CURRICULUM VITAE
Andrew Elby

Notarization. I have read the following and certify that this curriculum vitae is a current and accurate statement of my professional record.

Signature Andrew Elby Date 01/21/2025

I. Personal Information

I.A. Contact Information

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Andrew R. Elby
Dept. of Teaching & Learning, Policy & Leadership
2311 Benjamin Bldg., University of Maryland, College Park 20742
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https://education.umd.edu/directory/andrew-elby

I.B. Academic Appointments at UMD

08/1998 – 08/2002 *Research Associate,* less than 25% time
Dept. of Physics

08/2002 – 08/2007 *Assistant Research Scientist*, less than 50% time
Dept. of Physics

08/2007 – 08/2011 *Assistant Research Scientist*, greater than 50% time
Dept. of Curriculum & Instruction
Dept. of Physics

08/2011 - 08/2019 *Associate Professor*
Dept. of Teaching & Learning, Policy & Leadership (TLPL).
Affiliate Associate Professor, Dept. of Physics.

08/2019 - present *Professor*
Dept. of Teaching & Learning, Policy & Leadership (TLPL).
Affiliate Professor, Dept. of Physics.

I.D. Other Employment

08/1997 – 08/1998 *Research Associate*, half-time. Assessment Coordinator.
University of California, Berkeley, College of Engineering.

08/1997 – 06/1998 *High school teacher* half-time. Regular and advanced placement physics.

Albany High School, Albany, California.

08/1998 – 06/1999 *High school teacher*, half-time. Physics.
Thomas Jefferson High School for Science & Tech., Annandale, VA.

07/1999 – 08/2007 *Textbook writer,* Independent contractor for John Wiley & Sons.

I.E. Educational Background

Harvard University	Chemistry & Physics	B.A. 1988
Cambridge University	History & Philosophy of Science	M.Phil 1989
U. of California, Berkeley	Physics	M.A. 1991
U. of California, Berkeley	Individual major, Physics/Philosophy	Ph.D. 1995
U. of California, Berkeley	Education	M.A. 1997

I.G. Professional Certifications, Licenses, and Memberships

American Educational Research Association
American Association of Physics Teachers & Physics Education Research Topical Group
International Society of the Learning Sciences

II. Research, Scholarly, Creative, and Professional Activities

II.A. Books

II.A.1. Books Authored

Levin, D., Hammer, D., Elby, A., & Coffey, J. (2012). *Becoming a Responsive Science Teacher: Focusing on Student Thinking in Secondary Science*. Arlington, VA: National Science Teachers Association (NSTA) Press. ISBN 978-1936959051.

II.B. Chapters[‡]

II.B. Books (all invited)

1. Hull, M.M., Uematsu, H., Elby, A. (2024). The Interplay of Curricular Knowledge and Perceived Agency of Pre-service Physics Teachers in Vienna and Tokyo. In: Faletič, S., Pavlin, J. (eds) *Teaching and Learning Physics Effectively in Challenging Times. Challenges in Physics Education*. Springer, Cham. https://doi.org/10.1007/978-3-031-72541-8_18

2. Jaber, L. Z., Atkins, L., Elby, A., & Suárez, E. (2023). Affect in Physics Learning: Entanglement with Cognition and Learning Goals. In M. F. Taşar, & P. Heron, P. (Eds.), *International Handbook of Physics Education Research: Learning Physics* (chapter 14). AIP Publishing Books.

[‡] (*) = Graduate student. (†) = Post-doctoral research associate

3. Elby, A. (2022). Epistemology and Learning in STEM Education. In *Oxford Research Encyclopedia of Education*. Oxford: Oxford University Press. https://doi.org/10.1093/acrefore/9780190264093.013.1509

4. Gupta, A., Philip, T. M., Turpen, C., & Elby, A. (2022). Assumptions Matter! Epistemological, Ideological, and Axiological Aspects of Assumptions that Undergird Collective Reasoning About Science, Technology, and Society. In M.-C. Shanahan, B. Kim, M. A. Takeuchi, K. Koh, A. P. Presciado-Babb, P. Sengupta (Eds.), *The Learning Sciences in Conversation* (pp. 181-191). Routledge.

5. Weintrop, D., Walkoe, J., Walton, M., Bih, J., Moon, P., Elby, A., Bennett, B., & Kantzer, M. (2021). Sphero. Math: a computational thinking-enhanced fourth grade mathematics curriculum. In A. Ottenbreit-Leftwich & A. Yadav (Eds.), *Computational Thinking in PreK-5: Empirical Evidence for Integration and Future Directions* (pp. 39-46). New York, NY: Association for Computing Machinery (ACM).

6. Gupta, A., Turpen, C., Philip, T., & Elby, A. (2019). Narrative Co-construction of Stances Towards Engineers' Work in Socio-Technical Contexts. In P. Sengupta, M-C. Shanahan, & B. Kim (Eds.), *Critical, Transdisciplinary and Embodied Approaches in STEM Education* (pp. 251-272). Cham: Springer.

7. Levin, D. M., Chumbley, A. K. (*), Jardine, H. E. (*), Grosser-Clarkson, D., and Elby, A. (2018). Professed vs. enacted beliefs about responsive science teaching: Three cases from a practice-based middle level teacher certification program. In P. B. Howell, S. A. Faulkner, J. P. Jones, & J. Carpenter (Eds.), *Preparing Middle Level Educators for 21st Century Schools: Enduring Beliefs, Changing Times, Evolving Practices* (pp. 301-334). Charlotte, NC: Information Age Publishing. ISBN 978-1641133159

8. Secules, S. (*), Gupta, A., & Elby, A. (2016). Piecemeal versus integrated framing of design activities. In R. S. Adams & J. A. Siddiqui (Eds.), *Analyzing Design Review Conversations.* Purdue University Press. ISBN 978-1612494388.

9. Elby, A., Macrander, C. (*), & Hammer, D. (2016). Epistemic cognition in science. In J. A. Greene, W. A. Sandoval, & I. Bråten (Eds.), *Handbook of Epistemic Cognition* (pp. 113-127). New York: Routledge. ISBN 978-1138013421.

10. Gupta, A., Elby, A. & Sawtelle, V. (2016). Bridging Knowledge Analysis and Interaction Analysis Through Understanding the Dynamics of Knowledge in Use. In A. A. diSessa, M. Levin, & N. J. S. Brown (Eds.), *Knowledge and Interaction: A Synthetic Agenda for the Learning Sciences* (pp. 260-291). New York: Routledge. ISBN 978-1138797130.

11. Elby, A. (2016). Commentary – "IA Lite": Capturing some of the explanatory power of interaction analysis without committing to its ontology. In A. A. diSessa, M. Levin, & N. J. S. Brown (Eds.), *Knowledge and Interaction: A Synthetic Agenda for the Learning Sciences* (pp. 252-259). New York: Routledge. ISBN 9781138797130.

12. Robertson, A., Richards, J., Elby, A., & Walkoe, J. (2015). Documenting variability within teacher attention and responsiveness to the substance of student thinking. In A. Robertson, D. Hammer, & R. Scherr (Eds.), *Responsive Teaching in Science and Mathematics* (pp. 227-248). New York: Routledge. ISBN 978-1138916999. Elby, A. (2011). Getting started with research on epistemologies and expectations. In C. Henderson and K. A. Harper (Eds.) *Reviews in PER, Volume 2: Getting Started in PER*. College Park, MD: American Association of Physics Teachers. <http://www.per-central.org/items/detail.cfm?ID=10578>

13. Elby, A., & Hammer, D. (2010). Epistemological resources and framing: A cognitive framework for helping teachers interpret and respond to their students' epistemologies. In L. D. Bendixen & F. C. Feucht (Eds.), *Personal Epistemology in the Classroom: Theory, Research, and Implications for Practice* (pp. 409-434). Cambridge: Cambridge University Press. ISBN 978-1107412507.

14. Gillespie, N., & Elby, A. (2009). Content preparation for physics teachers. In A. Collins & N. Gillespie (Eds.), *The Continuum of Secondary Science Teacher Preparation: Knowledge, Questions and Research Recommendations* (pp. 129-142). Rotterdam: Sense Publishers. ISBN 978-9087908027.

15. Hammer, D., Elby, A., Scherr, R. E., & Redish, E. F. (2005). Resources, framing, and transfer. In J. Mestre (Ed.), *Transfer of Learning: Research and Perspectives* (pp. 89-120). Greenwich, CT: Information Age Publishing. ISBN 978-1593111649.

16. diSessa, A. A, Elby, A., & Hammer, D. (2002). J's epistemological stance and strategies. In G. M. Sinatra & P.R. Pintrich (Eds.), *Intentional Conceptual Change* (pp. 237-290). Mahwah, NJ: Erlbaum. ISBN 978-0805838251.

17. Hammer, D., & Elby, A. (2002). On the form of a personal epistemology. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing* (pp. 169-190). Mahwah, NJ: Erlbaum. ISBN 978-0805852356.

From previous "career" in philosophy of physics:

Elby, A. (1998). Interpreting the existential interpretation. In R. Healey and G. Hellman (Eds.), *Quantum Measurement: Beyond Paradox* (pp. 87-94). Minneapolis: University of Minnesota Press. ISBN 978-0816630653

Brown, H., Elby, A., & Weingard, R. (1996). Cause and effect in the pilot-wave interpretation of quantum mechanics. In J. Cushing, A. Fine, and S. Goldstein (Eds.), *Bohmian Mechanics and Quantum Theory: An Appraisal* (pp. 309-319). Boston: Kluwer Press. ISBN 978-9401587150

II.C. Refereed Journals[‡]

[‡] (*) = Graduate student. (†) = Post-doctoral research associate

II.C.1. Refereed Journal Articles

1. Sohr, E. R., Gupta, A., Elby, A., & Radoff, J. (2023). How a child entangles empathy and computational thinking in reasoning about fairness. *Early Childhood Research Quarterly*, *65*, 92-101.

2. Quan, G. M., Turpen, C., & Elby, A. (2022). Analyzing identity trajectories within the physics community. *Physical Review Physics Education Research*, *18*(2), 020125.

3. Tang, X., Levin, D. M., Chumbley, A. K., & Elby, A. (2022). Arguing about argument and evidence: Disagreements and ambiguities in science education research and practice. *Science Education*, *106*(2), 257-284.

4. Elby, A., & Yerdelen-Damar, S. (2020). Rethinking the relationship between instructors and physics education researchers. *Physical Review Physics Education Research, 16*(2), 020151.

5. Boudreaux, A., & Elby, A. (2020). How curriculum developers' cognitive theories influence curriculum development. *Physical Review Physics Education Research, 16*(2), 020144.

6. Sabo, H. (*), and Elby, A. (2020). Rethinking the division of labor between tutorial writers and instructors with respect to fostering equitable team dynamics. *Physical Review Physics Education Research, 16*(2), 020142. DOI: 10.1103/PhysRevPhysEducRes.16.020142

7. Tang, X., Elby, A., and Hammer, D. M. (2020). The tension between pattern-seeking and mechanistic reasoning in explanation construction: A case from Chinese elementary science classroom. *Science Education*, *104*(6), 1071-1099.

