

Dr. Katey Shirey

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Education

University of Maryland	Ph.D. in Teaching and Learning, Policy and Leadership-Mathematics and Science Education Specialization Dissertation: “ <i>How Do We Make This Happen?</i> ” <i>Teacher Challenges and Productive Resources for Integrating Engineering Design into High School Physics.</i> Chair: Andrew Elby	May 2017
University of Virginia	Master of Teaching-Secondary Science Education <i>Certification in Secondary Physics</i>	May 2007
	BA Physics, BA Studio Art. Minor-Art History	May 2004

Research Interests

- Integrated STEM and integrated STEAM curriculum development
- Teacher professional development, epistemology change, and empowerment
- Innovative STE(A)M teaching practices in and across single-content classrooms
- Diversity, equity, and inclusion in STEM education opportunities and assessments

Publications

Carberry, A. R., Klein-Gardner, S. S., Lottero-Perdue, P. S., & Shirey, K. L. (2023). Pre-college engineering education teacher preparation. In A. Johri (Ed.), <i>International Handbook of Engineering Education Research</i> (pp. 241-262). Routledge, London, UK. https://doi.org/10.4324/9781003287483-15	2023
Bosman, L. and Shirey, K. <i>Bioengineering as a Vehicle to Increase the Entrepreneurial Mindset</i> . In S. Kaya-Capocci and E. Peters-Burton (Eds.), <i>Integrated Science 15, Enhancing Entrepreneurial Mindsets Through STEM Education</i> (pp.351-382). Springer. ISBN: 978-3-031-17815-3 (Link)	2023
Shirey, K., & Bosman, L. (2022, August), <i>Using Bio-Inspired Design and STEAM to Teach the Entrepreneurial Mindset to Engineers</i> Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. (Link)	2022
Murzi, H., & Shirey, K., & Zarske, M., & Litzler, E., & London, J. (2022, August), <i>WIP: ASEE Year of Impact on Racial Equity: P-12 Parents and Guardians Engagement</i> Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN. (Link)	2022
Shirey, K. and Chandramouli, M. (2021, July), <i>Work in Progress Pilot Study: Virtual Reality for Computational Thinking Foundations and STEM Enrichment</i> Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. Link	2021

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- Shirey, K. L. (2021, July), *A Student Groupwork Spectrum for Engineering Design Collaboration* Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. 10.18260/1-2--3661 [Link](#) 2021
- Shirey, K. and Canales, P. (2020) Transformative Professional Development Through Integrated STEM. *Kaleidoscope: Educator Voices and Perspectives*, Fall 2020. [Link](#) 2020
- Shirey, K. (2020) An Integrated Three-year High School STEM Curriculum Based on the Global Grand Challenges (Resource Exchange). In *Proceedings of the 2020 ASEE Virtual Annual Conference*, June 2020. [PDF](#) 2020
- Shirey, K. and Wild, A. (2020) Professional Learning with Teacher Communities the Knowles Way. *American Physics Society's Forum on Education Spring 2020 Newsletter: 11-12*. [PDF](#) 2020
- Shirey, K. and Perry, A. (2019) How Our “Ideals” Influence Whom We Teach ([Parts 1](#) and [2](#)). Knowles Teacher Initiative blog posts. 2019
- Shirey, K. (2018) Breaking the Silos of Discipline for Integrated Student Learning: A Global STEM Course’s Curriculum Development[J]. *Engineering*, 2018, 4 (2): 170-174. [PDF](#) 2018
- Shirey, K. (2018) The Knowles Academy: Professional Growth for Seasoned Teachers. Knowles Teacher Initiative blog [post](#). 2018
- Engineering for Us All (e4usa) Course Plan. A holistic engineering curriculum for high school balancing structure, teacher choice, and community engagement. [Link](#) 2018
- Shirey, K. (2017) Don’t Panic: Fostering Student Engagement with Engineering Design. *The Source*, AdvancED. [Link](#) 2017
- Shirey, K. (2017) Teacher Productive Resources for Engineering Design Integration in High School Physics Instruction (Fundamental). In *Proceedings of the 2017 ASEE Annual Conference*, Columbus, OH, June 2017. [PDF](#) 2017
- Shirey, K. (2017) “How Do We Make This Happen?” *Teacher Challenges and Productive Resources for Integrating Engineering Design into High School Physics* (Doctoral dissertation). [PDF](#) 2017
- Shirey, K. (2016) Epistemological Alignment in Implementation of High School Engineering Instruction. In *Proceedings of the 2016 AERA Annual Conference*, Washington, DC, April 2016. 2016
- Shirey, K. (2015) The Engineering Education Epistemology of a Science Teacher. In *Proceedings of the 2015 ASEE Annual Conference*, Seattle, WA, June 2015. [PDF](#) 2015

