**ZOË ELIZABETH BUCK BRACEY, PH.D.**

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### EDUCATION

#### **Ph.D.** in Education • 2014 • University of california at santa cruz

#### **M.A.** in Education • 2011 • University of california at santa cruz

#### **B.A.** cum laude in astrophysics • 2008 • Princeton university

### CURRENT POSITION

#### **SCIENCE EDUCATOR/RESEARCH SCIENTIST** • BSCS • 2014-current

* Design, develop and facilitate professional development with science teachers from across the country
* Design and develop coherent, inquiry-rich, NGSS-aligned curriculum with educative teacher supports
* Conduct research on teaching and learning in science, including conceptualizing research design and theoretical framework, data collection, data analysis, and writing

### PROFESSIONAL DEVELOPMENT (PD) EXPERIENCE

**PROJECT LEAD** • KNOWLEDGE IN ACTION - PROJECT BASED LEARNING AP PHYSICS PD (BSCS) • 2017-CURRENT

* Lead developer and facilitator for year-long professional development program funded by Lucas Education Research with focus on applying inquiry-rich, project based learning (PBL) instructional approach to AP Physics
* In addition to creative control of the project, responsible for managing and training project staff, developing and maintaining project budget and timelines, and overseeing logistics for two four-day in-person summer institutes and eight days of in-person study groups throughout the year in Los Angeles, CA and Fairfax, VA
* Developed new set of tools and processes for supporting teachers implementing project-based AP Physics curriculum, including strategies for maintaining instructional coherence and engaging students in science practices
* PD tools evolved from an ongoing three-year curriculum consultation and review project on which I am also project lead, in collaboration with University of Washington, Stanford University and San Francisco Unified, which included the development of a rigorous review framework for curriculum that is both project-based and inquiry-rich

**PD DEVELOPER/FACILITATOR** • MN SCIENCE TEACHERS LEARNING THROUGH LESSON ANALYSIS (BSCS) • 2016-CURRENT

* Part of the BSCS STeLLA line of video-into-practice professional learning and leadership development
* Worked collaboratively to design professional learning experiences for teachers in the Minneapolis/St. Paul area
* Facilitated year-round professional learning with teachers in Minnesota, including a two-week in-person summer institute and five days of in-person study groups throughout the year
* Developed brand new classroom curriculum with focus on energy transfer/transformation and electricity production for in-person and online PD
* Worked collaboratively to develop online version of the learning experience for teachers across Minnesota

**PD DEVELOPER/FACILITATOR** • 3-D TEACHING AND LEARNING (BSCS) • 2015-CURRENT

* Conceptualized the anchoring phenomenon for, and worked collaboratively to develop three-dimensional curriculum using the new BSCS Anchored Inquiry Model, including student facing and teacher educative materials
* Collaboratively developed and revised online professional development plan based on BSCS STeLLA line of video-into-practice professional learning

**FACILITATOR IN TRAINING** • PROFESSIONAL DEVELOPER PROVIDERS INSTITUTE (BSCS) • 2016

* Attended professional developer provider institute in Monterey as an apprentice to the lead facilitators
* Collaborated with lead facilitators to adjust day-to-day activities, and assisted with activities and materials

**PARTICIPANT PROJECT LEADER** • INSTITUTE FOR SCIENCE AND ENGINEERING EDUCATORS (UC SANTA CRUZ) • 2009-2011

* Yearlong professional development program geared toward design and facilitation of inquiry-rich activities
* Led a team of early career scientists in collaboratively designing an inquiry activity, and then putting their new teaching skills into practice in an astronomy lab course

### TEACHING EXPERIENCE

**ADJUNCT ASTRONOMY INSTRUCTOR** • HARTNELL COMMUNITY COLLEGE• 2012-2015

* Taught, administrated and provided support for 20-60 students per section, 3 sections per week, in culturally and linguistically diverse classrooms in Salinas, CA and King City, CA.
* Developed original inquiry-rich curriculum for brand new 8-week astronomy short course, and for full-length (18 week) astronomy course, and restructured existing laboratory and lecture courses to be student-centered and inquiry-rich by engaging students in co-constructing explanations using models and analyzing data, rather than receiving knowledge exclusively through lecture or procedural labs
* Worked to create a culturally-responsive classroom by engaging students in the construction of knowledge, centering prior student experiences and cultural knowledge about the universe, accepting and honoring assignments in both Spanish and English, providing multiple opportunities for students to demonstrate competence, and providing space for productive collaborative work

**INSTRUCTOR – TEACHING CULTURALLY AND LINGUISTICALLY DIVERSE STUDENTS MATH AND SCIENCE** • UCSC • 2013

* Developed syllabus and course content around equity in science and math education.
* Taught, advised and assessed classroom of 17 students in upper-level education course

**TEACHING ASSISTANT** • UCSC • 2010-2012

* Served as a T.A. for *Intro to Education*, and *Teaching Culturally and Linguistically Diverse Students Math and Science*
* Taught 2-3 weekly sections covering topics including history, equity, and learning theory
* Facilitated student experience and administrative issues, graded out of class and in-class essays, held office hours, ran exam reviews, and lectured periodically as a “guest lecturer”