8. Kuo, E., Hull, M., Elby, A., & Gupta, A. (2020). Assessing mathematical sensemaking in physics through calculation-concept crossover. *Physical Review Physics Education Research, 16*(2), 020109.

9. Walkoe, J., Sherin, M., & Elby, A. (2020). Video tagging as a window into teacher noticing. *Journal of Mathematics Teacher Education, 23*(4), 385-405. DOI: 10.1007/s10857-019-09429-0

10. Richards, J., Elby, A., Luna, M. J., Robertson, A. D., Levin, D. M., & Nyeggen, C. G. (2020). Reframing the Responsiveness Challenge: A Framing-Anchored Explanatory Framework to Account for Irregularity in Novice Teachers' Attention and Responsiveness to Student Thinking. *Cognition and Instruction*, *38*(2), 116-152.

11. Elby, A. (2019). Did the Framework for K-12 Science Education trample itself? A reply to "Addressing the epistemic elephant in the room: Epistemic agency and the next generation science standards". *Journal of Research in Science Teaching*, *56*(4), 518-520.

12. Dreyfus, B. W., Hoehn, J. R., Elby, A., Finkelstein, N. D., & Gupta, A. (2019). Splits in students' beliefs about learning classical and quantum physics. *International Journal of STEM Education*, *6*(1), 31.

13. Alonzo, A. C., & Elby, A. (2019). Beyond empirical adequacy: Learning progressions as models and their value for teachers. *Cognition and Instruction, 37*(1), 1-37. DOI: 10.1080/07370008.2018.1539735

14. Quan, G. M., Turpen, C., & Elby, A. (2018). Interactions between disciplinary practice and joint work in undergraduate physics research experiences. *Physical Review Physics Education Research*, *14*(2), 020124. DOI: 10.1103/PhysRevPhysEducRes.14.020124

15. Secules, S. (*), Gupta, A., Elby, A., & Tanu, E. (*) (2018). Supporting the narrative agency of a marginalized engineering student. *Journal of Engineering Education, 107*(2), 186-218. DOI: 10.1002/jee.20201

16. Sohr, E. R. (*), Gupta, A., & Elby, A. (2018). Taking an escape hatch: Managing tension in group discourse. *Science Education*, *102*(5), 883-916. DOI: 10.1002/sce.21448

17. Gupta, A., Elby, A., & Danielak, B. A. (2018). Towards modeling the entanglement of personal epistemologies and emotions in students' thinking. *Physical Review – Physics Education Research, 14*, 010129. DOI: 10.1103/PhysRevPhysEducRes.14.010129 Philip, T. M., Gupta, A., Elby, A., & Turpen, C. (2018). Why ideology matters for learning: A case of ideological convergence in an engineering ethics classroom discussion on drone warfare. *Journal of the Learning Sciences*, *27*(2), 183-223. DOI: 10.1080/10508406.2017.1381964

18. Secules, S. (*), Gupta, A., Elby, A., & Turpen, C. (2018). Zooming out from the struggling individual student: An account of the cultural construction of engineering ability in an undergraduate programming class. *Journal of Engineering Education, 107*(1), 56-86. DOI: 10.1002/jee.20191.

19. Dreyfus, B. W., Elby, A., Gupta, A., & Sohr, E. R. (2017). Mathematical sense-making in quantum mechanics: An initial peek. *Physical Review – Physics Education Research*, *13*(2), 020141. DOI: 10.1103/PhysRevPhysEducRes.13.020141

20. Yerdelen-Damar, S. (*), & Elby, A. (2016). Sophisticated epistemologies of physics versus high-stakes tests: How do elite high school students respond to competing influences about how to learn physics? *Physical Review – Physics Education Research*, *12*(1), 010118. DOI: 10.1103/PhysRevPhysEducRes.12.010118

21. Quan, G. (*), & Elby, A. (2016). Connecting self-efficacy and views about nature of science in undergraduate research experiences. *Physical Review – Physics Education Research, 12*(2), 020140. DOI: 10.1103/PhysRevPhysEducRes.12.020140

22. Gupta, A., Elby, A., & Conlin, L. (2014). How substance-based ontologies for gravity can be productive: A case study. *Physical Review Special Topics – Physics Education Research*, *10*(1), 010113. DOI: 10.1103/PhysRevSTPER.10.010113 **Editor's suggestion (~10% of articles)**

23. Danielak, B. (*), Gupta, A., & Elby, A. (2014). The Marginalized Identities of Sense-makers: Reframing Engineering Student Retention. *Journal of Engineering Education*, *103*(1), 8-44.DOI: 10.1002/jee.20035 **Editor's choice (≤1 article per issue): Summary included in associated practitioner journal, ASEE Prism.**

24. Watkins, J. & Elby, A. (2013). Context dependence of students' views about the role of equations in understanding biology. *CBE – Life Sciences Education, 12*(2), 274-286.

25. Hull, M. (*), Kuo, E. (*), Gupta, A., & Elby, A. (2013). Problem-solving rubrics revisited: Attending to the blending of informal conceptual and formal mathematical reasoning. *Physical Review Special Topics — Physics Education Research, 9*(1), 010105. DOI: 10.1103/PhysRevSTPER.9.010105

26. Kuo, E. (*), Hull, M. (*), Gupta, A., & Elby, A. (2013). How students blend conceptual and formal mathematical reasoning in solving physics problems. *Science Education, 97*(1), 32-57.

27. Yerdelen-Damar, S. (*), Elby, A., & Eryilmaz, A. (2012). Applying beliefs and resources frameworks to the psychometric analyses of an epistemology survey. *Physical Review Special Topics — Physics Education Research*, *8*(1), 010104. DOI: 10.1103/PhysRevSTPER.8.010104

28. Goertzen, R. M. (*), Scherr, R. E., & Elby, A. (2010). Respecting tutorial instructors' beliefs and experiences: A case study of a physics teaching assistant. *Physical Review Special Topics — Physics Education Research*, *6*(2), 020125. DOI: 10.1103/PhysRevSTPER.6.020125

29. Gupta, A. (†), & Elby, A. (2011). Beyond epistemological deficits: Dynamic explanations of engineering students' difficulties with mathematical sense-making. *International Journal of Science Education, 33*(18), 2463-2488.

30. Elby, A. (2010). Coherence vs. fragmentation in student epistemologies: A reply to Smith & Wenk. *Electronic Journal of Science Education, 14*(1). ejse.southwestern.edu/article/view/7324

31. Tang, X. (*), Coffey, J., Elby, A., & Levin, D. (2010). The scientific method and scientific inquiry: Tensions in teaching and learning. *Science Education, 94*(1), 29-47.

32. Goertzen, R. M. (*), Scherr, R. E., & Elby, A. (2010). Tutorial teaching assistants in the classroom: Similar teaching behaviors are supported by varied beliefs about teaching and learning. *Physical Review Special Topics — Physics Education Research, 6*(1), 010105. DOI: 10.1103/PhysRevSTPER.6.010105

33. Goertzen, R. M. (*), Scherr, R. E., & Elby, A. (2009). Accounting for tutorial teaching assistants' buy-in to reform instruction. *Physical Review Special Topics — Physics Education Research, 5*(2), 020109. DOI: 10.1103/PhysRevSTPER.5.020109

34. Elby, A. (2009). Defining personal epistemology: A response to Hofer & Pintrich (1997) and Sandoval (2005). *Journal of the Learning Sciences, 18*(1), 138-149.

35. Lising, L. (†), & Elby, A. (2005). The impact of epistemology on learning: A case study from introductory physics. *American Journal of Physics*, *73*(4), 372-382.

36. Louca, L. (*), Elby, A., Hammer, D., & Kagey, T. (2004). Epistemological resources: Applying a new epistemological framework to science instruction. *Educational Psychologist*, *39*(1), 57-68. Invited and refereed.
37. Hammer, D. & Elby, A. (2003). Tapping epistemological resources for learning physics. *Journal of the Learning Sciences*, *12*, 53-90.

38. Elby, A. (2001). Helping physics students learn how to learn. *American Journal of Physics*, *Physics Education Research Supplement*, *69*(7), S54-S64.

39. Elby, A. & Hammer, D. (2001). On the substance of a sophisticated epistemology. *Science Education*, *85*(5), 554-567.

40. Elby, A. (2000). What students' learning of representations tells us about constructivism. *Journal of Mathematical Behavior*, *19*(4), 481-502.

41. Elby, A. (1999). Another reason that physics students learn by rote. *American Journal of Physics*, *Physics Education Research Supplement 67*(7), S52-S57.

From previous "career" in philosophy of physics:

Elby, A., & Bub, J. (1994). Triorthogonal uniqueness theorem and its relevance to the interpretation of quantum mechanics. *Physical Review A, 49,* 4213-4216.

Elby, A., Brown, H. R., & Foster, S. (1993). What makes a theory physically complete? *Foundations of Physics, 23,* 971-985.

Elby, A. (1993). Why local realistic theories violate, nontrivially, the quantum mechanical EPR perfect correlations. *British Journal for the Philosophy of Science, 44,* 213-230.

Elby, A. (1993). Why modal interpretations of quantum mechanics don't solve the measurement problem. *Foundations of Physics Letters, 6,* 5-19.

Elby, A., & Jones, M. R. (1992). Weakening the locality conditions in algebraic nonlocality proofs. *Physics Letters A, 171,* 11-16.

Elby, A., & Foster, S. (1992). Why SQUID experiments can rule out non-invasive measurability. *Physics Letters A, 166,* 17-23.

Elby, A. (1992). Should we explain the EPR correlations causally? *Philosophy of Science, 59,* 16-25.

Elby, A. (1991). Reply: How does Home and Sengupta's noncontextuality condition relate to locality? *Foundations of Physics Letters, 4,* 453-455.

Foster, S., & Elby, A. (1991). A SQUID no-go theorem without macrorealism: What SQUIDs really tell us about nature. *Foundations of Physics, 21,* 773-785.

Elby, A. (1990). Nonlocality and Gleason's lemma, part II: Stochastic theories. *Foundations of Physics, 20,* 1389-1397.

Elby, A. (1990). Critique of Home and Sengupta's derivation of a Bell inequality. *Foundations of Physics Letters, 3,* 317-324.

Elby, A. (1990). On the physical interpretation of Heywood and Redhead's algebraic impossibility theorem. *Foundations of Physics Letters, 3,* 239-247.

II.D. Published Conference Proceedings[‡]

II.D.1. Refereed Conference Proceedings

1. Elby, A., Moon, P. F., Sohr, E., Walkoe, J., Walton, M., Gresalfi, M. S., Krist, C., & Wilkerson, M. (2024). Computational Thinking Integration as Trojan Horse for Teachers' Rethinking Science and Mathematics Teaching and Learning. In *Proceedings of the 18th International Conference of the Learning Sciences-ICLS 2024, pp. 1879-1885*. International Society of the Learning Sciences.