- Johnson, K., Murphy, S., O'Hara, C., & Shirey, K. (2015). The Four Phases of Engineering Design. *Kaleidoscope: Educator Voices and Perspectives*, 1(2). [Link](#) 2015

Professional Experience

- Owner and Principal Consultant, eduKatey, LLC (Washington, DC) June 2020 - present
- Integrated STEM and STEAM curriculum design, STEM teacher professional development design and facilitation, and assessment and evaluation consultant. Research proposals developed and submitted to NASA, NSF, US Department of Defense, KEEN, ASU, and UL.
- Select clients: Knowles Teacher Initiative, Fairfax County Public Schools, UL, World Learning Inc., STEM Hub Cairo, University of Wisconsin-Madison, IceCube Neutrino Observatory, McGill University, Lingua Innovative Education (Kyrgyzstan), and University of Maryland Engineering for Us All (e4usa), Advanced Learning Partnerships (ALP).
- Knowles Academy Program Manager, Knowles Teacher Initiative (Moorestown, NJ) August 2016 - June 2020
- Professional development designer, facilitator, curriculum planner, instructional coach, facilitator coach. Recruited and contracted teachers, schools, and districts for Knowles Academy professional development services. Organized and lead the Knowles Engineering Senior Fellow Leadership Team. Designed and implemented research and evaluation on engineering integration professional learning opportunities. Developed training and trained workshop facilitators, instructional coaches, coaching coordinators.
- Physics Teacher, Upward Bound at U. of Wisc.-River Falls (River Falls, WI) Summers 2009 - 2014, 2020, 2023
- Developed and executed engineering, physics, and math curriculum to teach high school students about neutrino physics related to the IceCube Neutrino Observatory at the South Pole.
- Teacher of Record, Southern New Hampshire University (Manchester, NH) 2017 - 2020
- PDSC 598A Solar and Engineering Integration for Teachers*
- PDTI 598E Engaging Math and Science Students in Engineering Design (Teacher professional learning)*
- PDTI 598E Integrated STEM Practitioner*
- Substitute Teacher, Arlington County Public Schools (Arlington, VA) 2016 - 2018
- Substitute Teacher Fairfax County Public Schools (Fairfax, VA) 2017 - 2018
- Graduate Assistant, University of Maryland (College Park, MD) 2013 - 2017
- Taught *EDCI 470 Science Teaching Methods* for undergraduate science and education double majors. Assisted in coordinating the Educative

Teacher Performance Assessment (edTPA). Revamped online course presence, recruited local evaluators, managed evaluation of over 300 teacher candidates. Supervised Maryland Science Mathematics Resident Teacher (MSMaRT) program and master's certification (MCERT) program candidates.

Fellow Assistant, Knowles Teacher Initiative (Moorestown, NJ) 2013 - 2014

Worked with Team 1 (First and Second-Year Fellow Directorate) on planning and execution of physics tasks at Fall, Spring, and Summer meetings, application review, and analysis.

Physics Teacher, Washington-Liberty High School (Arlington, VA) 2007 - 2012

Taught IB, standard, and conceptual-level Physics classes.

Teaching Assistant, Univ. of Virginia, McIntire Dept. of Art (Charlottesville, VA) 2004 - 2005

Assisted with instruction, critique, and supervision of two university sculpture classes. Used problem-solving strategies to aid students, led critiques, and gave class lectures and presentations.

Teaching Assistant, Univ. of Virginia, Women's Center (Charlottesville, VA) 2004 - 2005

Instructed a team of students on InDesign and magazine layout design, solicited works, critiqued and graded work.

Honors & Recognition

Meritorious Service Award, American Society for Engineering Education (ASEE), Pre-College Engineering Education Division (PCEE) 2021

Northern Virginia Leadership "40 Under 40" Awardee 2021

University of Maryland College of Education Commencement Speaker 2017

American Education Research Association (AERA) Division K Outstanding Dissertation Award Nominee 2017

University of Maryland, College of Education Dean's Fellowship Award 2013 - 2016

NASA Astronaut Candidate Finalist (Top 50) 2012 - 2013

IceCube Teacher & PolarTREC Teacher (U. of Wisconsin-River Falls, Fairbanks, AK, South Pole) 2009 - 2014

Selected to participate as teacher liaison to researchers at the IceCube Neutrino Observatory a neutrino study project at the South Pole Research Station, Antarctica. Developed curriculum to tie polar science to the classroom (summer 2009) and travel to the South Pole in November 2010. Presented at the national conference on work completed with the Upward Bound IceCube program. Funded fully by the Knowles Science Teaching Foundation, NSF, PolarTREC (formerly TEA), and IceCube (including substitute.) Ongoing collaboration continues presently through eduKatey.

