

Anne Emerson Leak

Curriculum Vitae

High Point University
Stout School of Education
One University Parkway
High Point, NC
(336)841-9846 | aleak@highpoint.edu
anneemersonleak.weebly.com/

Education

June 2015	Ph.D., Science Education: University of California, Santa Barbara, CA Dissertation: <i>Solving Health Problems with Science: Exploring Sustainable Community-Driven Science Education in Kenya</i> Committee: Danielle Harlow (Chair), Julie Bianchini, Mary Brenner, and Hugo Loaiciga
June 2012	M.A. Science Education: University of California, Santa Barbara, CA Thesis: <i>Girls' Gateways to Science and Mathematics Education in Cameroon</i>
May 2008	B.A. Physics: Gettysburg College, PA

Professional Appointments

Aug 2018-current	Assistant Professor, Department of Educator Preparation, Stout School of Education, High Point University
July 2015-Aug 2018	Postdoctoral Researcher, Department of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY NSF Education and Human Resources Core Research (ECR) grant: <i>Photonics and Optics Workforce Education Research (POWER)</i> Supervisors: Benjamin Zwickl (PI) and Kelly Martin (Co-PI)

Awards and Grants

2022-2027	Co-PI National Science Foundation (NSF) HRD: 2150298 - \$999,504 (\$122,960) "Transitions and Research Across Interfaces (TRAINS)"
2019-2020	Gutenstein Family Faculty Fellow for High Point University Service Learning
2016-2019	Co-PI National Science Foundation (NSF) DUE: IUSE 1624882 \$141,999 "Collaborative Research: The PIPELINE Network"
2012-2013	UCSB Gevirtz Graduate School of Education Dean's Council Fellowship
2012	International Center for Materials Research - Developing Regions Travel Grant
2009-2010	UCSB Block Grant Fellowship
2008-2009	Fulbright Fellowship: University of Yaoundé II, Yaoundé, Cameroon

Publications

Leak, A. L., Martin, K. N., Owens, L. M., & Zwickl, B. (in press). Contextualizing and Integrating Practices: Reclaiming Authenticity Lost from Translating Workplace Engineering Practices into K-12 Standards.

- Harlow, D. B., Otero, V. K., Goldberg, F., **Leak, A. E.**, Robinson, S., & Price, E. (2020). Learning about teaching and learning while learning physics: An analysis of 15 years of responsive curriculum development, *Physical Review Physics Education Research*.
- Knippenberg, M. T., **Leak, A. E.**, Disseler, S., & Segarra, V. A. (2020). Establishing partnerships for science outreach inside and outside the undergraduate classroom, *J Microbiol Biol Educ.* 21(2), 1–6.
- Bailey, C., Arion, D., **Leak, A. E.**, Zwickl, B. (2019, contributor). Teaching physics for tomorrow: Equipping students to change the world, *Physics Today*, 72, 10, 40, DOI: 10.1063/PT.3.4318.
- Leak, A. E.**, ²Williamson, K., ³Moore, D. L., & Zwickl, B. (2019). On being a physics major: Student perceptions of physics difficulties, rewards, and applicability of innovation and entrepreneurship, PERC 2019 Proceedings.
- Hu, D., Chen, K., **Leak, A. E.**, ²Young, N. T., ²Santangelo, B., Zwickl, B. M., and Martin, K. N. (2019). Characterizing mathematical problem solving in physics-related workplaces using epistemic games, *Physical Review Physics Education Research*.
- Martin, K. N., Gaffney, A. L. H., **Leak, A. E.**, ²Nelson, J., ²Cervantes, A. T., ²Gardener, K. L., ²Clark, B. L., & Zwickl, B. M. (2018). Spewing nonsense [or not]: communication competence and socialization in optics and photonics workplaces, *Communication Education*, 67(4), 414-437.
- Leak, A. E.**, ²Santos, Z., ²Reiter, E., Martin, K. N., & Zwickl, B. (2018). Hidden factors that influence success in the optics workforce, *Phys. Rev. Phys. Educ. Res.* 14, 010136.
- Harlow, D. B., Hansen, A. K. McBeath, J. K., & **Leak, A. E.** (2018). Teacher education for maker education: Helping teachers develop appropriate PCK for engaging children in educative making. In S. Uzzo (Ed.) *Pedagogical Content Knowledge in STEM*, New York: Springer.
- Leak, A. E.**, Sciaky, E., Lenaburg, L., Bianchini, J. A., and Scott, S. (2018). Essential Elements of Collaboration: Understanding How Chemistry Graduate Students Experience Collaboration through International Research Visits, *Journal of Chemical Education Article ASAP*, DOI: 10.1021/acs.jchemed.7b00781.
- Leak, A. E.**, ²Vosburg, J., Martin, K. N., ²Olivera, J., & Zwickl, B. (2017). Examining problem-solving in physics-intensive PhD research, *Physical Review Physics Education Research*.
- Leak, A. E.**, ²Cammarota, C., ²Cawley, N., & Zwickl, B. (2017). Examining students' perceptions of innovation and entrepreneurship in physics, PERC 2017 Proceedings.
- ²Santangelo, B., ²Young, N., **Leak, A. E.**, Martin, K. N., & Zwickl, B. (2017). Integration of mathematics and communication in physics intensive workplaces, PERC 2017 Proceedings.
- Zwickl, B., ²Chen, K., ²Deslongchamps, J., **Leak, A. E.**, Martin, K. (2017). Characterizing analytical and computational mathematics use during PhD research, PERC 2017 Proceedings.
- ²Young, N. T., ²Santangelo, B., Martin, K. N., **Leak, A. E.**, & Zwickl, B. (2017). Models of math use in non-academic workplace settings, PERC 2017 Proceedings.