2. Smela, E., Nguyen, V., Andrade, N., & Elby, A. (2024). Introducing Social and Environmental Sustainability Aspects Cohesively throughout the Student Experience: One Course at a Time while Considering the Program as a Whole. In *2024 ASEE Annual Conference & Exposition*. American Society for Engineering Education.

3. Radoff, J., Turpen, C. A., Tomblin, D., Mogul, N. F., Agrawal, A. (*), & Elby, A. (2023). Shaping the macro-ethical reasoning of engineers through deliberate cultural practices. In *2023 ASEE Annual Conference & Exposition*.

4. Abdurrahman, F. N., Chudamani, S. (*), Turpen, C. A., Radoff, J., Elby, A., & Tomblin, D. (2023). The Amazon Effect: A Case Study of Corporate Influence on Student Macro-Ethical Reasoning. In *2023 ASEE Annual Conference & Exposition*.

5. Hull, M. M., Uematsu, H., & Elby, A. (2022). A progression of pre-service teachers towards deep curricular knowledge (the Pieces model in Open Source Tutorials). In B. Frank, D. Jones, & Q.X. Ryan (Eds.), 2022 Physics Education Research Conference (PERC) Proceedings (pp. 237-242). Grand Rapids, MI: American Association of Physics Teachers.

[‡] (*) = Graduate student. (†) = Post-doctoral research associate

6. Fofang, J. S. B., Weintrop, D., Moon, P., Elby, A. (2021). Thinking through Representation: Interpreting Representational Fluency across Contexts in Computational Thinking Enhanced Activities. In E. de Vries, Y. Hod, Y., & J. Ahn J. (Eds.), *15th International Conference of the Learning Sciences - ICLS 2021* (pp. 979-980). Bochum, Germany: International Society of the Learning Sciences.

7. Fofang, J. S. B., Weintrop, D., Walton, M. (*), Elby, A, & Walkoe, J. (2020). Mutually Supportive Mathematics and Computational Thinking in a Fourth-Grade Classroom. In M. Gresalfi & I. S. Horn (Eds.), *14th International Conference of the Learning Sciences (ICLS) 2020* (Vol. 3, pp. 1389-1396). Nashville, TN: International Society of the Learning Sciences.

8. Tang, X., Elby, A., & Hammer, D. (2020). The Tension Between Pattern-seeking and Mechanistic Reasoning in Explanation Construction in Elementary Science Classroom. In M. Gresalfi & I. S. Horn (Eds.), *14th International Conference of the Learning Sciences (ICLS) 2020* (Vol. 4, pp. 1855-1862). Nashville, TN: International Society of the Learning Sciences.

9. Walton, M. (*), Walkoe, J., Elby, A., Fofang, J. S. B., & Weintrop, D. (2020). Teachers' Conceptualizations of Computational and Mathematical Thinking. In M. Gresalfi & I. S. Horn (Eds.), *14th International Conference of the Learning Sciences (ICLS) 2020* (Vol. 4, pp. 2053-2060). Nashville, TN: International Society of the Learning Sciences.

10. Elby, A., Luna, M., Robertson, A., Levin, D., & Richards, J. (2020). Framing Analysis Lite: A Tool for Teacher Educators. In M. Gresalfi & I. S. Horn (Eds.), *14th International Conference of the Learning Sciences (ICLS) 2020* (Vol. 1, pp. 2085-2092). Nashville, TN: International Society of the Learning Sciences.

11. Turpen, C., Radoff, J., Gupta, A., Sabo, H. (*), & Elby, A. (2020). Examining How Engineering Educators (Re)produce or Challenge Technocracy in Their Pedagogical Reasoning. In M. Gresalfi & I. S. Horn (Eds.), *14th International Conference of the Learning Sciences (ICLS) 2020* (Vol. 4, pp. 2093-2100). Nashville, TN: International Society of the Learning Sciences.

12. Turpen, C. A., Radoff, J. (†), Gupta, A., Sabo, H. (*), & Elby, A. (2019). Examining How Engineering Educators Produce, Reproduce, or Challenge Meritocracy and Technocracy in Pedagogical Reasoning. In *ASEE annual conference & exposition*.

13. Sabo, H. (*), Radoff, J. (†), Elby, A., Gupta, A., & Turpen, C. (2018). Role-playing as a tool for helping LAs sense-make about inequitable team dynamics. In A. Traxler, Y. Cao, & S. Wolf (Eds.), *2018 Physics Education Research Conference (PERC) Proceedings*. College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2018.pr.Sabo

14. Turpen, C., Gupta, A., Radoff, J. (†), Sabo, H. (*), & Elby, A. (2018). Successes and challenges in supporting undergraduate peer educators to notice and respond to equity considerations within design teams. In *2018 ASEE (American Society of Engineering Education) Annual Conference & Exposition*. https://peer.asee.org/31028

15. Ko, M., & Elby, A. (2018). Talking past one another: Looking for signs of conversational mismatch in one 6th grade science classroom. *International Conference of the Learning Sciences (ICLS) 2018*.

16. Lawson, W. G., Secules, S., Bhattacharyya, S., Elby, A., Hawkins, W., Dumitras, T., & Ramirez, N. (2017). Traditional versus hardware-driven introductory programming courses: a comparison of student identity, efficacy and success. In *2017 ASEE (American Society of Engineering Education) Annual Conference & Exposition*. Washington, DC: ASEE. https://peer.asee.org/27939

17. Walkoe, J., Wilkerson, M., & Elby, A. (2017). Technology-mediated teacher noticing: A goal for classroom practice, tool design, and professional development. In B. K. Smith, M. Borge, E. Mercier, & K. Y. Lim (Eds.), *12th International Conference on Computer Supported Collaborative Learning (CSCL) 2017* (Vol. 1, pp. 65-70). Philadelphia: International Society of the Learning Sciences. https://cscl17.files.wordpress.com/2017/06/finalvol1cscl2017.pdf

18. Sohr, E. R. (*), Gupta, A., Elby, A., & Dreyfus, B. W. (†) (2016). Sense-making with inscriptions in quantum mechanics. In D. L. Jones, L. Ding, & A. Traxler (Eds.), *2016 Physics Education Research Conference (PERC) Proceedings* (pp. 324-327). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2016.pr.076

19. Quan, G. (*), Turpen, C. T., & Elby, A. (2016). Attending to scientific practices within undergraduate research experiences. In D. L. Jones, L. Ding, & A. Traxler (Eds.), *2016 Physics Education Research Conference (PERC) Proceedings* (pp. 252-255). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2016.pr.058

20. Secules, S. (*), Elby, A., & Gupta, A. (2016). "Turning away" from the struggling individual student: An account of the cultural construction of engineering ability in an undergraduate programming class. *2016 ASEE (American Society of Engineering Education) Annual Conference and Exposition*. Washington, DC: ASEE. DOI: 10.18260/p.26239 **Best Diversity Paper Award, Division of Educational Research & Measurement; Finalist, conference-wide Best Diversity Paper.**

21. Gupta, A., Elby, A., Turpen, C. T., & Philip, T. (2016). The dynamics of perspective-taking in discussions on socio-technical issues. *2016 ASEE (American Society of Engineering Education) Annual Conference and Exposition*. Washington, DC: ASEE. DOI: 10.18260/p.26129

22. Secules, S. (*), Gupta, A., Elby, A. (2015). Piecemeal versus integrated design: Framing meets design thinking. In R. S. Adams (Ed.), *Proceedings of DTRS 10: Design Thinking Research Symposium 2014*. West Lafayette, IN: Purdue University.

23. Gupta, A., Elby, A., Philip, T. M. (2015). How engineering students think about the roles and responsibilities of engineers with respect to broader social and global impact of engineering and technology. *2015 ASEE (American Society of Engineering Education) Annual Conference and Exposition*. Washington, DC: ASEE. DOI: 10.18260/p.24192

24. Elby, A., Kuo, E., Gupta, A., & Hull, M. M. (2015). Tensions and trade-offs in instructional goals for physics courses aimed at engineers. *2015 ASEE (American Society of Engineering Education) Annual Conference and Exposition*. Washington, DC: ASEE. DOI: 10.18260/p.24836

25. Secules, S. (*), Gupta, A., & Elby, A. (2015). Theorizing can contribute to marginalized students' agency in engineering persistence. *2015 ASEE (American Society of Engineering Education) Annual Conference and Exposition* Washington, DC: ASEE. DOI: 10.18260/p.24918

26. Quan, G. (*), Gupta, A., & Elby, A. (2015). Problematizing best practices for pairing in K-12 student design teams. *2015 ASEE (American Society of Engineering Education) Annual Conference and Exposition*. Washington, DC: ASEE. DOI: 10.18260/p.12565

27. Sohr, E. R. (*), Dreyfus, B. W. (†), Gupta, A., & Elby, A. (2015). "Because math": Epistemological stance or defusing social tension in quantum mechanics? In A. D. Churukian, D. L. Jones, & L. Ding (Eds.), *2015 Physics Education Research Conference (PERC) Proceedings* (pp. 319-322). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2015.pr.075.

28. Quan, G. (*) & Elby, A. (2015). Connecting self-efficacy and nature of science shifts in undergraduate research experiences. In A. D. Churukian, D. L. Jones, & L. Ding (Eds.), *2015 Physics Education Research Conference (PERC) Proceedings* (pp. 267-270). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2015.pr.062

29. Dreyfus, B. W. (†), Sohr, E. R. (*), Gupta, A., & Elby, A. (2015). "Classical-ish": Negotiating the boundary between classical and quantum particles. In A. D. Churukian, D. L. Jones, & L. Ding (Eds.), *2015 Physics Education Research Conference (PERC) Proceedings* (pp. 111-114). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2015.pr.023

30. Alonzo, A. C. & Elby, A. (2015). How physics teachers model student thinking and plan instructional responses when using learning-progression-based assessment information. In A. D. Churukian, D. L. Jones, & L. Ding (Eds.), *2015 Physics Education Research Conference (PERC) Proceedings* (pp. 31-34). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2015.pr.003

31. Elby, A., Richards, J., Walkoe, J., Gupta, A, Russ, R. S., Luna, M. J., Robertson, A., Coffey, J. E., Edwards, A. R., Sherin, M. G., & van Es, E. A. (2014). Differing notions of responsive teaching across mathematics and science: Does the discipline matter? In J. L. Polman, E. A. Kyza, D. K. O'Neill, I. Tabak, W. R. Penuel, A. S. Jurow, K. O'Connor, T. Lee, & L. D'Amico (Eds.), *International Conference of the Learning Sciences (ICLS) 2014* (Vol. 1, pp. 1406-1415). Boulder, CO: International Society of the Learning Sciences.