Teaching Fellow, Knowles Teacher Initiative (Moorestown, NJ)	2006 - 2011
Selected for teaching potential and exceptional physics knowledge, the Fellowship is an exclusive award. Benefits included tuition payment and stipend, funding for professional development including a mentor, and classroom improvement materials, involved three yearly meetings, and a nationwide network of math and science teacher leaders.	
U.Va. Curry School of Education Scholarship Award (Charlottesville, VA)	2006
Aunspaugh Fellow in the U.Va. McIntire Art Department (Charlottesville, VA)	2004 - 2005
Awarded based on artistic achievement and leadership. Included year-long graduate-level seminar, studio space, and job as a sculpture class teaching assistant, wages, and stipend.	

Committee Service and Leadership

Chair ASEE Commission on Pre-K to 12 Engineering Education (CP12)	2023 - 2026
Advisory Board member for NSF-funded project: "NSF INCLUDES Engineering Community Inclusion of Individuals with Autism (ECIIA)." PI: Dr. J. Kouo	2023 - 2025
National Academy of Science, Engineering, and Math (NASEM) Collaborative on Advancing Science Teaching and Learning in K-12 Planning Meeting, Washington, DC	2023
Advisory Board member for NSF-funded project: "NSF RAPID: DRL AI: Artificial Intelligence Curriculum and K-12 Teacher Agency: Barriers and Opportunities." PIs: Drs. K. Jensen and P. Jensen, University of Michigan	2023 - 2024
Co-Chair: Knowles Teacher Initiative Engineering Leadership Team	2015 - 2023
ASEE Commission on Diversity, Equity, and Inclusion Member-at-Large, Awards Sub-Committee Co-Chair	2020 - 2023
ASEE Commission on Pre-College Engineering Education PCEE Representative	2020 - 2023
ASEE PCEE Executive Committee member	2019 - 2023
Washington, D.C., Ward 1 Education Council member	2019 - 2023
Program Chair, Pre-College Engineering Education (PCEE) Division American Society for Engineering Education (ASEE)	2020 - 2021
Antarctic Research Consortium of the United States (ARCUS) Education Committee member	2017 - 2020

Workshops & Talks

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Instructor: <i>Intel AI for Youth 2.0</i> teacher professional development workshop, Waterloo, Ontario	January 2024
Developer and Facilitator: <i>Investigations into Integrated STEM</i> teacher workshop at Walton STEM Academy, Cobb County, GA	Winter 2023
Developer and Facilitator: <i>Using neutrino physics & engineering design in high school math and science instruction</i> teacher workshop held throughout Upward Bound 2023 on the University of Wisconsin-River Falls campus	July 2023
Keynote Speaker: 2022 "Institute for Arts Integration and STEAM" Summit	February 2022
Co-developer and Co-instructor: Knowles Teacher Initiative's Engineering for Student and Community Empowerment. Philadelphia, PA.	July 2022
Co-developer and Co-instructor: Engineering for Us All (e4usa) professional development training for e4usa Coaches, new teachers, and returning teachers. (Online workshop)	2022-2024
Facilitator: Bosman, L. and Shirey, K. (2022, June). <i>Using Bio-Inspired Design for STEAM Integration to Increase Student Entrepreneurial Mindset Growth: Easy to Follow Framework and Faculty-Developed Examples workshop</i> . 2022 ASEE Annual Conference (Minneapolis, MN)	June 2022
Instructor: <i>IceCube Afterschool Internship</i> . Design and facilitation. University of Wisconsin-Madison. (Online internship)	Spring 2022
Facilitator: <i>Engineering PD: Closing the Gender Gap</i> . Knowles Teacher Initiative (Erie County, Colorado, online & in-person workshop)	Spring 2021 - present
Trainer of Trainers: <i>Best Practices in STEAM Education (BP-STEAM)</i> STEM Hub Egypt & World Learning Inc. (Cairo, Egypt, online workshop, international teacher panel recruiting and moderating)	July & August 2021
Invited Speaker, CU Teach Engineering P-12 Engineering Experts Panel. University of Colorado, Boulder	August 2021
Plenary Speaker: "The Importance of STEAM to Ignite Student Passions" at <i>Innovation + Creativity STEAM: A New Learning Approach</i> Conference presented by Instituto Mexicano Norteamericano de Relaciones Culturales, División de Estudios Superiores, Licenciatura en la Enseñanza de la Lengua Inglesa (Monterrey, Mexico, online conference)	June 2021
Knowles summer meeting workshops: <i>Rev Up Your Engineering Integration with the Knowles Project Complexity Rubric, From Blab to Lab! How to Leverage Engineering Design for Increased Student Engagement in Science Labs, & Reshaping Classroom Engineering Design for Conscious Action</i> (online)	July 2021

