

AJ Richards, Ph. D.

aj.richards@tcnj.edu

Education

Ph. D., Physics, Rutgers University, 2013

Concentration: Physics Education Research

Dissertation: Students' Use of Resources to Understand Solar Cells

Advisor: Eugenia Etkina

This study examined how students activate their prior knowledge to understand a complex physics topic, namely, a photovoltaic cell.

MS, Physics, Rutgers University, 2011

Concentration: High-energy experimental physics

Thesis: Tag and Probe Analysis of Muons in Trilepton SUSY Events

BS, Physics, The College of New Jersey, 2007

Minor in Mathematics

Employment/Teaching Experience

Associate Professor, 2020-present

Assistant Professor, 2015-2020

The College of New Jersey

Courses: Introductory physics and astronomy, service courses, and teacher preparation science pedagogy courses

- Mentored undergraduate students in research that was presented by students at national conferences
- Led lecture and lab sessions for STEM and non-STEM majors
- Mentored and supervised student teacher candidates
- Oversaw implementation of innovative curriculum and pedagogy techniques, such as Learning Assistants and interactive clicker units

Visiting Assistant Professor, 2014-2015

The College of New Jersey

Courses: General Physics I; Intro to Astronomy; Physical, Earth, and Space Sciences

- Led lecture and lab sessions for STEM and non-STEM majors
- Mentored undergraduate student research
- Collaborated with faculty/staff to design Learning Assistant course

Course instructor, 2013

Rutgers University

Course: Physics of Modern Devices

- Designed a new research-based active engagement curriculum and taught advanced undergraduate class to both majors and non-majors.

Lead teaching assistant, 2012

Rutgers University

Course: Analytical Physics

- Oversaw learning assistants (LAs) in the course and optimized their effectiveness
- Observed learning assistants and provided mentoring/feedback
- Led workshops and recitations for engineering students

Course instructor, 2011

Rutgers University

Course: Peer Instructor Education

- Co-taught course that trained LAs in pedagogical techniques
- Observed LAs and provided mentoring/feedback

Teaching assistant, 2008-2012

Rutgers University

Course: Extended Analytical Physics

- Led workshops and recitations for engineering students, with emphasis on small-group problem solving and sensemaking sessions
- This course is designed using methods to retain underrepresented groups

Awards and Fellowships

Richard J Plano Outstanding Teaching Assistant Award, 2009

GAANN Fellowship, 2007

National Merit Scholar, 2001

Externally-funded Grants

“A Longitudinal Study of the Role of Qualitative Evidence in Creating and Sustaining Student-centered Teaching Cultures.” Gazley, L., Van der Sandt, S., Richards, AJ, and Marshall, J. NSF Award #2021332, August 12, 2020.

“Preparing Highly Qualified Physics Teachers.” Magee, N., Richards, AJ, Madden, L., and Wiita, P.J. NSF Award #1557357, September 1, 2016.

Publications

* indicates a TCNJ undergraduate student author

E. Parisi*, D. G. Vaughan*, & AJ Richards. Physics career expectations and diversity among secondary school students. *Physical Review: Physics Education Research*, (in revisions).

C. Reynolds* & AJ Richards. Investigating physics self-efficacy in secondary science students. *Research in Science Education*, (in revisions).

E. Parisi*, G. Masia*, C. Reynolds*, & AJ Richards. Investigating students' perception of careers and diversity issues within physics. *The Physics Teacher*, 61, pp. 140, (2023).

AJ Richards. Teaching electricity and magnetism using kinesthetic learning activities. *The Physics Teacher*, 58 (8), 572-576, (2020).

M. E. Bellino, AJ Richards, M. Chessler, L. Madden, & N. Magee. "Recruiting Future Physics Teachers Through a Field-based Summer Enrichment Program." In *Opportunities and Challenges in Teacher Recruitment and Retention*. C. Rinke & L. Mawhinney (Eds). IAP, pp. 259, (2019).

AJ Richards. Teaching mechanics using kinesthetic learning activities. *The Physics Teacher*, 57(1), p. 35-38, (2019).

C. Horna* & AJ Richards. Investigating physics self-belief of female African-American students. *The Physics Teacher*, 56(7), p. 448-451, (2018).

AJ Richards, D. C. Jones, & E. Etkina. How students combine resources to make conceptual breakthroughs. *Research in Science Education*, p. 1-23, (2018).

N. Magee, AJ Richards, L. Madden, & M. Chessler. Sowing seeds: growth of physics teacher education at The College of New Jersey (TCNJ). *Bulletin of the American Physical Society*, (2017).