32. Alonzo, A. & Elby, A. (2014). The nature of student thinking and its implications for the use of learning progressions to inform classroom instruction. In J. L. Polman, E. A. Kyza, D. K. O'Neill, I. Tabak, W. R. Penuel, A. S. Jurow, K. O'Connor, T. Lee, & L. D'Amico (Eds.),

International Conference of the Learning Sciences (ICLS) 2014 (Vol. 1, pp. 1037-1041). Boulder, CO: International Society of the Learning Sciences.

33. Richards, J. (†), Elby, A., & Gupta, A. (2014). Characterizing a new dimension of change in attending and responding to the substance of student thinking. In J. L. Polman, E. A. Kyza, D. K. O'Neill, I. Tabak, W. R. Penuel, A. S. Jurow, K. O'Connor, T. Lee, & L. D'Amico (Eds.), *International Conference of the Learning Sciences (ICLS) 2014* (Vol. 1, pp. 286-293). Boulder, CO: International Society of the Learning Sciences.

34. Korff, J. V., Elby, A., Hu, D., & Rebello, S. (2014). Student epistemology about mathematical integration in a physics context: A case study. In P. V. Engelhardt, A. D. Churukian, & D. L. Jones (Eds.), *2013 Physics Education Research Conference (PERC) Proceedings* (pp. 353-356). College Park, MD: American Association of Physics Teachers. DOI: 10.1119/perc.2013.pr.076

35. Richards, J. (*), Conlin, L. (*), Gupta, A., & Elby, A. (2013). Coupling epistemology and identity in explaining student interest in science. In P. V. Engelhardt, A. D. Churukian, & J. N. Rebello (Eds.), *American Institute of Physics Conference Proceedings: 2012 Physics Education Research Conference* (Vol. 1513, pp. 334-337). Melville, NY: American Institute of Physics. DOI: 10.1063/1.4789720

36. Hutchison, P., & Elby, A. (2013). Evidence of epistemological framing in survey question misinterpretation. In P. V. Engelhardt, A. D. Churukian, & J. N. Rebello (Eds.), *American Institute of Physics Conference Proceedings: 2012 Physics Education Research Conference* (Vol. 1513, pp. 194-197). Melville, NY: American Institute of Physics. DOI: 10.1063/1.4789685

37. Hull, M. (*), & Elby, A. (2013). A conceptual physics class where students found meaning in calculations. In P. V. Engelhardt, A. D. Churukian, & J. N. Rebello (Eds.), *American Institute of Physics Conference Proceedings: 2012 Physics Education Research Conference* (Vol. 1513, pp. 190-193). Melville, NY: American Institute of Physics. DOI: 10.1063/1.4789684 **Finalist, best paper award.**

38. Danielak, B. (*), Gupta, A. (†), & Elby, A. (2010). The marginalized identities of sense-makers: Reframing engineering student retention. *Proceedings of 2010 Frontiers in Education Conference.* Washington, DC: Institute of Electrical and Electronics Engineers. DOI: 10.1109/FIE.2010.5673158

39. Gupta, A. (†), Danielak, B. (*), & Elby, A. (2010). Understanding students' difficulties in terms of coupled epistemological and affective dynamics. *Proceedings of 2010 Frontiers in Education Conference.* Washington, DC: Institute of Electrical and Electronics Engineers. DOI: 10.1109/FIE.2010.5673256

40. Gupta, A. (†), & Elby, A. (2010). Beyond epistemological deficits: Incorporating flexible epistemological views into fine-grained cognitive dynamics. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Proceedings of the 9th International Conference of the Learning Sciences* (Vol. 2, pp. 372-373). Chicago: International Society of the Learning Sciences.

41. Danielak, B. (*), Gupta, A. (†), & Elby, A. (2010). Incorporating affect in an engineering student's epistemological dynamics. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Proceedings of the 9th International Conference of the Learning Sciences* (Vol. 2, pp. 411-412). Chicago: International Society of the Learning Sciences.

42. Goertzen, R. M. (*), Scherr, R. E., & Elby, A. (2008). Indicators of understanding: What TAs listen for in student responses. In C. Henderson, M. Sabella, & L. Hsu (Eds.), *American Institute of Physics Conference Proceedings: 2008 Physics Education Research Conference* (Vol. 1064, pp. 119-122). Melville, NY: American Institute of Physics. DOI: 10.1063/1.3021231

43. Lau, M. (*), and Elby, A. (2008). Two distinct ways of attending to the substance of students' ideas. In *Proceedings of the 8th International Conference of the Learning Sciences* (Vol. 3, pp. 70-71). Chicago: International Society of the Learning Sciences.

44. Scherr, R. E., & Elby, A. (2007). Enabling informed adaptation: Open-source physics worksheets integrated with implementation resources. In P. R. Heron, L. McCullough & J. Marx (Eds.), *American Institute of Physics Conference Proceedings: 2006 Physics Education Research Conference* (Vol. 883, pp. 46-49). Melville, NY: American Institute of Physics. DOI: 10.1063/1.2508688

45. McCaskey, T. L. (*), & Elby, A. (2005). Probing students' epistemologies using split tasks. In S. Franklin, J. Marx & P. R. Heron (Eds.), *American Institute of Physics Conference Proceedings: 2004 Physics Education Research Conference* (Vol. 790, pp. 57-60). Melville, NY: American Institute of Physics. DOI: 10.1063/1.2084700

46. McCaskey, T. L. (*), Dancy, M. H., & Elby, A. (2004). Effects on assessment caused by splits between belief and understanding. In S. Franklin, J. Marx & K. Cummings (Eds.), *American Institute of Physics Conference Proceedings: 2003 Physics Education Research Conference* (Vol. 720, pp. 37-40). Melville, NY: American Institute of Physics. DOI: 10.1063/1.1807248

47. Hammer, D., & Elby, A. (2000). Epistemological resources. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Proceedings of the Fourth International Conference of the Learning Sciences* (pp. 4-5). Mahwah, NJ: Erlbaum.

From previous "career" in philosophy of physics:

Elby, A. (1994). The decoherence approach to the measurement problem. In D. Hull, M. Forbes, & R. Burian (Eds.), *Proceedings of 1994 Biennial PSA Conference* (Vol. 1, pp. 355-365). Chicago: University of Chicago Press on behalf of Philosophy of Science Association.

Elby, A. (1992). Bell's *other* theorem and its connection with nonlocality, part II. In A. van der Merwe, F. Selleri, & G. Tarozzi (Eds.), *International Conference on Bell's theorem and the foundations of modern physics* (pp. 117-125). Singapore: World Scientific.

II.E. Conferences, Workshops, and Talks[‡]

II.E.2. Invited Talks

1. Elby, A. (2024). How Your Implicit Theory of Learning Influences Your Curriculum Writing. *University of Wisconsin–Madison Department of Chemistry, Chemistry Education Seminar*, Madison, WI, 03/13/2024.

2. Elby, A. (2023). Illustrating a "Resources Mindset." *Physics Education Research Conference*, Sacramento, CA, 07/20/2023.

3. Elby, A. (2021). Discussant. "How Teachers Navigate Tensions between Enacting Coherent Curriculum Materials and Supporting Students' Epistemic Agency," Paper set presented at *National Association for Research on Science Teaching annual conference*, 04/08/2021.

4. Elby, A. (2019). A framing-anchored explanatory framework to account for irregularity in novice teachers' attention and responsiveness to student thinking. *Rutgers Graduate School of Education Brown Bag Lecture Series*, New Brunswick, NJ, 10/09/2019.
5. Elby, A. (2017). What does students' mathematical sense-making look like in quantum mechanics? *Tufts University Department of Physics Colloquium,* Medford, MA, 09/28/2017.

6. Elby, A. (2015). The new AP Physics exams: Integrating qualitative and quantitative reasoning. *American Physical Society national meeting*, Baltimore, MD, 04/14/2015.

7. Elby, A. (2015). Why instructors other than Joe Redish should care about epistemological framing. *American Physical Society national meeting*, Baltimore, MD, 04/11/2015.

8. Elby, A. (2015). Affordances and limitations of quantitative and qualitative methods. *American Association of Physics Teachers summer national meeting*, College Park, MD, 07/29/2015.

9. Elby, A., Gupta, A., & Richards, J. (2014). Assessing whether and how professional development affects teachers' classroom practices. *American Association of Physics Teachers winter national meeting*, Orlando, FL, 01/05/2014.

10. Elby, A. (2013). Using the "resources" framework without identifying specific resources: Huh? *American Association of Physics Teachers summer national meeting*, Portland, OR, 07/16/2013.

11. Elby, A. (2013). Discussant for the SIG-Learning Sciences session *What does "science" shift? The positioning of activities and identities with respect to the domain of science*. *AERA Annual Meeting*, San Francisco, 05/01/2013.

[‡] (*) = Graduate student. (†) = Post-doctoral research associate

12. Elby, A. & Gupta, A. (2012). Beyond courses: Graduate curricula as cognitive apprenticeship. *American Association of Physics Teachers winter national meeting*, Ontario, CA, 2/7/2012.

13. Elby, A. (2007). Why resources theory matters for everyday PER and teaching. *Foundations and Frontiers in Physics Education Research*, Bar Harbor, ME, 08/06/2007.

14. Elby, A. (2004). Discussant for session Goals of Physics Education. *American Association of Physics Teachers winter national meeting*, Miami Beach, FL, 1/27/2004.

15. Elby, A. (2003). Interpretive blinders: I missed the coolest results in my data! *American Association of Physics Teachers winter national meeting*, Austin, TX, 1/14/2003.

16. Elby, A. (2001). The importance of epistemological considerations in fostering conceptual development. *American Association of Physics Teachers summer national meeting*, Rochester, NY, 7/23/2001.

17. Elby, A. (2001). How can we help students become better learners? *American Association of Physics Teachers winter national meeting*, San Diego, CA, 1/9/2001.

18. Elby, A. (2000). How should teacher training incorporate research about students' prior conceptions? *American Association of Physics Teachers summer national meeting*, Guelph, Ontario, 8/1/2000.

II.E.3. Refereed Presentations

Does not include presentations corresponding to refereed conference proceedings

1. Green, A. E., Radoff, J., Elby, A., Dalal, K., Rivera, J., & Nansimbi, A. (2024). How Bottom-Up Researcher-Teacher Collaborations Can Support Bottom-Up Computational Thinking Integration. *AERA 2024 Annual Meeting*, 04/12/2024.

2. Visintainer, T. (*), Elby, A., Little, A., Quan, G. (*), & Aceves, A. (2017). Exploring the physics summer program experiences of undergraduate students underrepresented in the physical sciences. *AERA 2017 Annual Meeting*, in roundtable session *Curriculum and pedagogy in support of STEM engagement among groups of students that have been historically marginalized.* San Antonio, TX, 04/28/2017.

3. Yip, J., & Elby, A. (2016). What is Freddie Science: The role of personal epistemologies in science/engineering identity development. *AERA 2016 Annual Meeting*, in SIG–Learning Science roundtable session *Issues in identity development*. Washington, DC, 04/08/2016.