SCIENCE INSTRUCTOR AND PROGRAM COORDINATOR • GUIDED DISCOVERIES “ASTROCAMP" • 2008-2009

* Worked with school groups (grades 3-9) year-round, teaching astronomy, physics and outdoor education with an emphasis on inquiry and personal discovery
* Coordinated regarding program and curriculum with school administrators and teachers

**TEACHING ASSISTANT – INTRODUCTION TO ASTROPHYSICS** • PRINCETON UNIVERSITY • 2007

* Co-ran problem solving sessions and exam reviews with groups of up to 100 students.
* Held weekly office hours to work through course content with students; graded homework and exams

### RESEARCH EXPERIENCE

**RESEARCHER AND KEY PERSONNEL** • BSCS • 2014 - CURRENT

* *Towards a More Human(e) Genetics Education: Exploring how Knowledge of Genetic Variation and Causation Affects Racial Bias among Adolescents (NSF award #1660985):* In charge of qualitative analysis, including generating codebook and coding process in NVivo for student think-aloud and focus group data, training and calibrating research associates in the coding process, and interpreting results
* *Collaborative Research: ArguLex--Applying Automated Analysis to a Learning Progression for Argumentation (NSF award #* *1561150*: Led the development of a theoretical framework for teacher professional knowledge based on literature, created and collaboratively revised a codebook for scoring teacher professional knowledge based on responses to classroom video, and trained coders in the use of the codebook
* *Collaborative Research: PCK\*Lex: Applying Computerized Lexical Analysis to Develop a Cost-Effective Measure of Science Teacher Pedagogical Content Knowledge (NSF award # 1437173)*: Conceptualized the research design, and currently leading data collection and analysis around investigating the potential to reduce assessment bias against English Learners using automated analysis, revised argumentation rubrics based on argumentation learning progression
* *T**hree-Dimensional Teaching and Learning: Rebuilding and Researching an Online Middle School Curriculum* *(NSF award number: 1502571):* Collaborated on the development of innovative three-dimensional research assessments using evidence-centered-design

**GRADUATE STUDENT RESEARCHER** • UCSC • 2009-2014

* *High Adventure Science*: In collaboration with the Concord Consortium, developed theoretical framework for ongoing research, conceptualized new research questions and coding schemes, managed undergraduate coders
* *High-Performance Astrophysics Computing Center (UC-HiPACC)*: Developed research questions and agenda around learning with dynamic visualizations, collected and analyzed data at Adler Planetarium in Chicago, and provided general consultation with HiPACC on issues of “education and public outreach” (E/PO)
* *Vocabulary Assessment Study in Education (VASE)*: Created detailed tagging scheme for Common Core standards documents, and administered vocabulary tests for research purposes to 4th and 5th graders in classrooms in Santa Cruz, Merced, Newark, Seaside and Sacramento
* *Ash Labs:* Developed and implemented coding scheme to study professional learning of museum educators involved in collaborative PD at the Museum of Science and Industry (MOSI) in Tampa, FL

**STAFF RESEARCH ASSOCIATE II** • UNIVERSITY OF CALIFORNIA LICK OBSERVATORY • 2007

* Observed several nights a week for the Optical SETI project (OSETI)
* Developed new techniques to streamline observing

RESEARCH EXPERIENCE FOR UNDERGRADUATES • SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE (SETI) • 2006

* Worked with Dr. Frank Drake to develop protocol for on-site and remote observing using the Nickel telescope at UCO Lick , and observed several nights a week for the Optical SETI project (OSETI)
* Piloted development of new instrumentation for the OSETI detector

**INDEPENDENT UNDERGRADUATE RESEARCH** **•** PRINCETON DEPARTMENT OF ASTROPHYSICS **•** 2006 - 2008

* *Distant Quasar Clustering in the SDSS Deep Stripe* with Professor Michael Strauss
* *Accurately Determining Galaxy Cluster Parameters using a Matched Filter Method* with Professor David Spergel
* *Identifying Pre-Main-Sequence Stars Using SDSS* Spectroscopy with Professor Gillian Knapp

### AWARDS

**EDUCATION DEPARTMENT BLUE & GOLD FELLOWSHIP** • 2013

* Competitive Education Dept. fellowships based on merit (scholarship, teaching, and service)

**UC ALL CAMPUS CONSORTIUM ON RESEARCH FOR DIVERSITY (ACCORD) DISSERTATION FELLOWSHIP •** 2012

* One of 12 fellows selected from candidates across all UC campuses supporting research that informs efforts to erase prevailing patterns of schooling inequality and disparities in access to higher education.

**CHANCELLOR’S FELLOWSHIP, UNIVERSITY OF CALIFORNIA** • 2009

* Competitive University-wide merit-based fellowships awarded to first-year doctoral students.

**SIGMA XI: THE SCIENTIFIC RESEARCH SOCIETY •** 2008

* Elected by professors based on achievement in independent, original research in the field of Astrophysics.

**ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS) MASS MEDIA FELLOWSHIP** • 2008

* One of 15-20 Mass Media Fellows chosen each year from a national pool of applicants. Spent 10 weeks as a science reporter at the Raleigh News & Observer. Published dozens of articles including four front-page stories.

