

CURRICULUM VITAE

Matthew M. Johnson

Research Associate, Center for Science and the Schools
Assistant Professor of Science Education
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EDUCATION

- May 2016 **Ph.D., Curriculum and Instruction (Science Education)**
Penn State University, College of Education, University Park, PA
Dissertation: “Failure is an Option: Reactions to Failure in Elementary Engineering Design”
Dissertation Advisor: William S. Carlsen, Ph.D.
- December 2010 **M.Ed., Curriculum and Instruction (Science Education)**
Penn State University, College of Education, University Park, PA
- May 2003 **B.S., Education**
Clarion University of Pennsylvania, Dept. of Education, Clarion, PA
Certifications: Biology, Chemistry, Physics, General Science
- May 1999 **B.A., Biology**
Mercyhurst College, Department of Biology, Erie, PA

EMPLOYMENT

Academic Appointments

- 2016 – Present *Assistant Professor of Science Education*
College of Education, Penn State University, University Park, PA
Instructor of SCIED/ENGR 110 course for preservice elementary teachers;
Modify curriculum, projects, and assessments; Attend Science Education faculty meetings.
- 2011 – Present *Research Associate*
Center for Science and the Schools, Penn State, University Park, PA
Develop and implement teacher professional development programs associated with STEM research grants; Pursue grant funding in collaboration with STEM or education faculty; Prepare and oversee project budgets; Provide professional development for STEM undergraduate and graduate students in preparation for K-12 outreach activities; Oversee the CSATS curriculum center; Write IRB proposals for data collection and evaluation of education programs; Write evaluation reports for various stakeholders; Coordinate the logistics for week-long summer professional

development workshops; Establish close relationships with Pennsylvania school district administrators and teachers, Intermediate Units, and commonwealth campuses; Support implementation of curriculum with workshop attendees in their classrooms; Support teacher-led action research projects; Represent CSATS at College of Education strategic planning meetings and Science Education Wing renovation meetings; Co-constructed EDSGN 452, *Projects in Community Engineering*; Work closely with director and associate director on strategic planning for the center; Participate in professional associations and disseminate work; Plan and conduct research related to CSATS projects.

Secondary-Level Teaching Positions

2003-2011 *Secondary Science Teacher*
West Branch Area Jr. / Sr. High School, Morrisdale, PA
Taught middle school grade general science to all 8th graders; Taught Biology II, Advanced Biology, Practical Chemistry, Reproduction/Development and Microbiology; Co-advised Envirothon team; Advised the Science Club; Participated on the Student Assistance Program (SAP) team; Co-chaired the School Improvement Plan team; Participated on the Data Analysis team.

University Assistantships in Science

2002 *Teaching Assistant*
Department of Biology, Clarion University, Clarion, PA
Collaborated to plan and prepare cell biology lab with professor; Facilitated lab sessions.

2000-2001 *Research Assistant*
Department of Biochemistry, Microbiology, and Molecular Biology, Penn State University, University Park, PA
Studied red blood cell development in mice in a molecular hematology lab as a part of a graduate program in Biochemistry, Microbiology, and Molecular Biology; Published paper on the research; Presented at journal club.

1999-2000 *Teaching Assistant*
Department of Biochemistry, Microbiology, and Molecular Biology, Penn State University, University Park, PA
Facilitated introductory microbiology lab course (Micro 202), Wrote and presented short lectures; Generated summative assessments; Led recitation sessions for introductory genetics lecture course (Bio 222) to help students with word problems.