- Leak, A. E.**, ²Vosburg, J., Martin, K. N., ²Olivera, J., Zwickl, B. (2016). Characterizing problem-solving strategies in physics-intensive PhD research, PERC 2016 Proceedings, 192-195.
- Zwickl, B., **Leak, A. E.**, ²Olivera, J., ²Vosburg, J., Martin, K. N. (2016). Characterizing problem types and features in physics-intensive PhD research, PERC 2016 Proceedings, 412-415.
- Harlow, D., Dwyer, H., Hansen, A., Hill, C., Iveland, A, **Leak, A.**, Franklin, D., (2015). Computer programming in elementary and middle school: Connections across content. In M. Urban and D. Falvo (Eds.) *Improving K-12 STEM educational outcomes through technological integration*. (337-361). Hershey, PA: IGI Global.
- Harlow, D. B. & **Leak, A. E.** (2014). Mapping students' ideas to understand learning in a collaborative programming environment. *Journal of Computer Science Education*.
- Gimbel, S., & ¹**Emerson, A.** (2009). Montessori and the uncited influence of Hegel. *Communications Association Montessori Internationale*, 2009(1).

Teaching and Mentoring Experience

Assistant Professor, Department of Educator Preparation 2018-current
Stout School of Education, High Point University, High Point, NC

- Teach STEM education courses for undergraduate pre-service teachers
- Teach science and robotics courses for elementary STEM education masters' students
- Teach research methods courses for undergraduates, masters', and doctoral students
- Lead STEM Saturdays with PREPARE teacher resident masters' students
- Advise and mentor elementary education majors

Research Experience for Undergraduates (REU) Mentor and Instructor 2015-2016
Science and Mathematics Education Research Collaborative (SMERC), RIT, Rochester, NY

- Mentored undergraduate discipline-based researchers (DBER) on projects relating to model-based reasoning in STEM education.
- Designed and taught professional development seminar to prepare students for careers in teaching, science education research, and STEM discipline-based education research (DBER).

College Physics Instructor 2016
College of Physics and Astronomy, RIT, Rochester, NY

- Co-instructed an algebra-based workshop physics course for undergraduates using student-centered, hands-on approaches.
- Topics included kinematics, Newton's laws, work and energy, momentum, conservation laws, simple harmonic motion, waves, data analysis, and problem-solving.