4. Philip, T. M., Gupta, A., & Elby, A. (2016). Political Imagination, Responsibility, and Ethics in Engineering Students' Discussions of Drone Surveillance and Warfare. *AERA 2016 Annual Meeting*, in the session *Ethics, STEM, and the possibilities and limitations of transformation in capitalist, militarist democracies*. Washington, DC, 04/10/2016.

5. Secules, S. (*), Gupta, A., Elby, A., & Turpen, C. A. (2016). The cultural construction of engineering ability in an undergraduate programming class. *AERA 2016 Annual Meeting*, in the session *Applying cultural construction frameworks in engineering education research.* Washington, DC, 04/09/2016. **Best student paper award, SIG-Learning Sciences**

6. Russ, R., Elby, A., Richards, J., Robertson, A., Walkoe, J., & Luna, M. (2016). Exploring diversity in researchers' conceptualizations of responsive teaching. *AERA 2016 Annual Meeting*, in the session *Differing notions of responsive teaching across mathematics and science: Does the discipline matter?* Washington, DC, 04/10/2016.

7. Richards, J., Gupta, A., & Elby, A. (2016). Characterizing a new dimension of progress in attending and responding to students' scientific thinking. *AERA 2016 Annual Meeting*, in the session *Differing notions of responsive teaching across mathematics and science: Does the discipline matter?* Washington, DC, 04/10/2016.

8. Alonzo, A. C., & Elby, A. (2015). One teacher's use of a learning progression to generate knowledge about student understanding of physics. *AERA 2015 Annual Meeting*, in the session *Teachers' use of learning progressions for formative assessment: Implications for professional development and further research*. Chicago, 04/17/2015.

9. Edwards, A. R., Hammer, D., Turpen, C. A., Jaber, L. Z. (*), Elby, A., & Coffey, J. E. (2012). The contesting and stabilizing of teachers' understandings and participation in professional development. *AERA 2012 Annual Meeting*, in the session *Integrating issues of knowledge and interaction in analyses of cognition and learning*. Vancouver, 04/14/2012.

10. Tang, X. (*), & Elby, A. (2010). Kim's ninth-grade environmental science class: A teacher's deliberate attempt to epistemologically reframe her students' activity. *AERA 2010 Annual Meeting*, in the session *Epistemological framing: Understanding shifts in teachers' attention, behavior, and epistemological stances.* Denver, 03/2010.

11. Lau, M. (*), Elby, A., Hammer, D., & Hovan, D. (2010). Dave's ninth-grade physics class: a "sticky" shift from eliciting ideas to finding correct answers. *AERA 2010 Annual Meeting*, in the session *Epistemological framing: Understanding shifts in teachers' attention, behavior, and epistemological stances.* Denver, 03/2010.

12. Elby, A., Lau, M. (*), & Hammer, D. (2007). Accounting for variability in a teacher's epistemology. *AERA 2007 Annual Meeting*, in the session *Teachers' Personal Epistemology and Its Impact on Teaching and Learning.* Chicago, 4/2007.

13. Lau, M. (*), Elby, A., Hammer, D., & Hovan, D. (2007). Framing as a tool for understanding Variability in teacher attention and interaction. *AERA 2007 Annual Meeting*, in the session *Classroom assessment: When teachers attend to learners.* Chicago, 4/2007.

14. Elby, A. (2002). What 'Jan' tells us about student epistemologies. *AERA 2002 Annual Meeting*. New Orleans, 4/2002.

15. Elby, A. (1999). A high school physics curriculum designed to nudge students' epistemological beliefs. *AERA 1999 Annual Meeting*, in the session *Assessing and changing students' epistemological beliefs about science and learning.* Montreal, 4/1999.

16. Elby, A. (1998). Changes in students' epistemological beliefs. *AERA 1998 Annual Meeting,* in the session *Reforming university math and science classes: Epistemological challenges.* San Diego, 4/1998.

17. Elby, A. (1998). What students' learning of representations tells us about constructivism. *AERA 1998 Annual Meeting,* in the session *From pictures to scientific representations: An investigation of students' meta-representational competence.* San Diego, 4/1998.

18. Elby, A. (1997). Do students think they must "understand" physics to do well in physics courses? *AERA 1997 Annual Meeting,* in the session *Investigating the relationship between students' epistemologies of science and their learning.* Chicago, 3/1997.

II.E.6. Refereed Posters

1. Krist, C. R. (†), Elby, A., Good, J. (*), Gupta, A., Sohr, E. R. (*), & Yadav, A. (2017). Integrating computational thinking strategies that support science inquiry: A case study from a summer professional development. *AERA 2017 Annual Meeting*, in Division C poster session *Special topics in engineering and computer science: Engineering design, computational thinking, and assessment.* San Antonio, TX, 04/30/2017.

2. Quan, G. (*), Turpen, C. A., & Elby, A. (2016). Tracing the participation of undergraduate physics majors in research experiences. *AERA 2016 Annual Meeting*, in Division C poster session *Scientific practices and the learning of science.* Washington, DC, 04/09/2016.
3. Walkoe, J., Wilkerson, M., & Elby, A. (2017). Technology-Mediated Teacher Noticing: A Goal for Classroom Practice, Tool Design, and Professional Development. *American Educational Research Association annual meeting*, 04/11/2016.

1. Walkoe, J., Wilkerson, M., & Elby, A. (2016). Technology-mediated teacher noticing: A goal for classroom practice, tool design, and professional development. *AERA 2016 Annual Meeting*, in SIG-Learning Sciences poster session. Washington, DC, 04/10/2016.

2. Gupta, A. (†), & Elby, A. (2011). Integrating emotions in fine-grained accounts of students' reasoning. *Annual Meeting of the Jean Piaget Society,* Berkeley, 02/2011.

II.E.8. Non-Refereed Presentations

Need to update with AAPT presentations.

1. Elby, A., Kuo, E., Gupta, A., & Hull, M. M. (2015). Trade-offs in pursuing PER-inspired versus traditional goals in introductory physics. *American Association of Physics Teachers summer national meeting,* College Park, MD, 07/29/2015.

2. Elby, A. (2013). An instructional strategy arising from the resources framework. *American Association of Physics Teachers winter national meeting,* New Orleans, 01/09/2013.

3. Elby, A., Danielak, B., & Gupta, A. (2012). Entangled identity and epistemology meet electromagnetism: The case of Michael. *American Association of Physics Teachers summer national meeting,* Philadelphia, 02/07/2012.

4. Elby, A., Gupta, A., & Conlin, L. (2012). Rediscovering Galileo: the productivity of thinking of forces as "stuff." *American Association of Physics Teachers winter national meeting,* Ontario, CA, 02/07/2012.

5. Elby, A. (2005). A non-PER transfer experiment with PER implications. *American Association of Physics Teachers winter national meeting*, Albuquerque, NM, 01/11/2005.

6. Elby, A. (2003). Teasing apart confidence from epistemology. *American Association of Physics Teachers winter national meeting,* Austin, TX, 01/13/2003.

7. Elby, A. & Scherr, R. (2002). Why teachers should care about cognitive theory. *American Association of Physics Teachers summer national meeting,* Boise, ID, 08/07/2002.

8. Elby, A. & Lippmann, R. (2002). Bringing epistemological considerations to interactive lecture demonstrations. *American Association of Physics Teachers winter national meeting,* Philadelphia, 01/21/2002.

9. Elby, A., & Wittmann, M. C. (2001). What the "FCI invalidity" results really show. *American Association of Physics Teachers summer national meeting,* Rochester, NY, 7/2001.

10. Elby, A. (2001). What does the MPEX measure? *American Association of Physics Teachers winter national meeting*, San Diego, 1/2001.

11. Elby, A. (2000). Misconceptions vs. primitives: Why instructors and curriculum designers should care. *American Association of Physics Teachers summer national meeting*, Guelph, Ontario, 7/2000.

12. Elby, A. (2000). A curriculum designed to help students learn how to learn physics. *American Association of Physics Teachers winter national meeting,* Orlando, Florida, 1/2000.

II.E.13. Symposia (competitively selected)

1. Organizer and Chair, "Differing notions of responsive teaching across mathematics and science: Does the discipline matter?" *AERA 2016 Annual Meeting*, Washington, DC, 04/10/2016.

2. Organizer and Chair, "Applying Cultural Construction Frameworks in Engineering Education Research." *AERA 2016 Annual Meeting*, Washington, DC, 04/09/2016.

3. Organizer and Discussant, "Student learning with PhET simulations: Beyond conceptual gains in classroom settings." *2015 Physics Education Research Conference*, College Park, MD, 06/30/2015.

4. Organizer and Chair, "Differing notions of responsive teaching across mathematics and science: Does the discipline matter?" *2014 International Conference of the Learning Sciences*, Boulder, CO, 06/26/2014.

5. Organizer and Chair, "Good intentions, problematic epistemologies: Why common 'supports' for science students hinder inquiry." *Annual Meeting of the Jean Piaget Society,* Berkeley, 06/04/2011.

II.E.14. Workshops (competitively selected)

1. Gupta, A., Elby, A., & Conlin, L. (2015). Examining metacognition and epistemology in introductory labs: Video workshop. *2015 Physics Education Research Conference*, College Park, MD, 07/30/2015.

2. Gupta, A., & Elby, A. (2012). Video analysis workshop: Reconciling cognitivist and interaction analysis methodologies. *2012 Physics Education Research Conference*, Philadelphia, 08/02/2012.

II.E.15. Colloquia (not at UMD)

1. Elby, A. (2017). What does students' mathematical sense-making look like in quantum mechanics? *Tufts University Physics Dept. Colloquium*, Medford, MA, 09/29/2017.

2. Elby, A., Lau, M., & Hammer, D. (2007). Accounting for variability in a teacher's epistemology. *TERC Colloquium*, Cambridge, MA, 10/15/2007.

3. Elby, A. (2007). What are student epistemologies and why should science professors care? *Western Kentucky University Dept. of Physics & Astronomy Colloquium,* Bowling Green, KY, 03/05/2007.

4. Elby, A. (2002). Helping physics students learn how to learn. *University of New Hampshire public lecture series*, 3/25/2002.

5. Elby, A. (2001). Physics students' beliefs about the nature of learning: Implications for instruction. *Johns Hopkins University, Geology colloquium*, 01/29/2001.

6. Elby, A. (2000). Misconceptions vs. p-prims: Why instructors should care about the form of students' intuitive conceptions. *Ohio State University, Physics Education Research Group*, 03/15/2000.

7. Birkett, B., Elby, A., & Speer, N. (1998). The "Gateway" project: Reforming the introductory math and physics courses at UC Berkeley. *University of California at Berkeley Graduate School of Education, Cognition & Development colloquium*, 03/16/1998.

II.G. Book Reviews, Notes, and Other Contributions

II.G.1. Book Reviews

1. Elby, A. (2023). Squaring the quantum circle. Review of *Quantum Computing: From Alice to Bob*, by Alice Flarend and Bob Hilborn (Oxford University Press, 2022). Published in *Physics Today 76*(7), 46–47.