GRANT PROPOSALS

Proposals in Progress

Title: **Effect of co-variance errors in land surface variables on modeling mesoscale convective system events**
Sponsor: National Science Foundation
Role: Senior personnel
PI: David Stensrud (Meteorology)

Proposals in Review

Title: **RET Site: CLUSTER – Classroom teachers Using Supercomputers Through Experiences in Research**
Sponsor: National Science Foundation
Role: Co-PI; lead author on proposal
PI: Conrad Tucker (Engineering design)
Award amount: \$599,468

Title: **Using Digital Innovation to Revitalize K-12 STEM Education through High Performance Computing (HPC-in-K12)**
Sponsor: University Strategic Plan RFP
Role: Co-PI, co-developer of professional development
PI: Kathy Hill (CSATS)
Award amount: \$220,600

Title: **Revealing the Connection between Astrophysical Explosions and Fast Radio Bursts**
Sponsor: National Science Foundation
Role: Research associate, lead of K-12 professional development and evaluation
PI: Kohta Murase (Astronomy & Astrophysics)
Award amount: \$679,097

Title: **Inhibition of the Rayleigh-Benard Instability in Cylindrical Geometries via Axial Vibration**
Sponsor: National Science Foundation
Role: Senior personnel, lead of K-12 professional development and evaluation
PI: Robert Smith (Applied Research Lab)
Award amount: \$387,000

Title: **CAREER – All-acoustic multi-modality minimally-invasive implants for high-resolution neuromodulation and neuroimaging**
Sponsor: National Science Foundation
Role: Senior personnel; co-author of proposal; lead of planning, developing, and implementing workshop activities

PI: Mehdi Kiani (Electrical engineering)
Award amount: \$500,000

Title: **CAREER: Mechanobiology of mesenchymal-epithelial transition**
Sponsor: National Science Foundation
Role: Senior personnel; lead of planning, developing, and implementing workshop activities
PI: Esther Gomez (Biological Engineering)
Award amount: \$500,000

Funded Proposals – Active

Title: **NSF Nanosystems Engineering Research Center on Advanced Self-Powered Systems of Integrated Sensor Technologies (ASSIST)**
Sponsor: National Science Foundation
Role: Senior personnel; lead of Penn State's precollege education team
PI: Veena Misra (North Carolina State University)
Award amount: \$ 23,753,518

Title: **CAREER: Defining novel pathways for mitochondrial dynamics in an early-diverging eukaryote**
Sponsor: National Science Foundation
Role: Faculty; co-developer and lead implementer of teacher PD workshop
PI: Megan Povelones (Biology, PSU Brandywine)
Award amount: \$922,876

Title: **Toward Solving Cosmic Particle Mysteries with Neutrinos and Gamma Rays**
Sponsor: National Science Foundation
Role: Co-PI; co-author of proposal, lead of PD workshop and evaluation
PI: Kohta Murase (Astronomy & Astrophysics)
Award amount: \$80,000

Title: **Infrared electro-optical spectroscopy of degradation pathways in organo-halide perovskite photovoltaics**
Sponsor: National Science Foundation
Role: Faculty; co-lead of PD workshop and evaluation
PI: John Asbury (Chemistry)
Award amount: \$395,396

Title: **Institute for CyberScience Seed Grant**
Sponsor: Penn State Institute for CyberScience
Role: Co-PI; co-lead of PD workshop and evaluation
PI: Annmarie Ward (CSATS)
Award amount: \$80,000

Title: **Developing a climatology of horizontal convective rolls over Oklahoma – Meteorology research**
Sponsor: National Science Foundation
Role: Senior personnel; co-lead of week-long PD workshop and evaluation
PI: David Stensrud (Meteorology)
Award amount: \$484,146

Title: **Boeing – Research Experiences for Teachers**
Sponsor: Boeing Corporation
Role: Design and implement professional development program
PI: Annmarie Ward
Award amount: \$180,000

Funded Proposals - Ended

Title: **CarbonEARTH (Carbon Educators and Researchers Together for Humanity)**
Sponsor: National Science Foundation
Role: Senior personnel; led professional development for graduate students; worked with teachers in implementing new projects in the classroom
PI: Renee Diehl (Physics)
Award amount: \$3,000,000