**NATIONAL MERIT SCHOLAR** • 2004

* National merit scholar finalist based on exceptional SAT scores

### SELECT PUBLICATIONS AND PAPERS

**Buck Bracey, Z. E**. (accepted for publication in CSSE). Personal universes: Revealing community college students' competences though their organization of the cosmos.

**Buck Bracey, Z. E**. (2017). Students from non‐dominant linguistic backgrounds making sense of cosmology visualizations. Journal of Research in Science Teaching, 54(1), 29-57.

Lee, H-S., Pallant, A., Pryputniewicz, S., Liu, L., **Buck, Z. E.,** (2014). Assessment of Uncertainty-Infused Scientific Argumentation . *Journal of Research in Science Teaching*. 51(5), 581-605.

**Buck, Z. E**., Lee, H. S., & Flores, J. (2014). I Am Sure There May Be a Planet There: Student articulation of uncertainty in argumentation tasks. *International Journal of Science Education*, *36*(14), 2391-2420.

Jiang, L., Fan, X., Bian, F., McGreer, I. D., Strauss, M. A., Annis, J., **Buck, Z.E**.… & Richards, G. (2014). The Sloan Digital Sky Survey Stripe 82 Imaging Data: Depth-Optimized Co-adds Over 300 Deg^ 2 in Five Filters. *Astrophysical Journal, Supplement Series, 213(1)*.

**Buck, Z. E**. (2013). The Effect of Color Choice on Learner Interpretation of a Cosmology Visualization. *Astronomy Education Review, 12*(1), 010104.

**Buck, Z**., Pelton, P., Knapp, G., Finkbeiner, D. P., Padmanabhan, N., Schlegel, D. J., ... & Brooke, T. (2007). New “Orion Population” Emission Line Stars in the Taurus Star Formation Region. *Bulletin of the American Astronomical Society*. 39, p. 754.

### SELECT CONFERENCE PRESENTATIONS

Wilson, C., Stuhlsatz, M., **Buck Bracey, Z. E.**, & Donovan, B. (2017 European Science Education Research Association Conference). *Applying Automated Analysis to the Measurement of Constructed Responses: Applications in Student Argumentation and Teacher PCK.*

Bourdelat-Parks, B., Stennett, B., **Buck Bracey, Z.E**., Mohan, A., Bintz, J., Kowalski, S.M. (2017 NARST conference) *Three-Dimensional Teaching and Learning: Rebuilding and Researching an Online Middle School Curriculum to Support the NGSS.*

Stuhlsatz, M., Wilson, C., **Buck Bracey, Z.E**., Urban-Lurain, M., Merrill, J., Haudek, K. (2016 NARST conference). *Applying Automated Analysis to Develop a Cost-Effective Measure of Science Teacher Pedagogical Content Knowledge.*

**Buck Bracey, Z.E**. (Invited presentation at AAPT Winter Conference 2016). *Cosmological Sense-making: Refocusing on Supporting Student Competence.*

**Buck Bracey, Z.E.** (2015 NARST Annual Conference). *Community College Students Making Sense of Cosmology Visualizations.*

**Buck, Z. E.**, Lee, H., Flores, J. (2014 NARST Annual Conference). *Investigating Student Articulation of Uncertainty in Argumentation Tasks.*

Dimick A.S., Aguilar-Valdez J.A., **Buck, Z.E**., Kahle, T. (2014 NARST Annual Conference). *Teaching and Learning Science in a Neoliberal Context.*

**Buck, Z. E.,** Maldonado, S. I., Lyon, E. R., & Mosqueda, E. (2012 NARST Annual Conference). *Estimating the Influence of Course-Taking Patterns and English Language Proficiency on Science Achievement.*

**Buck, Z. E.** (2012 Astronomical Society of the Pacific (ASP) Annual Conference, “Communicating Science”). *Why Color Matters: The Effect of Visual Cues on Learner’s Interpretation of Dark Matter in a Cosmology Visualization.*

**Buck, Z. E.** (2012 Astronomical Society of the Pacific (ASP) Annual Conference, “Communicating Science”). *Understanding how learners interact with cosmology visualizations.*

**Buck, Z. E.** (Invited presentation at 2011 SRL/ISSDM Research Symposium). *Families Engaging in Immersive Planetarium Show Content at the Adler Planetarium.*

### SERVICE

BOARD OF DIRECTORS • PIKES PEAK OBSERVATORY • 2016-CURRENT

VOLUNTEER • PIKES PEAK ROAD RUNNERS • 2016-CURRENT

REVIEWER • VARIOUS SCIENCE EDUCATION JOURNALS • 2014-CURRENT

DOCENT • RANCHO DEL OSO – BIG BASIC STATE PARK • 2009-2014

GRADUATE STUDENT REPRESENTATIVE • UCSC EDUCATION COLLOQUIUM AND COMMUNITY COMMITTEE • 2010-2012

UNDERGRADUATE STUDENT REPRESENTATIVE • PRINCETON COUNCIL ON SCIENCE AND TECHNOLOGY • 2006-2008