B. Santangelo* & AJ Richards. Characterizing teacher-asked questions in a high school physics classroom. *PERC 2016 Proceedings*, p. 300-303, (2016).

D. C. Jones, M. Malysheva, AJ Richards, G. Planinsic, & E. Etkina. Resource activation patterns in expert problem solving. *PERC 2013 Proceedings*, p. 197-200, (2016).

AJ Richards & E. Etkina. Kinesthetic learning activities and learning about solar cells. *Physics Education*, 48(5), p. 578-585, (2013).

AJ Richards. How students combine resources to build understanding of complex topics. *Ph. D. thesis, Rutgers University*, (2013).

AJ Richards & E. Etkina. Students' use of resources to understand solar cells. *PERC 2012 Proceedings*. Vol. 1513, No. 1, AIP Publishing, p. 330-333, (2013).

Conference Presentations

* indicates a TCNJ undergraduate student author

AJ Richards, N. Magee, L. Madden, M. Bellino, & M. Chessler. Noyce at a PUI: Outcomes and Sustainability. Contributed talk presented at AAPT Summer Meeting, Grand Rapids, MI, July 13, 2022.

J. Ryan*, E. Parisi*, & AJ Richards. Developing a Physics Career Intervention Among Middle School Students. Contributed poster presented at AAPT Summer Meeting, Grand Rapids, MI, July 12, 2022.

D. Klunk* & AJ Richards. Do elementary schools ignore physics? Contributed talk presented virtually at AAPT Winter Meeting 2022, January 8, 2022.

E. Parisi*, D. G. Vaughan*, & AJ Richards. Physics career expectations and diversity among secondary school students. Contributed poster presented virtually at XDBER 2021 Meeting, March 3, 2021.

E. Parisi*, D. Vaughan*, & AJ Richards. Physics career expectations and diversity among secondary school students. Contributed talk presented virtually at AAPT Summer Meeting 2020, July 7, 2020.

E. Parisi*, G. Masia*, C. Reynolds*, & AJ Richards. Investigating high school physics students' self-belief in physics. Contributed poster presented at AAPT Summer meeting, Provo, UT, July 24, 2019.

C. Reynolds*, E. Parisi*, G. Masia*, & AJ Richards. How students develop their views of physics and other sciences. Contributed poster presented at AAPT Summer meeting, Provo, UT, July 24, 2019.

E. Parisi*, G. Masia*, C. Reynolds*, & AJ Richards. Investigating high school physics students' self-belief in physics. Contributed talk presented at AAPT Summer meeting, Provo, UT, July 23, 2019.

C. Reynolds*, E. Parisi*, G. Masia*, & AJ Richards. How students develop their views of physics and other sciences. Contributed talk presented at AAPT Summer meeting, Provo, UT, July 22, 2019.

AJ Richards & C. Reynolds*. How do students learn what physics is? Contributed poster presented at AAPT Winter meeting, Houston, TX, January 14, 2019.

AJ Richards & C. Reynolds*. How do students learn what physics is? Contributed talk presented at AAPT Winter meeting, Houston, TX, January 13, 2019.

AJ Richards, L. Madden, M. E. Bellino, M. Chessler, & N. Magee. Recruiting future physics teachers through a field-based summer enrichment program. Contributed poster presented at PERC 2018, Washington, DC, August 1, 2018.

C. Reynolds* & AJ Richards. Investigating Physics Self-Efficacy in Secondary Education Students. Contributed poster presented at PERC 2018, Washington, DC, August 1, 2018.

AJ Richards, L. Madden, M. E. Bellino, M. Chessler, & N. Magee. Recruiting future physics teachers through a field-based summer enrichment program. Contributed talk presented at AAPT Summer meeting, Washington, DC, August 1, 2018.

C. Reynolds* & AJ Richards. Investigating Physics Self-Efficacy in Secondary Education Students. Contributed poster presented at AAPT Summer meeting, Washington, DC, August 1, 2018.

AJ Richards, L. Madden, M. E. Bellino, M. Chessler, & N. Magee. Recruiting future physics teachers through a field-based summer enrichment program. Contributed poster presented at AAPT Summer meeting, Washington, DC, July 30, 2018.

C. Reynolds* & AJ Richards. Investigating Physics Self-Efficacy in Secondary Education Students. Contributed talk presented at AAPT Summer meeting, Washington, DC, July 31, 2018.

AJ Richards, L. Madden, M. E. Bellino, M. Chessler, & N. Magee. Recruiting future physics teachers through a field-based summer enrichment program. Contributed talk presented at NARST annual meeting, Atlanta, GA, March 12, 2018.