II.J. Sponsored Research and Programs – Administered by ORA

II.J.1. Grants (All from National Science Foundation)

NSF postdoctoral fellowships in science, mathematics, engineering and technology education. NSF DGE-9714474. **$102,000**. 09/01/1997 – 08/31/2000. **Principal Investigator**.

Helping students learn how to learn: Open-source physics worksheets integrated with TA development resources. NSF DUE-0341447. **$405,463**. 07/01/2004 – 06/30/2007. **Principal Investigator.** (Co-Principal Investigators: Rachel Scherr, David Hammer, Edward Redish, Seth Rosenberg, Stamatis Vokos.)

Toward a new Conceptualization of What Constitutes Progress in Learning Physics, K-16: Resources, Frames, and Networks. NSF DRL-0440113. **$799,800**. 04/01/2005 03/30/2009. **Co-Principal Investigator**. (Principal Investigator: David Hammer. Other Co-Principal Investigators: Uri Wilensky, Rachel Scherr, Edward Redish.)

What Influences Teachers' Modifications of Curriculum? NSF DRL-0455711. **$1,453,677**. 06/01/2005 – 05/31/2010. **Co-Principal Investigator**. (Principal Investigator: David Hammer. Other Co-Principal Investigators: Janet Coffey, Alan Berkowitz.)

Developing Conceptual and Teaching Expertise in Physics Graduate Students: An Integrated Approach. NSF DRL-0529482. **$209,806**. 01/01/2006 – 12/31/2009. **Co-Principal Investigator**. (Principal Investigator: Rachel Scherr. Other Co-Principal Investigators: Edward Redish, David Hammer.)

Collaborative Research: Open-source physics tutorial worksheets with faculty/TA development and implementation resources. NSF DUE-0715567. **$258,841**. 09/15/2007 - 09/14/2010.

Co-Principal Investigator. (Principal Investigator: Rachel Scherr. Other Co-Principal Investigators: Edward Redish, David Hammer.)

Learning Progressions for Scientific Inquiry: A Model Implementation in the Context of Energy. NSF DRL-0732233. $2,907,792 **(~$1,500.000 @ UMD**). 01/01/2008 – 06/30/2013. **Co-Principal Investigator**. (Principal Investigator: Fred Goldberg. Other Co-Principal Investigators: Sharon Bendall, Janet Coffey, David Hammer.)

Disciplinary Experts in Science Education Research: A University of Maryland Program for Producing STEM Education Researchers. NSF DRL-0733613. **$1,311,072**. 01/01/2008 – 12/31/2013. **Principal Investigator.** (Co-Principal Investigators: David Hammer, Spencer Benson, Janet Coffey, Mike Stieff.)

Improving students' mathematical sense-making in engineering: Research and development. NSF EEC-0835880. **$499,991**. 09/01/2008 – 08/31/2013. **Principal Investigator.** (Co-Principal Investigators: Edward Redish, David Hammer, David Bigio, Wesley Lawson.)

Minority Student Pipeline MSP. NSF DRL-0831970. $12,424,182 **(~$1,350,000 @ UMD**). 10/01/2008 – 09/30/2014. **Co-Principal Investigator**. (Principal Investigator: Anisha Campbell. Other Co-Principal Investigators: Nancy Shapiro, Gladys Whitehead, Christine Barrow.)

University of Maryland Noyce Scholars Program for Science Teachers. NSF DUE-1239999. **$1,199,674**. 01/01/2013 – 12/31/2017. **Principal Investigator.** (Co-Principal Investigators: Daniel Levin (took over as PI in 2016), Lawrence Clark, Edward Redish.)

Changing how physics students approach learning with simulations: Research and development of PhET-based tutorials. NSF DUE-1245400. **$199,983**. 06/15/2013 – 06/14/ 2018. **Principal Investigator**. (Co-Principal Investigator: Ayush Gupta.)

Collaborative Research: Helping Engineering Students Transform Their Understanding of Quantum Phenomenon and Devices. NSF DUE-1323129. **$393,261**. 09/01/2013 – 08/31/2016. **Co-Principal Investigator**. (Principal Investigator: Ayush Gupta.)

An application-based learning approach to introductory C programming language courses. NSF DUE-1245745. **$199,354**. 09/01/2013 – 08/31/2016. **Co-Principal Investigator**. (Principal Investigator: Wesley Lawson. Other Co-Principal Investigators: Shuvra Bhattacharyya, Ayush Gupta.)

Collaborative Research: Modeling the dynamics of integrated technical and moral reasoning in contexts of socio-scientific issues. NSF SES-1338700. **$225,561.** 01/14/2014 – 12/31/2016. **Co-Principal Investigator**. (Principal Investigator: Ayush Gupta.)

Forging identity and community in physics: Evaluation and dissemination of Compass. NSF DUE-1245590. **$97,500** (plus **$21,000 subaward** from collaborating institution). 04/01/2014 – 03/30/2016. **Principal Investigator.**

Research on Practice Using STEM Inquiry Embedded with Computational Thinking in Elementary School. NSF DUE-1543061. **$1,013,651**. 09/01/2015 – 08/31/2018. **Principal Investigator.** (Co-Principal Investigators: Ayush Gupta, Aman Yadav.)

Collaborative Research: Integrating conceptual reasoning with mathematical formalism: Teaching and assessing mathematical sense-making in quantum mechanics. NSF DUE-1625797. **$385,349**. 09/01/2016 – 08/31/2019. **Co-Principal Investigator**. (Principal Investigator: Ayush Gupta.)

Preparing undergraduate 'learning assistants' to teach in design courses. NSF EEC-1733649. **$399,804**. 08/01/2017 – 07/31/2020. **Principal Investigator.** (Co-Principal Investigators: Ayush Gupta, Chandra Turpen.)

Negotiating the certification-to-workplace transition: What helps pre-service middle-school science teacher candidates bring responsive teaching practices to their classrooms. NSF DUE-1712220. **$299,473.** 08/01/2017 – 07/31/2020. **Co-Principal Investigator**. (Principal Investigator: Daniel Levin. Other Co-Principal Investigator: Janet Walkoe.)

Partnering with Teachers on the Design of Inquiry for Socio-scientific Computational Thinking. NSF DRL-1842358. **$1,035,998.** 09/15/2018 – 08/31/2023. **Co-Principal Investigator** through 2019; now Senior Personnel. (Principal Investigator: Ayush Gupta. Other Co-Principal Investigators: Jennifer Radoff, Pratim Sengupta, Erin Sohr, Tara Brown.)

Supporting Ethical Engineering: The role of immersive engineering subcommunities. NSF EEC-1916929. **$449,313.** 09/01/2019 – 08/31/2023. **Co-Principal Investigator**. (Principal Investigator: Ayush Gupta. Other Co-Principal Investigators: Chandra Turpen, David Tomblin.)

Investigating the Effects of a Mastery-based Assessment Approach on Undergraduate Engineering Education across Multiple Engineering Courses and Universities. NSF DUE-2013268. **$199,996.** 08/01/2020 – 07/31/2023. **Co-Principal Investigator**. (Principal Investigator: Kenneth Kiger. Other Co-Principal Investigators: Kevin Calabro.)

An Ethnographic Study of Student Use of Online Resources to Improve Student Learning Outcomes. NSF DUE-2142461. **$598,830.** 02/01/2022 -01/31/2026. **Co-Principal Investigator**. (Principal Investigator: Erin Sohr. Other Co-Principal Investigators: Jennifer Radoff.)

II.P. Research Fellowships, Prizes, and Awards

Spencer Foundation Mid-Career Grant (2016-2017). One of seven fellowships awarded in 2016, for scholars 7 to 20 years out from their Ph.D. Paid full salary and expenses for one year.

Best conference paper awards—see boldface notes in II.D.1 and II.E.3 above.

III. Teaching, Extension, Mentoring, and Advising

III.A. Courses Taught

	Courses taught	Enrollment	Notes
Spring 2019	**TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	1 1	
Fall 2019	**TLPL604:** Learning and Teaching Physical Science **TLPL889:** Research internship **TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	18 1 1 1	
Spring 2020	**TLPL728:** Seminar in Mathematics & Science Education **TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	5 1 4	
Fall 2020	**TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	1 4	
Spring 2021	**TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	1 2	
Fall 2021	**TLPL899:** Doctoral dissertation research	3	
Spring 2022	**TLPL795:** Foundations of Education Research **TLPL899:** Doctoral dissertation research	30 3	Co-instructor of this "Core" course for doctoral students
Fall 2022	**TLPL621:** Learning & Teaching in the Physical Sciences **TLPL498:** Undergraduate research **TLPL899:** Doctoral dissertation research	7 1 2	
Spring 2023	**TLPL899:** Doctoral dissertation research	2	
Fall 2023	**TLPL728:** Doctoral seminar, mathematics & science education **TLPL789:** Internship in Education **TLPL888:** Apprenticeship in Education **TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	12 1 1 2 1	
Spring 2024	**TLPL728:** Doctoral seminar, mathematics & science education **TLPL898:** Pre-doctoral research **TLPL899:** Doctoral dissertation research	7 3 1	
Fall 2024	**TLPL795:** Foundations of Education Research **TLPL899:** Doctoral dissertation research	17 1	

III.B. Teaching Innovations

III.B.3. Textbooks

Elby, A. (1995). The Portable TA: A Physics Problem Solving Guide. Volume 1. Upper Saddle River, NJ: Prentice Hall (2nd ed.). ISBN 978-0132317139

Elby, A. (1997). The Portable TA: A Physics Problem Solving Guide. Volume 2. Upper Saddle River, NJ: Prentice Hall (1st ed.). ISBN 978-0132317214

III.B.4. Software, Applications, Online Education

P. Manly & A. Elby (1994). *Interactive Physics Problem Set.* Physics problems accompanied by detailed solutions and Interactive Physics simulations.

III.B.5. Instructional Workshops and Seminar Established

Active-learning physics discussion sections targeted at underrepresented students (1993-1996). As a graduate student at the University of California, Berkeley, working with the Minorities in Engineering Program, I developed and taught group problem-solving sessions for introductory physics courses, based on Uri Treisman's model.

Scaling up active learning in physics discussion sections (1996-1997). I wrote instructional materials and assisted Bruce Birkett in transitioning all sections of UC Berkeley's introductory courses for scientists and engineers to the active-learning format described above. We documented improved student performance on conceptual questions and course exams.

EDCI 898: DESEP seminar (08/2008-05/2013). As part of an external capacity-building grant, I developed and taught a seminar for UMD science education graduate students, designed to help them learn skills and habits of mind that are essential to success in graduate school and beyond, but that are not the focus of regular courses. Our external advisory board, based on feedback from graduate students, rated the seminar highly in its annual reports to NSF.

