for Outstanding Research in Teaching and Learning	2002, 2005 & 2014
Spencer Dissertation Fellowship	1998-1999

### **Professional Activities and Service**

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Editor-in-Chief Cognition and Instruction	2016-present
Editorial Board the Journal of the Learning Sciences	2005-present
Editorial Board International Journal of Computer Supported Collaborative Learning	2011-present
Director of Research, UCLA Lab School/CONNECT	2006-2017
Editorial Board Cognition and Instruction	2008-2012
Executive Editor Cognition and Instruction	2012-2016
Co-chair Jan Hawkins award selection committee	2008-2010

### **Vanderbilt Service**

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Science Education Endowed chair faculty search committee 2019  
 Melissa Gresalfi ad hoc committee 2019  
 Jessica Watson mentoring committee 2018-present  
 Center for Science Outreach committee member 2018-present  
 L&D Masters Program Advisory committee 2018-present  
 Vanderbilt Faculty Senate member 2019-present