AJ Richards, D. Brookes, & E. Etkina. How students use far analogies to understand new physics topics. Contributed talk presented at AAPT Summer Meeting, Cincinnati, OH, July 25, 2017.

C. Horna* & AJ Richards. Investigating physics self-efficacy of female African-American students. Poster presented at AAPT Summer Meeting, Cincinnati, OH, July 24, 2017.

AJ Richards, D. Brookes, & E. Etkina. How students use far analogies to understand new physics topics. Poster presented at AAPT Summer Meeting, Cincinnati, OH, July 24, 2017.

N. Magee, AJ Richards, L. Madden, & M. Chessler. Sowing Seeds: Growth of Physics Teacher Education at The College of New Jersey. Poster presented at PhysTEC 2017, Atlanta, GA, February 17, 2017.

B. Santangelo* & AJ Richards. Physics teachers' questioning patterns and the reasoning behind them. Poster presented at PERC 2016, Sacramento, CA, July 20, 2016.

B. Santangelo* & AJ Richards. Physics teachers' questioning patterns and the reasoning behind them. Contributed talk presented at AAPT Summer Meeting, Sacramento, CA, July 20, 2016.

AJ Richards & E. Etkina. How students use metaphor while learning about complex physics topics. Poster presented at AAPT Summer Meeting, Sacramento, CA, July 19, 2016.

B. Santangelo* & AJ Richards. Physics teachers' questioning patterns and the reasoning behind them. Poster presented at AAPT Summer Meeting, Sacramento, CA, July 19, 2016.

AJ Richards & E. Etkina. How students use metaphor while learning about complex physics topics. Contributed talk presented at AAPT Summer Meeting, Sacramento, CA, July 18, 2016.

AJ Richards, D. C. Jones, & E. Etkina. How students use prior knowledge while constructing understanding. Contributed talk presented at AAPT Winter Meeting, New Orleans, LA, January 12, 2016.

B. Santangelo* & AJ Richards. Exploring questioning patterns in high school physics classrooms. Poster presented at AAPT Winter Meeting, New Orleans, LA, January 11, 2016.

AJ Richards, D. C. Jones, & E. Etkina. How students use prior knowledge while constructing understanding. Poster presented at AAPT Winter Meeting, New Orleans, LA, January 11, 2016.

AJ Richards, D. C. Jones, & E. Etkina. How students combine resources to build understanding of complex ideas. Contributed talk presented at AAPT Summer Meeting, Portland, OR, July 17, 2013.

D. C. Jones, AJ Richards, & E. Etkina. Resource activation patterns in expert problem solving. Contributed talk presented at AAPT Summer Meeting, Portland, OR, July 17, 2013.

AJ Richards, D. C. Jones, & E. Etkina. Student reasoning using combinations of resources. Poster presented at AAPT Summer Meeting, Portland, OR, July 15, 2013.

AJ Richards, D. C. Jones, & E. Etkina. Revising curricular materials using cognitive resources. Poster presented at PERC 2013, Portland, OR, July 17, 2013.

AJ Richards & E. Etkina. Students' use of resources to understand solar cells. Contributed talk presented at AAPT Summer Meeting, Philadelphia, PA, July 30, 2012.

AJ Richards & E. Etkina. Students' use of resources to understand solar cells. Poster presented at PERC 2012, Philadelphia, PA, July 30, 2012.

AJ Richards & E. Etkina. What students think about solar cells. Poster presented at AAPT Winter Meeting, Ontario, CA, February 7, 2012.

T. Lewis, R. France III, AJ Richards, M. Ahmed, M. C. Spraker. Measurements of $^{11}\text{B}(p,p)^{11}\text{B}$. Poster presented at APS CEU meeting, Nashville, TN, October 27, 2006.

Professional Workshops

"Leading NGSS-aligned Science Lessons for Elementary Students" – a 1-day professional development workshop for in-service elementary teachers, Taunton Forge ES, March 15, 2018.

"Sensemaking Activities for Physics" – a 1-day workshop for preservice physics teachers presenting TIPERs questions and how to prime students for sensemaking, Rutgers University, October 8, 2012.

"Answermaking vs. Sensemaking" – a 1-day workshop for peer instructors discussing alternate question types and how to prime students for sensemaking, Rutgers University, August 31, 2012.

"Using Invention Tasks to Promote Sense-Making and Proportional Reasoning." – an invited workshop for physics instructors and PER researchers, presented at PTEC conference, Ontario, CA, February 3, 2012.