III.B.6. Course and Curriculum Development

Physics 121/122 tutorials and interactive lecture demonstrations (2002-2009). I spearheaded the creation of research-based physics tutorials (guided-inquiry worksheets). External grants allowed these materials to be refined into Teaching Modules listed below.

EDCI 604 & 605 (2008-2009): Learning and Teaching in the Physical Sciences. As part of an outreach program for grade 1-8 teachers earning a science certificate and a masters in Teacher Leadership, I developed and taught courses to engage teachers in extended inquiry. The course used particular physics content to engage teachers in activities and discussion about what counts as knowing and learning in the physical sciences, and the implications of these epistemological insights for teaching.

Physics 270: 3rd semester introductory physics for scientists and engineers (2010). As part of my NSF-funded project *Improving Students' Mathematical Sense-making in Engineering: Research and Development*, I revamped the lectures, discussion sections, and homework to scaffold and reward mathematical sense-making— "translating" back and forth between mathematical formalism and causal/functional relations in the physical world.

EDCI 604 revision (2013). Revised this outreach course to serve as the first course in TLPL's new Masters in Teacher Leadership with STEM Emphasis outreach program for elementary and middle school teachers.

III.B.7. Teaching Modules (published)

Elby, A., Scherr, R., McCaskey, T., Hodges, R., Redish, E. F., Hammer, D., & Bing, T. (2007). *Open-Source Tutorials in Physics Sense-making, part 1.* On-line. Physics tutorial worksheets with instructors' guides and annotated video of students using the materials.

Scherr, R., Elby, A., Goertzen, R.M., & McCaskey, T. (2010). *Maryland Open-Source Tutorials in Physics Sense-making, part 2.* On-line. Physics tutorial worksheets with instructors' guides and annotated video of students using the materials.

III.C. Advising[‡]

III.C.2. Master's

Advisor and research project director for:

- Amy Green, EDCI, 08/2010 – 08/2011. Entered EDCI doctoral program, 08/2011.
- Heather Weir, EDCI, 01/2011 – 08/2012. NASA Science Outreach

III.C.3. Doctoral

Completed dissertations:

1. Tim McCaskey (08/2005-08/2009). Adviser, *Comparing and contrasting different methods for probing student epistemology and epistemological development in introductory physics*. PHYS. Now Assistant Professor at Columbia College, Chicago.

2. Matty Lau (08/2008- 08/2010). Adviser & Co-chair, *Understanding the dynamics of teacher attention: Examples of how high school physics and physical science teachers attend to student ideas*. EDCI. Now Director of Pre-Service Science Teacher Education Programs at the New York Hall of Science (museum).

3. Michael Hull (08/2011 – 05/2013). Adviser & Chair, *Open Source Tutorials in Japan*. PHYS. Visiting Assistant Professor, University of Vienna, Austria.

[‡] EDCI = Dept. of Curriculum and Instruction, a pre-cursor to TLPL. TLPL = Dept. of Teaching & Learning, Policy & Leadership. PHYS = Dept. Of Physics.

4. Jennifer Richards (08/2010 – 05/2013). Adviser & Co-Chair, *Exploring what stabilizes teachers' attention and responsiveness to the substance of students' scientific thinking in the classroom*. EDCI. Research faculty at University of Washington. **Runner-up for College of Education Outstanding Doctoral Student Award, 2013.**

5. Colleen Gillespie (08/2011 – 05/2013). Co-Adviser & Chair, *Exploring the variability in how educators attend to science classroom interactions.* EDCI. Teacher at Lick Wilmerding High School in San Francisco, California.

6. Brian Danielak (08/2009 – 01/2014). Co-Adviser & Chair, *How electrical engineering students design computer programs.* EDCI. Research Scientist at the Concord Consortium.

7. Laura Cathcart (01/2011 – 05/2015). Adviser & Chair, *The Salient Map Analysis for Research And Teaching (SMART) Method: Powerful potential as a formative assessment in the biomedical sciences.* EDCI. Training Specialist at the Centers for Disease Control (Atlanta).

8. Katey Shirey (08/2013 – 01/2017). Advisor & Chair, *How do we make this happen? Teacher challenges and productive resources for integrating engineering design into high-school physics.* EDCI. Program Officer for the Knowles Teacher Initiative's Engineering Group.

9. Stephen Secules (08/2013 – 04/2017). Co-Adviser & Co-Chair. *Beyond diversity as usual: Expanding critical cultural approaches to marginalization in engineering education.* EDCI. Post-doctoral Fellow, Engineering Education Group, University of Georgia. **Outstanding Doctoral Student Award, College of Education, 2016.**

10. Celestine Elimbi Nakeli (08/2012 – 04/2017). Adviser & Chair, *Cultural border crossing: The interaction between fundamental Christian beliefs and scientific explanations.* EDCI. Teacher, Bishop McNamara High School.

11. Gina Quan (08/2012 – 05/2017). Co-Adviser & Co-Chair, *Becoming a physicist: How identities and practices shape physics trajectories.* PHYS. Assistant Professor of Physics, San Jose State University, as of 08/2018. **Outstanding GA Award, Dept. of Physics**

12. Amy Green (08/2011 – 11/2017). Adviser & Chair, *The 'next generation' of constructivist reform in science and STEM: Case study explorations of the practices of students and the perspectives of teachers.* EDCI. Director of Teacher Professional Learning, Chesapeake Bay Foundation.

13. Kweli Powell (01/2017 – 12/2020). Co-adviser, Co-Chair. *Formative-Home Cultural Influences Of Scientific Sense-Making: A Case Study On The Affordances Of Pedagogical "Bio Mechanistic Thoroughness" ("BMT")*. EDCI.

14. Hanoori Yeong (01/2020 – 12/2020). Adviser & Chair. *Navigating Contexts: South Korean Families' Conceptualizations of Museum-Based Science Learning.* TLPL.

15. Hannah Sabo (08/2016 – 01/2021). Adviser and Chair, *A Study Of How Inequities Emerge In Interaction In Undergraduate Physics And Engineering Education Spaces.* TLPL. Post-doc, University of Oslo.

16. Rebecca Vieyra (08/2018 – 05/2022). Advisor & Chair, *Stem Teachers as International Strategic Leaders: Change Agents at the Systems Scale*. Associate Director of Global Initiatives for PhET Interactive Simulations, University of Colorado – Boulder.
17. Erika Aparakakankanange (09/2020 – 05/2023). Advisor & Chair, *Assessing the Value of Third Space for African American Doctoral Students in STEM Degree Programs.* TLPL.
18. Kenyatta Crenshaw (09/2020 – 08/2023). co-Advisor & Chair, *Activating Technocapital: A Case Study of Marginalized Middle School Youths' Experiences with Information Communication Technology.* TLPL.
19. Christine Hirst Bernhardt (08/2022 – 12/2024). Advisor & Chair, Space for All; Framing for Epistemic Agency; Teachers Moves to Establish Familiar Forms of Epistemic Agency. TLPL.

Current doctoral advisees:

- Khusbu Dala, TLPL (co-Advisor). Anticipated completion: 2027.
- Annelise Roti Roti, TLPL (Advisor). Anticipated completion: 2027.
- Stephanie Williams, TLPL (Program Advisor, Research co-Advisor). Anticipated completion: 2026.
- Ryen Burris, TLPL (Advisor). Anticipated completion: 2026.

Dissertation committee member (not Chair) for:

- Leslie Atkins, PHYS, 2004
- Tom Bing, PHYS, 2008
- Daniel Levin, EDCI, 2008
- Renee-Michelle PHYS, 2010
- Luke Conlin, EDCI, 2012
- Tiffany Sikorski, EDCI, 2012
- Kristi Hall, EDCI, 2013
- Lisa Leininger, Philosophy, 2013.
- Jason Yip, EDCI, 2014
- Ben Dreyfus, PHYS, 2014
- Ben Geller, PHYS, 2014
- Eric Kuo, PHYS, 2014
- Alice Olmstead, Astronomy, 2016
- Elizabeth Fleming, EDCI, 2017
- Erin Ronayne Sohr, PHYS, 2017
- Xiaoyang Gong, EDCI, 2017
- Mark Eichenlaub, PHYS, 2018
- Hannah Jardine, TLPL, 2019
- Jennifer Hayes-Kosteridis, 2019

- Kelly Mills, TLPL, 2019
- Kylie Ewing, Philosophy, 2020
- Michael Dascal, Philosophy, 2020
- Matthew Aruch, Higher Education (Dept. of CHSE), 2021
- Ashley Coon, TLPL, 2022
- Nardos Ghebreab, TLPL, 2022
- Stephanie Breen, TLPL, 2023
- Vivian Zohery, TLPL, 2024

External evaluator (or similar role) for non-UMD dissertations:

- Xiang Huang, Concordia University, CANADA, 2012
- Sandy Martinuk, University of British Columbia, CANADA, 2012
- Sevda Yerdelen-Damar, Middle East Technical University, Ankara, TURKEY, 2013.
- Xihui Wang, McGill University, CANADA, 2014
- Darrick Jones, Rutgers University, USA, 2015
- Phil Southey, University of Cape Town, SOUTH AFRICA, 2017
- Sarah Satanassi, University of Bologna, ITALY, 2023
- Yan Tian, University of Albany (State University of New York), 2024

Project-specific supervision of graduate students and post-docs:

- Laura Lising, post-doc, PHYS, 2003-2005.
- Ayush Gupta, post-doc, PHYS, 2008-2010.
- Eric Kuo, graduate student, PHYS, 2008-2013.
- Luke Conlin, graduate student, EDCI, 2009-2011.
- Kweli Powell, graduate student, EDCI, 2009-2011.
- Vijay Kaul, graduate student, PHYS, 2015.
- Brandon Johnson, PHYS, 2021-2022.

III.C.4. Post-doctoral

- Ayush Gupta, PHYS, 2009-2011
- Christina Krist, TLPL, 2016-2017

III.D. Mentorship‡

III.D.1. Junior Faculty

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Ayush Gupta, Research Assistant Professor, PHYS, 2011–2021. Mentorship in paper-writing and grant-writing, project management, graduate student advisement, and career advancement. Dr. Gupta now regularly first-author papers and wins and administers grants as Principal Investigator.

Chandra Turpen, Research Assistant Professor, PHYS, 2013–present. Mentorship in grant-writing, graduate student advising, and career advancement.

Dan Levin, Clinical Assistant Professor, EDCI & TLPL, 2014–present. Mentorship in grant-writing, project management, graduate student advisement. In 2017, Dr. Levin won his first National Science Foundation grant as Principal Investigator.

Janet Walkoe, Assistant Professor, Dept. of TLPL, 2016–present. Co-mentor. Mentorship in grant-writing, paper writing, scholarly planning, career advancement.

David Weintrop, Assistant Professor, Dept. of TLPL, 2017–present. Co-mentor. Mentorship around Spencer and other grants, time management, advising graduate students.

III.I. Teaching Awards

Graduate Faculty Mentor of the Year Award, University of Maryland, 2012. One of four such awards given campus-wide by the Graduate School that year.