Title: **Northeast Woody and Warm Season Biomass Consortium (NEWBio)**
Sponsor: United States Department of Agriculture
Role: Senior personnel; led professional development workshops and classroom implementation activities; wrote annual education report
PI: Tom Richard (Agriculture and Biological Engineering)
Award amount: \$18,323,000

Title: **Research on the Impacts of Engineering is Elementary**
Sponsor: Museum of Science, Boston
Role: Co-PI; performed quantitative research on student learning; presented at NARST meeting
PI: William Carlsen (Science Education)
Award amount: \$175,000

Unfunded Proposals

Title: **Research in Energy and Environmental Sustainability in Teams of Researchers and Educators (RESTORE)**
Sponsor: National Science Foundation
Role: Senior personnel; lead author of proposal
PI: Rachel Brennan (Environmental Engineering)
Award amount: \$599,343

Title: **CBio: Chesapeake Biomass Consortium for Sustainable Energy and Water Quality Protection**
Sponsor: United States Department of Agriculture
Role: Other professional; co-author of proposal
PI: Tom Richard (Agriculture and Biological Engineering)
Award amount: \$15,000,000

REFEREED PUBLICATIONS

Manuscripts in Preparation

Hill, K.M., **Johnson, M.M.**, Smith, A., and Ward, A., (in progress). Supporting teachers to translate research experiences into practices-based instruction. *Journal of Science Teacher Education*.

Hill, K.M., **Johnson, M.M.**, Smith, A., and Wood, T. (in progress). Moving K-12 Science Forward: The Successes and Pitfalls of Research Experiences for Teachers. *Science*.

Johnson, M.M., Hill, K.M., Wood, T., Smith, A. (in progress). Teachers as Science Researchers: A Critical Literature Review. *Journal of Research in Science Teaching*.

Manuscripts in Review

Johnson, M.M. and Carlsen, W.S. (in revision). "Failure is an option: Reactions to failure in elementary engineering design projects." *Journal of Engineering Education*.

Johnson, M.M. (submitted). "Learning from Failure in Elementary Engineering Design Projects". In *Discourse studies of science and engineering education: Research methods for the study of knowledge and practice*. Gregory Kelly and Judith Green, editors. Routledge.

Peer-reviewed Publications

Johnson, M.M., Croom-Perez, T., Perez, A.A., Antonison, E., Tekeley, C., Edelman, R. (2017). "From Fish Tank to Fuel Tank: Engineering photobioreactors in the classroom". *Science Scope*. 40 (6), 41-49.

Engstrom, T., **Johnson, M.M.**, Russin, T., Ecklund, P. (2015). "A computer-controlled classroom model of an atomic force microscope". *The Physics Teacher*. 56 (9), 536-538.

Zhang D, **Johnson M.M.**, Miller C.P., Pircher T, Geiger J.N., Wojchowski DM. (2001). "An optimized system for studies of EPO-dependent murine pro-erythroblast development". *Experimental Hematology*. 29(11), 1278-88.

McDonald, C.M., **Johnson M**, Schunk, D., Kreuter, R., Wigton, B., Chohan, B. and Sykes, D. (2011) "A portable, low-Cost, LED fluorimeter for middle school, high school, and undergraduate chemistry labs". *Journal of Chemical Education* 88 (8), 1182-1187.

Dominguez V, McDonald C, **Johnson M**, Schunk D, Kreuter R, Wigton, B, Chohan B and Sykes D. (2010). "The characterization of a custom-built coulometric Karl-Fischer titrator". *Journal of Chemical Education*. 87(9), 987-991.

INVITED TALKS

Johnson, M.M., (May, 2016). *Engineering Design in the Elementary Classroom: Failure IS an Option*. Engineering Education Symposium, Museum of Science. Boston, MA.

Johnson, M.M. (April 2014). *A model for understanding and planning STEM education outreach*. North-Holland Provincial Network for Primary Science and Technology Education. University of Amsterdam. Amsterdam, Netherlands.