Academic Presentations

"What is physics and how do I fit in?" – presented at TCNJ School of Science faculty colloquium, The College of New Jersey, February 26, 2019.

"How to Encourage Sense-making in the Classroom" – presented to first-time physics TAs discussing different question types and strategies to ask questions effectively in the classroom, Rutgers University, November 1, 2018.

"How to Encourage Sense-making in the Classroom" – presented to first-time physics TAs discussing different question types and strategies to ask questions effectively in the classroom, Rutgers University, November 16, 2016.

“Effective Questioning Strategies” – presented to first-time physics TAs discussing different question types and strategies to ask questions effectively in the classroom, Rutgers University, December 1, 2016.

“Using Cognitive Resources to Improve Instruction” – presented to Learning Assistants providing an introduction to Physics Education Research and classroom teaching strategies, Rutgers University, November 15, 2016.

“Effective Questioning Strategies” – presented to first-time physics TAs discussing different question types and strategies to ask questions effectively in the classroom, Rutgers University, October 1, 2015.

“Effective Questioning Strategies” – presented to first-time physics TAs discussing different question types and strategies to ask questions effectively in the classroom, Rutgers University, November 13, 2014.

“How Students Combine Knowledge” – physics colloquium discussing research into how students combine cognitive resources to achieve conceptual breakthroughs, The College of New Jersey, September 19, 2014.

“Learning About Learning: Making Science Education Research Work For You.” – presented to Learning Assistants providing an introduction to research findings and opportunities, Rutgers University, November 30, 2012.

“Using What Our Students Give Us.” – presented to first-time physics TAs discussing how to use students’ prior knowledge in the classroom, Rutgers University, September 27, 2012.

“From Light to Electricity: Designing a Curriculum for Student Learning of the Physics of Solar Cells.” – presented to the Graduate School of Education, Rutgers University, October 19, 2011.

“Learning About Learning: What Physics Education Research Can Do For You.” – presented to first-time physics TAs discussing how to implement PER findings in their teaching, Rutgers University, September 29, 2011.

“Three’s Company: the Search for Supersymmetry Using the Trimuon Channel.” – a seminar given to graduate students about a SUSY search, Rutgers University, June 8, 2010.

“Muon Efficiency Study for RA7 Using Tag and Probe at 100pb^{-1} .” – a talk presented virtually to CMS trilepton group, November 19, 2009.

Professional Memberships

American Association of Physics Teachers

American Physical Society

American Association for the Advancement of Science

Leadership/Service Positions

HHMI course redesign committee, The College of New Jersey, 2022-present

- I contributed to redesigning the introductory course sequence for the physics department, including designing new laboratory activities and providing feedback on programmatic changes.
- I served as interim chair of this committee in Spring 2023.

Teacher Education Council, The College of New Jersey, 2018-present

- I represented the Physics department as the council addressed issues regarding teacher training and certification.

Teaching and Learning Program Council, The College of New Jersey, 2015-2018

- I assisted the council in addressing issues pertaining to instructional design and to the reduction of the achievement gap among marginalized students at TCNJ.

Departmental Faculty & Academic Affairs subcommittee, The College of New Jersey, 2015-2018

- I assisted the committee in addressing issues pertaining to the faculty and academic environment within the department

Chair, departmental Operations & Infrastructure subcommittee, The College of New Jersey, 2014-2015

- I led the committee in addressing issues with the maintenance and infrastructure of the facility.

Coordinator, DELTA-P seminar series, Rutgers University, 2012

- I organized and supervised a weekly seminar series in which first-time physics TAs were exposed to theory and practical techniques about teaching physics.

Physics Graduate Student Organization president, Rutgers University, 2010-2011

- I led the GSO in planning events for the physics graduate students as well as for the department as a whole.

Graduate Student Life Committee liaison, Rutgers University, 2009-2010

- I served on a departmental panel, representing the graduate students and voicing their concerns.

Consultancy employment

Assessment developer, 2020

CourseHero

- I developed quizzes to assess test-takers' physics content knowledge and ability to explain solutions.

Item writer, 2018-2019

Educational Testing Service

NSF Division of Research on Learning

- I designed and reviewed items for an assessment of the Content Knowledge for Teaching of elementary teachers. This NSF-funded project seeks to better prepare educators to teach elementary science.

Editor, 2016-present

Sterling Test Prep

- I reviewed test preparation materials and edited and created solutions to ensure accuracy, clarity, and lack of ambiguity.

Industry employment

Content strategist, 2013-2014

Ogilvy CommonHealth Worldwide

- I worked to develop innovative, analytics-driven marketing strategies for healthcare clients