Faculty mentoring award, College of Education, University of Maryland, 2018.

IV. Service and Outreach

IV.A Editorships, Editorial Boards, and Reviewing Activities.

IV.A.2. Editorial Boards

Editorial Board, *Teacher Education in Physics: Research, Curriculum, and Practice* (2011). Edited by David Meltzer and Peter Shaffer. College Park, MD: American Physical Society. ISBN 978-0984811014.

Advisory Board, *Physical Review – Physics Education Research* journal's focused collection on astronomy education research (2016–2017).

Advisory Board, *Physical Review – Physics Education Research* journal's focused collection on curriculum development (2018–2019).

Executive Editor (equivalent to Associate Editor), *Cognition and Instruction*, 2018- present. *In this role, I have been piloting a new way of processing manuscripts. When I receive a manuscript from the Editor-in-Chief, I doesn't immediately send it out for review unless it's*

unusually polished. Instead, I carefully read it, flagging issues I anticipate reviewers would raise. I then write up a pre-review that delineates those issues and, most importantly, suggests ways the authors might address them. Kind of like the feedback a mentor would provide to a junior faculty member or a late-stage graduate student. Authors have been happy to receive this feedback, which I frame in part as an effort to cut down the manuscript's time in review. Most authors revise their manuscript, improving it substantially. With glaring problems largely eliminated from the resubmitted manuscript that I then send out for review, reviewers can focus on more nuanced, constructive feedback. The eventual acceptance rate for these pre-reviewed manuscripts is higher than the journal's overall acceptance.

Editorial Board, *Physical Review – Physics Education Research*, Dec. 2019 – Dec. 2022.

IV.A.3. Reviewing Activities for Journals and Presses

Science Education					
Cognition and Instruction					
Journal of PreK-12 Engineering Ed. Research					
Journal of Educational Psychology					
Physical Review– Physics Ed. Research					
Educational Psychologist					
Journal of the Learning Sciences					
The Physics Teacher					
MIT Press					
Routledge					
TOTALS					

IV.A.4. Reviewing Activities for Agencies and Foundations

IV.A.5. Reviewing Activities for Conferences

IV.A.6. Other

External evaluator for non-UMD tenure cases, 2013-present

2019: 1 evaluation
2020: 4 evaluations
2021: 1 evaluation
2022: 1 evaluation
2023: 3 evaluations
2024: 2 evaluations

IV.B. Committees, Professional, and Campus Service

IV.B.1. Campus Service – Department

Task force, Distinguishing the Ph.D. from the Ed.D. 01/2009 – 06/2009. EDCI

Graduate Education Committee (GREC), 08/2011 – 06/2014. EDCI/TLPL

IRB Liaison, 08/2012 – 08/16. EDCI/TLPL.

Task force, Ph.D. program revision, TLPL, 08/2012 – 12/2013. TLPL. *Played significant role in merging the science ed. and mathematics ed. programs into a single unified doctoral specialization.*

Search committee, Assistant Professor of Mathematics Education, 08/2013 – 12/2013. TLPL

Merit pay committee. Member, 03/2013 – 05/2013. Chair, 03/2014 – 06/2014. EDCI/TLPL. *Formulated workflow by which two committee members review a file, the committee chair spots any ratings disagreements with a "flagging" spreadsheet, and a third reviewer is brought in only when needed—achieving a balance between fairness and efficiency.*

Search Committee, Terrapin Teachers (UTeach) Associate Director, 01/2014 – 03/2014.

Doctoral admissions coordinator, Science Education concentration, 07/2014 – present. TLPL

Chair, Division 1 comprehensive exams unification task force, 12/2013 – present. TLPL. *Spearheaded creation of a compromise policy acceptable to the new Mathematics and Science Education and the Technology Learning & Leadership specializations.*

Division 1 Coordinator, 01/2016 – 07/2017. TLPL. *Solidified procedures to bring greater fairness and transparency to GA assignments.*

APT Committee, 2015-16.

Director of Graduate Studies & Associate Chair, 07/2017 – 05/2024. TLPL. *Started work on initiatives to get doctoral graduate students involved in research earlier, potentially increasing the scholarly productivity of both the graduate students and their faculty collaborators. Led Graduate Research and Education Committee (GREC) in eliminating GRE requirement for both the M.A. and the Ph.D. program, providing Dean's Fellowships to all doctoral students, streamlining admissions bureaucracy, expanding awareness of "3-paper" dissertations, improving recruitment of doctoral students, and other initiatives. In 2022-23, the other Associate Chair and I have helped acclimate our new Chair, Nihat Polat, to the department. In 2022-23, I also spearheaded changing the structure of TLPL's financial packages for doctoral students to guarantee four years of funding (as opposed to three years).*

APT Subcommittee Chair, TLPL, 2019-2020. *3 tenure/promotion cases, including one "rush job" for a new appointment (Donna Wiseman chaired that last case). One 3rd-year review.*

APT Criteria revisions task force, TLPL, Chair, 2021-24. *Rewriting TLPL's criteria to align with campus- and College-level APT criteria revisions, to increase clarity, and to incentivize a greater number of approaches to scholarship. Approved by TLPL faculty, 2023.*

APT Subcommittee Chair, 2022, TLPL. *1 tenure/promotion case.*

Search Committee Chair, Science Education Clinical Associate Professor, 2022-23.

TLPL Workload Policy Revisions task force, 2023-24. *Rewriting TLPL's policy about instructional workload to give "credit" to faculty who engage in unusually time-consuming mentoring and/or service or teach extremely large courses without a TA. Approved by TLPL faculty, 2023.*

APT Subcommittees, 2024, TLPL.

- Chair for one case
- Member for another case

IV.B.2. Campus Service – College

Committee member, Support Program for Advancing Research and Collaboration (SPARC), College of Education. 10/2011- 04/2012.

Committee member, Support Program for Advancing Research and Collaboration (SPARC), College of Education. 11/2014 – 06/2015

Chair, Graduate Education Committee, College of Education, 08/2017 – 07/2020.

College APT Committee member, 2023. *2 cases*

IV.B.3. Campus Service – University

Interim co-director, Terrapin Teachers, 01/2020 – 01/2021. This CMNS-EDUC collaboration prepares undergraduates to be secondary mathematics and science teachers.

Leadership team, Terrapin Teachers, 01/2021 – present. Contribute to monthly meetings of the program directors and associate director, for long-term planning and strategy.

Committee member, Professional Track Appointments and Promotion Committee, 03/2020 – 05/2021. *Professional-track analog of the campus APT Committee.*

Member, Graduate Council, an advisory committee to the Graduate School Deans and administrators, 2021-23. *One achievement: in a small subcommittee, I helped revise the structure of McNair Fellowships for doctoral students.*

IV.B.7. Offices and Committee Memberships

Co-Organizer, Physics Education Research Conference (2018)
This 400+ person conference follows the American Association of Physics Teacher summer meeting. Co-organizers are essentially the program chairs and logistical coordinators.

Executive Committee, Physics Education Research Topical Group (2011-2014)

- Elected member at large, 01/2011 – 01/2012.
- Grants coordinator, 01/2012 – 01/2013.
- **Chair, 01/2013 – 01/2014**.

With 700+ members, this topical group within the American Association of Physics Teachers is the primary international organization for physics education researchers. The elected Executive Committee provides leadership by choosing organizers and Proceedings Editors for the annual Physics Education Research Conference (PERC), by awarding small grants for projects that benefit the community, and by representing the community in its dealings with other organizations such as the American Physical Society. Initiatives that I helped to create or implement during my time as Grants coordinator and Chair included (i) a switch to purely on-line PERC Conference Proceedings, saving ~$15K per year in printing costs; (ii) guaranteed permanent graduate student representation on the Executive Committee, in response to a request from graduate student leaders in the community; and (iii) standardization of the grant application process and an increased number of grants awarded.

IV.C. External Service and Consulting

IV.C.5. Consultancies

Educational Testing Service (ETS), 2017-present. *Continuing my work with the College Board Advanced Placement Program—work done in concert with ETS—I write and edit items for the AP Physics 1 exam.*

College Board Advanced Placement Program (2008-2017)

- Member, Advanced Placement (AP) Physics Curriculum Development and Assessment Committee, 08/2008 – 12/2009.
- Co-Chair, Advanced Placement (AP) Physics Curriculum Development and Assessment Committee, 01/2010-07/2013.
- Co-Chair, Advanced Placement Physics 1 Development Committee, 08/2013 - 06/2017.
- Item writer and reviewer, 2018 – present.

For 9 years, I helped to create controversial changes to the algebra-based AP Physics course, and then helped spearhead the creation of exams consistent with the revised course vision. The new courses—Physics 1 and Physics 2, replacing the old Physics B—emphasize conceptual understanding and application of scientific thinking instead of the quick, rote problem solving often rewarded by Physics B. I helped shepherd the course and exam through "push back" arising from entrenched expectations among many teachers and other stakeholders that physics exams should reward quick calculation. We also engineered Physics 1 to function as a student's first physics course. As a result, the number of students taking algebra-based AP Physics exams has doubled. Furthermore, the number of students from underrepresented groups in STEM taking and passing the exam with a score of 3 or better has increased. This work is both consultancy and service; although I received a stipend, the number of hours I spent far exceeded the number of hours for which I was paid.

IV.G. Service Awards

Outstanding Referee Award, American Physical Society, 2009. Given to fewer than 1% of active reviewers for APS journals.

Outstanding Reviewer (referee) award, AERA & AERJ (American Educational Research Journal – Teaching, Learning, and Human Development), 2011. One of about 50 such awards given, across all AERA journals.

2023 Reviewer of the Year, Journal of the Learning Sciences, 2024. One of 9 awards given.

V. Other Information

Co-leader, interdepartmental Physics Education Research Group (2010 – present)

The nationally recognized University of Maryland Physics Education Research Group (PERG), consisting of faculty, post-docs, and graduate students from the College of Education and the College of Computer, Mathematical, and Natural Sciences, has outgrown its name. It now spearheads research and development projects not only in physics education but also in biology education and engineering education (through an Engineering Education Research subgroup). It has served as a home for cross-College research and

course development aimed at undergraduate science and engineering education. So, the group's efforts cut across Scholarship, Teaching, and Service.

Before 2010, PERG co-leader David Hammer had a joint appointment in Curriculum & Instruction and Physics. After he left UMD in 2010, I took over his role in maintaining the cross-College nature of the group, but without a joint appointment. So, what was part of his job description is now part of my service work.

PERG benefits the university (e.g., by bringing in millions of dollars of grants) and specifically benefits TLPL by attracting doctoral students to study physics and engineering education in TLPL. Some PERG grad students are housed in Physics, not TLPL, but they benefit TLPL as well. For instance, they regularly take TLPL science education graduate courses, courses that sometimes wouldn't meet minimum enrollment numbers without their presence. PERG students from Physics also participate in graduate student seminars and other TLPL courses and activities, enriching the graduate student community in TLPL.