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Co-developer and Co-instructor, Engineering for Us All (e4usa) professional development training for e4usa Coaches, new teachers, and returning teachers.	July 2021
Co-Instructor and Course Co-Developer, Physics + Sports Camp for high school students. American Society of Engineering Education (ASEE) Summer Camp Courses. (Online camp)	June 2021
Facilitator: <i>STEM 2021 Teacher Professional Development</i> . Lingua Innovative Education (Bishkek, Kyrgyzstan, online workshop)	Spring 2021
Instructor: <i>IceCube Afterschool Internship</i> . Design and facilitation. University of Wisconsin-Madison. (Online internship)	Spring 2021
Facilitator: <i>Reshaping Classroom Engineering Design for Conscious Action</i> . Teaching for Change Black Lives Matter at School Virtual Curriculum Fair (Online workshop)	January 2021
Moderator: <i>A Conversation with Past Winners About the Best Paper Award</i> . ASEE Commission on Diversity, Equity, and Inclusion Focus Friday (Online workshop)	January 2021
Invited Workshop Speaker: <i>Bioengineering as a Vehicle to Increase the Entrepreneurial Mindset</i> with Dr. Lisa Bosman. Universal Scientific Education and Research Network (USERN) 2020 Annual Conference. (Online workshop)	November 2020
Featured Speaker: <i>The Practice of XplorLabs: Portable Electrical Power</i> . UL Xplorlabs (Online workshop)	September 2020
Facilitator: <i>Rev Up Your Engineering Integration with the Knowles Project Complexity Rubric</i> . Knowles Teacher Initiative (Moorestown, NJ, online workshop)	July - August 2021
Facilitator: <i>From Blab to Lab! How to Leverage Engineering Design for Increased Student Engagement in Science Labs</i> . Knowles Teacher Initiative (Moorestown, NJ, online workshop)	July - August 2021
Featured Speaker: <i>The Practice of Xplorlabs: Extraction to E-waste</i> . UL Xplorlabs (Online workshop)	July 2020
Featured Speaker: <i>NSTA STEM20: Virtual Event</i> . National Science Teachers Association Annual Conference (Online)	July 2020
Invited Speaker: <i>Women in Engineering Day, 2020</i> . The Athenian School, (Berkeley, CA)	April 2020
Advisor: Chattanooga STEM School consultation on Grand Challenges of Engineering inclusion in an integrated-STEM school (Chattanooga, TN)	October 2019
Program Coordinator: ASEE PCEE Teacher Conference (paper review, session assignment, logistical operations, presentation) (Tampa, FL)	June 2019