STEM Program Coordinator 2010-2015

¹ Maiden name is Anne Emerson

² Undergraduate student researchers

³ Graduate student researchers

Center for Science and Engineering Partnerships (CSEP), California NanoSystems Institute (CNSI), UCSB, Santa Barbara, CA

- Coordinated programs and mentor instructors for elementary after-school science clubs, middle school science nights, and the Annual Santa Barbara County Science Fair Exposition.
- Trained graduate students in curriculum design and instructional methods with the School for Scientific Thought (SST) Saturday program for high school students.

Teacher Education Co-Instructor, Teaching Assistant, and Performance Evaluator 2010-2011
Gevirtz School of Education, UCSB, Santa Barbara, CA

- Co-instructed a course for pre-service teachers focused on the practices of science, model-based inquiry methods, physical and chemical science content and skills, student ideas about science, lesson planning and implementation, and integrating science into language arts and mathematics curricula.
- Evaluated Performance Assessment for California Teachers (PACT), now called EdTPA, exams.

Teacher and Teaching Assistant 2004-2008
Gettysburg Growing Place, Gettysburg, PA

- Taught and assisted classes part-time for ages one through five. Teaching focused on developing students' early literacy, number sense, science inquiry, communication, and social skills.

Laboratory Teaching Assistant 2006-2008
Department of Physics, Gettysburg College, Gettysburg, PA

- Assisted in introductory physics laboratory courses focused on Newtonian mechanics, electricity and magnetism, and atomic and nuclear physics.

Teaching Responsibilities

Graduate

EDU 4511SL/5011SL – STEM Technology Integration for Schools and Communities, HPU Fall 2018-21
EDU 5232 – Robotics and Technology in Education, HPU Spring 2021
EDU 5233 – Connected Systems and Interdependence in Science, HPU Fall 2018-21
EDU 5234 – Practicum Infused STEM K-6, HPU Summ 2019-22
EDU 5030 – Methods of Educational Research, HPU 2020-22
EDU 7178 – Qualitative Inquiry in Education, HPU Spring 2020
EDU 5300 – Product of Learning, HPU Spring 2019-20

In-Service Teachers/Teacher Residents

PREPARE STEM Saturdays, HPU 2019-22
Optics and Photonics Education High School Science Teacher Workshop, RIT Summ 2019
STEM Education Teacher Leadership Academy Workshop, RIT Spring 2020

Undergraduate Education

HNR 1200 – Honors Social Science Research: Learning Around the World, HPU Spring 2022
EDU 4233 – Integrated Principles of Math and Science, HPU Fall 2018-21
EDU 4330 – Educational Research Methods, HPU Spring 2019-22
EDU 3232 – Integrated Practicum for the Elementary Classroom, HPU Spring 2019-21
EDU 3110 – Education Technology for Teachers, HPU Spring 2021-22

EDU 199RA – Education Independent Research Studies, UCSB

Fall 2010-13

Undergraduate STEM

PHY 1100 – Physics of Music and Sound, HPU

Spring 2021

College Physics, RIT

Spring 2016

Careers in Physics Professional Development Workshop Series, RIT

Fall 2015-17

Undergraduate Professional Development Workshop Series, RIT

Summ 2015-18

PHY 160 – Science for the Public, UCSB

Fall 2010-13

Research Experience

Physics Education APS PIPELINE Network Applied Researcher

2017-2020

High Point University, High Point, NC and Rochester Institute of Technology, Rochester, NY

- Collaborated with seven institutions, under the direction of Crystal Bailey at the American Physical Society (APS), to create and document new approaches to teaching innovation and entrepreneurship in physics.
- Researched physics undergraduate and faculty perceptions of physics, career goals, and experiences with physics innovation and entrepreneurship.
- Used qualitative and quantitative methods to survey undergraduate physics majors nationally.
- Contributed to American Physical Society Educating Physicists for Impactful Careers (EPIC) Report.

Photonics and Optics Workforce Education Postdoctoral Researcher

2015-2018

School of Physics and Astronomy, College of Sciences, Rochester Institute of Technology, Rochester, NY

- Researched the scientific content, mathematics, and communication skills necessary for entry and success in the photonics and optics workforce.
- Used qualitative research methods to interview recently hired employees and their supervisors and analyze trends in the photonics industry to better prepare students' for future careers.