PEER-REVIEWED PRESENTATIONS AND POSTERS

2017

Johnson, M.M. and Carlsen, W.S. (April, 2017). *Success is not the only goal: Failure and improvement in elementary engineering*. International NARST conference, San Antonio, TX.

Hill, K.M., **Johnson, M.M.**, Ward, A.R., and Smith A. (April, 2017). *Research immersion experiences and the development of classroom research projects to teach content with practices*. International NARST conference, San Antonio, TX.

Hill, K.M., and **Johnson, M.M.** (April, 2017). *The development of a peer-reviewed journal for broader impacts*. National Alliance for Broader Impacts Summit, Stevenson, WA.

2016

Johnson, M.M. (June, 2016). *Creating university partnerships in providing effective teacher professional development in energy education*. National Energy Education Summit, Washington, D.C.

Ward, A.R., and **Johnson, M.M.** (April, 2016). *Promoting improved communication to non-technical audiences using a systems-based model*. National Alliance for Broader Impacts Summit, Philadelphia, PA.

2015

Kortenaar, M., Allen, J.P., Wolfe, B., Decker, R., Breen, M., Nichol, C., **Johnson, M.M.**, Faltens, T., Hehr, L. (June, 2015). *Creating and implementing K-12 teacher professional development*. NISENet Network-wide annual meeting. St. Paul, MN.

Johnson, M.M. (June 2015). *Using NISE Net kits to develop classroom lessons*. A poster presented at the NISENet Network-wide annual meeting. St. Paul, MN.

Ward, A.R., and **Johnson, M.M.** (April, 2015) *Promoting strategic STEM education outreach programming using a systems-based STEM education outreach model*. Broader Impacts Summit, University of Wisconsin, Madison, WI

Johnson, M.M, and Carlsen, W.S (April 2015). *Feedback from failure: teacher discourse moves in reaction to “unsuccessful” elementary engineering projects*. International NARST Conference, Chicago, IL

Johnson, M.M., Bug, L., and Ward, A.R. (February 2015). *Enhancing T-S partner understanding of the systems nature of STEM research*. International Teacher Scientist Partnership Conference, San Francisco, CA

2014

Wilberding, S., **Johnson, M.M.**, Dere, A. and Perez, A.A. (June 2014). *Penn State’s CarbonEARTH program. GK-12 and Beyond: Mapping the Future for Teachers, Students and Scientists*, Penn State University, University Park, PA

Johnson, M.M. and Carlsen, W.S. (April 2014) *Characterizing the views of NOS and OTS of scientists teaching elementary school science*. Poster presented at International NARST conference, Pittsburgh, PA.

2013

Johnson, M.M. and Ward, A.R. (December 2013). *STEM education outreach and its application in broader impacts*. Pennsylvania Science Teachers’ Association Conference, Penn State University, University Park, PA

Johnson, M.M. (December 2013). *What is engineering?* Pennsylvania Science Teachers’ Association Conference, Penn State University, University Park, PA

Ward, A.R., **Johnson, M.M.** and Bug, L. (May 2013). *Promoting University-wide strategic, cohesive STEM education outreach programming*. Broader Impacts Summit. University of Missouri, Columbia, MO.

Ward, A.R and **Johnson, M.M.** (February 2013). *Examining a model for enhancing K-12 teachers’ understanding of scientific research*. International Teacher-Scientist Partnership Conference, Boston, MA.

2012

Johnson, M.M. and Ward, A.R. (August 2012). *Using short-term research projects in the classroom*. CarbonEARTH summer workshop, Penn State University, University Park, PA

Johnson, M.M. (May 2012). *Humanitarian Engineering and Social Entrepreneurship (HESE) K-12 Pilot Program: “Growing STEMs”* Northwest PA STEM conference, Edinboro University of Pennsylvania, Edinboro, PA.