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Panel Guest: <i>Careers in Physics, Teaching Physics</i> . Conference for Undergraduate Women in Physics (Princeton, NJ)	January 2019
Invited Guest & curriculum advisor, <i>Engineering for Us All (E4USA)</i> (College Park, MD)	2018 - 2019
Commencement Speaker: <i>A Few Amazing Things You Can Do with a Physics Degree</i> U. of Wisconsin-River Falls Physics Commencement (River Falls, WI)	May 2018
Guest Speaker: <i>Living & Working at the South Pole, and Engineering Design in Physics</i> . American Association of Physics Teachers' Physics Day at the National Science Teachers Association National Conference (Milwaukee, WI)	November 2017
Panelist: <i>Education/Public Engagement Panel</i> . Global Grand Challenges Summit (Washington, DC) Sponsors: US National Academy of Engineering (NAE), the UK Royal Academy of Engineering, and the Chinese Academy of Engineering.	July 2017
Guest Speaker: <i>Science at the South Pole</i> . National Science Foundation (Arlington, VA)	April 2017
Trainer: <i>Knowles Engineering Facilitator Development Weekend</i> (Phoenix, AZ)	February 2017
Course Instructor: <i>Engineering in Science and Math</i> . Math for America (New York, NY)	Fall 2016
Facilitator: <i>Knowles Signature Program for Engineering in High School Science and Math</i> . Knowles Teacher Initiative (Moorestown, NJ)	July 2016
Roundtable Presenter: <i>Epistemological Alignment in Implementation of High School Engineering Instruction</i> American Education Research Association National Conference (Washington, DC)	April 2016
Guest Instructor, University of Maryland STEM Leadership Course (Greenbelt, MD)	October 2015
Reviewer: American Society for Engineering Education Research Conference (Washington, DC)	Fall 2015
Facilitator: <i>Engineer-ize Your Classroom</i> , Knowles Teacher Initiative (Moorestown, NJ)	September 2015
Presenter: <i>The Engineering Education Epistemology of a Science Teacher</i> , American Society for Engineering Education National Conference (Seattle, WA)	June 2015
Presenter: <i>The Engineering Education Epistemology of a Science Teacher</i> . TLPL Graduate Student Organization Poster Session, University of Maryland (College Park, MD)	April 2015

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Presenter: <i>Engineering Project Slices: How to Use Class Period-Length Physics-Based Engineering Tasks and Implementing Engineering Practices in a Physics Classroom</i> . National Science Teacher Association National Conference (Chicago, IL)	March 2015
Facilitator <i>Engineering Task Force Teacher Developer Professional Development</i> . Knowles Teacher Initiative (Moorestown, NJ)	February 2015
Scribe: <i>Engineering the Education Enterprise</i> Conference. (College Park, MD)	Nov. 2014
Book Panelist: Knowles Teacher Initiative National Conference (Cherry Hill, NJ)	July 2014
Facilitator: <i>Using Engineering to Authentically Drive Science and Math Instruction</i> , and <i>Kaleidoscope: KSTF's New Online Journal</i> Knowles Teacher Initiative National Conference (Cherry Hill, NJ)	July 2014
Facilitator: <i>Engineering Design Principles</i> , Mount de Sales Academy (Baltimore, MD)	March 2014
Senior Fellow Advisor: Professional development planner, facilitator, scribe, and application reader. Knowles Teacher Initiative (Moorestown, NJ)	2013-2014
Presenter: <i>Bringing neutrino physics and cutting-edge science to high school students through a "narrative arc" approach</i> . National Science Teachers Association National Conference (Indianapolis, IN)	March 2012
Presenter: IceCube Collaboration Meeting Teacher Professional Development (Madison, WI)	April 2011
Student Teacher Mentor (Arlington, VA)	Fall 2011
Guest speaker series: <i>South Pole Stories</i> in Washington, DC Public Libraries (Washington, DC)	Summer 2011
Guest speaker: <i>South Pole Stories</i> . National Science Foundation (Arlington, VA)	March 2011
Guest speaker: <i>South Pole Stories</i> . Rotary Club (Fairfax, VA)	March 2011
Guest speaker: <i>South Pole Stories</i> . Knights of Columbus (Arlington, VA)	March 2011
Guest: "Our Voices" WPFW Radio Pacifica (Washington, DC)	April 2010
Seminar Presenter: <i>Inquiry and the Nature of Science in Secondary Science Education</i> . Virginia Association of Science Teachers (Richmond, VA)	November 2006

Memberships

- Member of:
- Elevate Inclusion Network
 - American Society for Engineering Education (ASEE)

- ASEE Pre-college Engineering Education (PCEE) Division
- ASEE Commission on P-12 Engineering Education
- ASEE Commission on Diversity, Equity, and Inclusion
- American Education Research Association (AERA)
- American Physical Society (APS)
- Knowles Engineering Leadership Team at the Knowles Teacher Initiative
- Knowles Teacher Initiative Senior Fellows

Past member of:

- National Science Teachers Association (NSTA)
- Antarctic Research Consortium of the United States (ARCUS) Education Committee
- Physics Education Research Group at the University of Maryland (PERG)
- Engineering Education Research Group at the University of Maryland (EE)
- The Center for Science and Technology in Education (CSTE)
- American Education Research Association (AERA)
- *Kaleidoscope: Educator Voices and Perspectives* Editorial Board
- Founding member of the Knowles Science Teaching Foundation IB Physics SL planning group (KSTFIBSL)
- American Association of Physics Teachers
- Virginia Association of Science Teachers
- Virginia Instructors of Physics
- The National Scholars Honors Society