Integrated Photonics Education and Workforce Development Researcher

2015-2018

Kate Gleason College of Engineering and College of Physics and Astronomy, RIT, Rochester, NY

- Worked with an education and workforce development team from RIT, MIT, and UCSB under the direction of Lionel Kimerling as part of the National Network for Manufacturing Innovation (NNMI): "American Institute for Manufacturing Integrated (AIM) Photonics"
- Conducted and analyzed interviews with industry to determine education and workforce needs specific to integrated photonics

Physics and Everyday Thinking (PET) Graduate Student Researcher

2014-2015

Gevirtz School of Education, UCSB, Santa Barbara, CA

- Researched students' reported use of evidence in changing conceptual understandings.
- Worked with a team of physicists and educators to integrate learning about learning and NGSS curriculum and assessments into a revised version of Physics and Everyday Thinking (PET).

Science and Engineering Graduate Student Program Evaluator and Researcher

2010-2015

Center for Science and Engineering Partnerships (CSEP), California NanoSystems Institute (CNSI), UCSB, Santa Barbara, CA

- Developed, managed, and analyzed interview and survey data for science and education programs.
- Wrote evaluation and research reports for principal investigators and funding agencies.
- Collaborated with chemical engineering faculty to assess undergraduate student writing.

Computer Science Education Graduate Student Researcher 2009-2012

Gevirtz School of Education and Department of Computer Science, UCSB, Santa Barbara, CA

- Researched technology and learning in elementary classrooms, designed curriculum for One Laptop per Child computers, and mentored undergraduate researchers.
- Led undergraduates in curriculum design and educational research on middle school students' computer science skill development as a result of participation in a summer camp integrating computer science, Mayan culture, and endangered species in Mesoamerica.

Evaluation and Technical Reports

APS PIPELINE Project EPIC Report (2021, contributor). Educating physicists for impactful careers: Equipping physics students to change the world through physics innovation and entrepreneurship education.

Leak, A. E. & Lenaburg, L. A. (2011, 2012, 2013, & 2014). Partnership for international research and education – Electron chemistry and catalysis at Interfaces (PIRE-ECCI): Annual evaluation report.

Leak, A. E. & Lenaburg, L. A. (2012, 2013, & 2014). International research experience for students – Electron chemistry and catalysis at Interfaces (IRES-ECCI): Annual evaluation report.

Leak, A. E. & Lenaburg, L. A. (2012, 2013, & 2014). Enhanced support, training and experiences for engineering majors (ESTEEM): Annual evaluation report.

Leak, A. E. & Lenaburg, L. A. (2013 & 2014). Center for sustainable use of renewable feedstocks (CenSURF): Semi-annual evaluation report.

Leak, A. E. & Lenaburg, L. A. (2013 & 2014). Chemical engineering writing assessment evaluation report.

Banakis, N., Cagel, D., Clark, B., Dodge, M., **Emerson, A.**, Freeborn, D., Kemei, M., & Poerschke, D. (2013). Community water source distribution phase II Alternatives analysis report. Engineers without Borders, UC Santa Barbara Chapter.

Belding, M., Cagle, D., Clark, B., Dodge, M., **Emerson, A.** Finney, C., Garcia, E., Kemei, M., Loaiciga, H., von Phul, P., Poerschke, D., Showers, J., & Smith, R. (2012). Community water source distribution pre-implementation report. Engineers without Borders, UC Santa Barbara Chapter.

Belding, M., **Emerson, A.**, Garcia, E., Loaiciga, H., Poerschke, D., Smith, R., & Yeh, C. (2011). Community water source drilling post-assessment report. Engineers without Borders, UC Santa Barbara Chapter.