2011

Johnson, M.M. and Ward, A.R. (August 2011). *Using short-term research projects in the classroom*. CarbonEARTH summer workshop, Penn State University, University Park, PA

Johnson, M.M. (May, 2011). *Best-practices in immersion experiences in science*. NSF Earth Space Science Partnership (ESSP) program meeting. Penn State University, University Park, PA

Professional Development Workshops

2017

Johnson, M.M., Hill, K.M., Wood, T., Smith, A., and Ward A.R. (June-August, 2017). *CSATS Research Experiences for Teachers*. Penn State University, University Park, PA

Johnson, M.M., Antonison, E.A., and Wood, T. (July 2017). *Bioenergy and bioproducts*. Week-long NEWBio Teacher workshop. Penn State University, University Park, PA.

Johnson, M.M., Asbury, J., Munson, K. (June, 2017). *Catching the Sun: Physical and chemical investigations of materials for solar power*. iSTEAM workshop, Penn State University, University Park, PA.

Johnson, M.M. and McEntaffer, R. (April, 2017). *Nanodays Teacher Workshop*. Penn State University, University Park, PA.

Johnson, M.M. (February, 2017). *Everyone Engineers: Designing Bridges*. Kinzua Bridge State Park, Mt. Jewett, PA.

2016

Johnson, M.M., Hill, K.M., Ward, A.R., and Smith, A. (June-August, 2016). *CSATS Research Experiences for Teachers*. Penn State University, University Park, PA

Johnson, M.M. (October, 2016). *Bioproducts: Biodegradable Packing Peanuts*. New and Beginning Agriculture Teacher Workshop. Central Columbia Area High School, Columbia, PA

Johnson, M.M., Antonison, E.A., and Bug, L. (July 2016). *Bioenergy and bioproducts*. Week-long NEWBio Teacher workshop. Penn State University, University Park, PA.

Johnson, M.M., and Marianelli, A. (May, 2016). *Biological mimics: Why biologists, chemists, physicists, mathematicians, and engineers need to get along*. Nanodays teacher workshop. Penn State University, University Park, PA.

Johnson, M.M., Hill, K., Berbano, S. (March, 2016). *Next Generation Energy Storage: Batteries for Our Future*. CSATS Saturday Science Workshop. Penn State University, University Park, PA.

2015

Johnson, M.M., Ward, A.R., Hill, K.M., (June-August, 2015). *ASSIST Research Experiences for Teachers*. Penn State University, University Park, PA

Johnson, M.M. (August, 2015). *Bioproducts: Biodegradable Packing Peanuts*. Pennsylvania Association of Agricultural Educators annual conference. Penn State University, University Park, PA.

Johnson, M.M., Bug, L., Hill, K. (July 2015) *Bioenergy and bioproducts*. Week-long NEWBio Teacher workshop. Penn State University, University Park, PA

Johnson, M.M. and Domingue, M. (April, 2015). *How nanotechnology helped catch the Emerald Ash Borer*. Nanodays teacher workshop. Penn State University, University Park, PA

Johnson, M.M. (March, 2015). *Everyone Engineers: Designing Bridges*. CSATS Saturday Science Workshop, Penn State University, University Park, PA

Johnson, M.M. and Alstadt, V.A. (March 2015). *How do researchers “see” things we can’t see: Tools of Nanotechnology*. CSATS Saturday Science Workshop. Penn State University, University Park, PA

Johnson, M.M., Advani, S., and Narayanan, V. (February 2015). *Authentic classroom research using Google Glass*. ASSIST and Visual Cortex on Silicon Teacher Workshop. Penn State University, University Park, PA

2014

Johnson, M.M., Ward, A.R., (June-August, 2014). *ASSIST Research Experiences for Teachers*. Penn State University, University Park, PA

Bug, L., and **Johnson, M.M.** (July 2014) *Bioenergy and bioproducts*. Week-long NEWBio Teacher workshop. Penn State University, University Park, PA

Johnson, M.M. (May 2014). *Lotus effect*. Nanodays teacher workshop. Penn State University, University Park, PA