Conference Presentations

- Leak, A. E.** (2022). Shifting Culture to Support Physics Innovation and Entrepreneurship Curriculum Implementation. *American Association of Physics Teachers (AAPT) Winter Meeting*. January 6-8, 2022. Virtual.
- Leak, A. E.**, ²Bruce, C., & Guzey, S. (2021). The Influence of Teacher Questioning Approaches on Students' Productive Thinking. *NARST 94th Annual International Conference*. April 7-10, 2021. Virtual.
- Leak, A. E.**, ²Williamson, K. & M. Zwickl, B. M. (2020). Dream Jobs and Desired Career Paths of Physics Majors. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 19-22, 2020. Virtual.
- Leak, A. E.**, ³Moore, D. L. & M. Zwickl, B. M. (2019). The PIPELINE Survey: Investigating Perceptions, Experiences, and Pathways in Physics. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 20-24, 2019. Provo, UT.
- Leak, A. E.**, Martin, K., ²Rocha, A., ²Reiter, E., & Zwickl, B. (2018). Adapting Measurement and Testing to Integrate Practices within Authentic Contexts. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 28-August 1, 2018. Washington D.C.
- Zwickl, B., Hu, D., ²Chen, K., & **Leak, A. E.** (2018). Epistemic Modeling Games within Physics-Intensive Workplaces. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 28-August 1, 2018. Washington D.C.
- ²Hathaway, J. N., **Leak, A. E.**, ²Reiter, E., Martin, K. N., & Zwickl, B. (2018). Attitudes and Perceptions of Math Used in Physics-Intensive Careers. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 28-August 1, 2018. Washington D.C.
- Leak, A. E.**, Sciaky, E., ²Cammarota, C. & Zwickl, B. (2018). Examining Student and Faculty Perceptions of Physics Innovation and Entrepreneurship. *American Association of Physics Teachers (AAPT) Winter Meeting*. January 6-9, 2018. San Diego, CA.
- Leak, A. E.**, ²Santos, Z., ²Reiter, E., Martin, K. N., & Zwickl, B. (2017). Blackbox Science: Hidden Science Practices used in the Optics Workplace. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 22-26, 2017. Cincinnati, OH.
- ²Santangelo, B., ²Young, N., **Leak, A. E.**, Martin, K. N., & Zwickl, B. (2017). Communicating and Using Math in the Optics and Photonics Workforce. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 22-26, 2017. Cincinnati, OH.
- ²Vosburg, J., Zwickl, B., ²Olivera, J., ²Chen, K., **Leak, A. E.**, Martin, K. N., Deslongchamps, J. (2016). Preparing Undergraduates for Solving Problems in PhD-Level Research. *American Association of Physics Teachers (AAPT) Summer Meeting*. July 16-20, 2016. Sacramento, CA.
- ²Bertram, C., **Leak, A. E.**, Sayre, E. C., Kustus, M. B., and Franklin, S. V. Student Conceptions of Expertise. *Proceedings of the 2016 International Conference of Learning Sciences (ICLS2016)*, July 2016, Singapore.

- Leak, A. E.**, Martin, K. N., & Zwickl, B. (2015). Studying the skills needed for success in optics careers. *SPIE Optifab*. October 14, 2015. Rochester, NY.
- Leak, A. E.**, Cheung, P. Harlow, D. (2015, January). How quantum mechanics history informs our understanding of scientific models. American Association of Physics Teachers (AAPT). January 15, San Diego, CA.
- Law, M., **Leak, A. E.**, Harlow, D. (2015, January). What is your evidence? Undergraduate students' writing about changing models. American Association of Physics Teachers (AAPT). January 2015, San Diego, CA.
- Leak, A.**, Tillman, J., Bernt, C., Kubiak, C., Lenaburg, L., and Ford, P., The role of research centers in graduate student professional development, presented at the *American Chemical Society (ACS) National Meeting*, August 2014, San Francisco, CA.
- Harlow, D., & **Emerson, A.**, The shape of idea flow: 3rd grade students' sharing ideas developed through Logo programming, presented at the *American Educational Research Association (AERA) Annual Meeting*, April 2012, Vancouver, Canada.
- Sciaky, E., **Emerson, A.**, & Lenaburg, L. Research experiences abroad: Preparing US graduate students for the global science community, presented at the *American Chemical Society (ACS) National Meeting*, March, 2012, San Diego, CA.
- Emerson, A.**, Harlow, D., & Dyar, A., Moving and Making Ideas: Students Using XO Laptops to Create, Discover, and Share Ideas, to be presented at the *American Association of Physics Teachers (AAPT) Winter Meeting*, February, 2012, Ontario, CA.
- Emerson, A.**, Collins, A., Lenaburg, L., Harlow, D., Bianchini, J., & Scott, S., Graduate students' perceptions of scientific collaborations after researching in China, *American Association of Physics Teachers (AAPT) Summer Meeting*, July 2011, Omaha, NE.
- Emerson, A.** & Harlow, D., Mathematics in Cameroon: from text to talk in the classroom, *American Association of Physics Teachers (AAPT) Summer Meeting*, July 2011, Omaha, NE.
- Emerson, A.**, Harlow, D., & Byar, A., Moving and making ideas: Students using XO laptops to create, discover, and share ideas, *National Association of Research in Science Teaching (NARST) Annual International Conference*, April 2011, Orlando, FL.
- Swanson, L., **Emerson, A.**, & Harlow, D., Embracing Confusion: Students' attitudes toward Confusion for Model-based Inquiry, *American Association of Physics Teachers (AAPT) Summer Meeting*, July 2010, Portland, OR.
- Harlow, D., Swanson, L., Dywer, H., **Emerson, A.**, & Moon, S., Learning about teaching and learning in PET, *American Association of Physics Teachers (AAPT) Summer Meeting*, July 2010, Portland, OR.
- Toskes, K., **Emerson, A.**, Deaven, J., Leiter, J., McNamara, L., Stephenson, S. Target thickness optimization of Carbon-12 for tertiary-neutron activation at OMEGA, presented at the *Joint*

Meeting of the Nuclear Physics Divisions of the American Physical Society and the Physical Society of Japan, September 2005, Maui, HI.

Invited Presentations

Leak, A. E., Zwickl, B., & Bailey, C. (2021). Skills for Physics Bachelor Careers in the Private Sector. American Physical Society Success in Industry Careers Series, Washington D.C.: American Physical Society. May 6, 2021.

Leak, A. E. (2018) Connections and context: Refocusing NGSS to create meaningful learning opportunities. Keynote address at the *Maine Center for Research in STEM Education (RiSE Center) Fall STEM Summit*, November 16, 2018. Northport, ME.

Leak, A. E. (2018). Community and Career Contexts as Spaces to Build and Apply Students' Wonderful Ideas. In Symposium organized by Eric Kuo. What Can Be Achieved by Building on Wonderful Ideas. *Physics Education Research Conference (PERC)*. August 1-2, 2018. Washington D.C.

Zwickl, B., **Leak, A. E.,** & Martin, K. N. (2018). Teaching the Whole Physics Student: Integrating Communication, Context, and Career Preparation into the Physics Curriculum. In webinar organized by Crystal Bailey. *American Physical Society*. April 25, 2018.

Leak, A. E., Martin, K. N., & Zwickl, B. (2018). How to Be Successful in a Physics Career: Preparing for Life After Your Physics Degree. In webinar organized by Crystal Bailey. *American Physical Society*. March 21, 2018.

Leak, A. E. & Zwickl, B. (2016). Defining Professional STEM Practice. In Symposium organized by Leslie Atkins Elliott & Angela Little. Iteration, Ownership, and Emotions: Examining How Classroom Experiences in Physics Move Outside the Classroom. *Physics Education Research Conference (PERC)*. July 20-21, 2016. Sacramento, CA.

Leak, A. E. Solving Health Problems with Science: Exploring Sustainable Community-Driven Science Education in Kenya, Gettysburg Physics Colloquium, April 2, 2014, Gettysburg, PA.

Emerson, A. The writing process and instruction methods for primary school literacy programs, NURU International Education Team, January 2013, Isibania, Kenya.

Emerson, A. Learning progressions and lesson planning, NURU International Education Team, July 2012, Isibania, Kenya.

Emerson, A. Water and sustainability in Kenya, *North Durham Rotary Club*, September 2011, Durham, NC.

Affiliations

American Association of Physics Teachers (AAPT) and Physics Education Research (PER)

National Association for Research in Science Teaching (NARST) – Engineering Education Research Interest Group Chair Elect (2018-2019), Strand 5 College Science Teaching and Learning Coordinator (2020-2022)
Reviewer – NSF, Mandela Washington Young African Leaders Initiative (YALI) Fellowship, Science Education, Physical Review Physics Education Research, Computer Science Education, and Journal of Chemical Education