Johnson, M.M. and Perez, A.A. (March 2014). *Bioenergy: Going green with algae and cyanobacteria*. CSATS Saturday Science Workshop. Penn State University, University Park, PA

Johnson, M.M. and Keech, R. (February 2014). *Nanoelectronics*. CSATS Saturday Science Workshop. Penn State University, University Park, PA

2013

Johnson, M.M., Ward, A.R., (June-August, 2013). *ASSIST Research Experiences for Teachers*. Penn State University, University Park, PA

Bug, L., **Johnson, M.M.**, Gray, K.B., Guo, M. and Wojnar, Z. (July 2013). *Bioenergy and bioproducts*. Week-long NEWBio teacher workshop. Penn State University, University Park, PA

Johnson, M.M. (June 2013). *Everyone engineers: Cleaning an oil spill*. Engineering is Elementary teacher workshop. Bellwood-Antis Area School District, Bellwood, PA

Johnson, M.M. (April 2013). *Gecko Feet*. Nanodays teacher workshop. Penn State University, University Park, PA

2012

Johnson, M.M. and Goff, T. (December 2012). *Nanotechnology from a chemists' perspective*. CSATS Saturday Science Workshop. Penn State University, University Park, PA

2011

Johnson, M.M. and Cunningham, C.M. (December 2011). *Everyone engineers: Cleaning an oil spill*. CSATS Saturday Science Workshop. Penn State University, University Park, PA

UNDERGRADUATE TEACHING EXPERIENCE

Fall 2016 & 2017

- **SCIED/ENGR 110 – Introduction to Engineering for Educators** – a course for preservice elementary teachers that counts as a science content credit

Spring 2012

- **EDSGN 452 – Projects in Community Engineering** – a course for undergraduates in the Humanitarian Engineering and Social Entrepreneurship program that worked with middle school students to co-develop an indoor garden for residents of a senior-living facility

SERVICE

2016-present	Board of Directors, CenClear Child Services, Inc.
2016-present	Proposal reviewer, Broader Impacts Summit, National Alliance for Broader Impacts
2016-present	Science education wing committee meetings
2015-present	Planning committee – Broader Impacts Summit, National Alliance for Broader Impacts
2014-present	Proposal reviewer, International NARST Conference

HONORS, AWARDS, AND RECOGNITION

2008-2011 NSF Research Experience for Teachers Participant, Penn State University, University Park, PA

2003 Outstanding Student Teacher, Clarion University of Pennsylvania, Clarion, PA

- 1999-2000 Nellie H. and Oscar L. Roberts Fellowship, Department of Biochemistry, Microbiology, and Molecular Biology, Penn State University, University Park, PA
- 1999 President's Award for Excellence, Natural Sciences and Mathematics, Mercyhurst College, Erie, PA
- 1998 NSF Research for Undergraduates Participant, Center for Metalloenzymes Studies, Department of Biochemistry. University of Georgia, Athens, GA

TECHNOLOGY SKILLS

Educational Technology in Research

- SPSS – quantitative analysis software
- Transana – qualitative analysis software

Educational Technology in Teaching

- Collaboration – Google Classroom, Google Drive, Dropbox, Box, Slack
- Online course management – Blackboard, Angel, Canvas
- Promethean Board technology
- Geospatial software: ArcGIS, Google Earth
- Data analysis and representation: R studio, Jupyter, Excel
- Small, mobile instruments for laboratory enhancement (SMILE) program – developed and used low-cost fluorimeter, Karl-Fischer titrator and conductivity meter in classrooms

REFERENCES

Dr. William Carlsen

Professor, Science Education,
Penn State University, wsc10@psu.edu
(814) 865-5664

Dr. Gregory Kelly,

Associate Dean of Research, Outreach, and Technology; Professor, Science Education
Penn State University, gkelly@psu.edu
(814) 863-1489

Dr. Christine Cunningham

Director, Engineering is Elementary,
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