BIOGRAPHICAL SKETCH

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NAME: Rushton, Gregory

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: DIRECTOR, TN STEM EDUCATION CENTER

EDUCATION/TRAINING *(Begin with baccalaureate and include postdoctoral training if applicable. Add/delete rows as necessary)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CA	AB	05/1993	CHEMISTRY
UNIVERSITY OF SOUTH CAROLINA, COLUMBIA, SC	MED	08/1998	SCIENCE EDUCATION
UNIVERSITY OF SOUTH CAROLINA, COLUMBIA, SC	PHD	08/2004	CHEMISTRY

A. Personal Statement

I am currently funded as an IES PI (Award R305A180509) and as an NSF PI on four additional projects involving teacher professional development, teacher leadership, and reform-based pedagogies in STEM classrooms. Our work encompasses diverse research designs and data analytic techniques within educational settings, and we regularly disseminate our findings in high-profile publication and conference venues. Over the past fifteen years, I have been funded as PI, co-PI, or senior personnel on 28 competitive awards in educational research and published almost 50 papers or book chapters.

1. Shah L, Butler Basner E, Ferraro K, Sajan A, Fatima A, Rushton G. Diversifying Undergraduate Chemistry Course Pathways to Improve Outcomes for At-Risk Students. Journal of Chemical Education. 2020 June 05; 97(7):1822-1831. Available from: https://pubs.acs.org/doi/10.1021/acs.jchemed.9b00972 DOI: 10.1021/acs.jchemed.9b00972
2. Criswell B, Rushton G, Nachtigall D, Staggs S, Alemdar M, Cappelli C. Strengthening the vision: Examining the understanding of a framework for teacher leadership development by experienced science teachers. Science Education. 2018 November; 102(6):1265-1287. Available from: http://doi.wiley.com/10.1002/sce.21472 DOI: 10.1002/sce.21472
3. Rushton G, Lotter C, Singer J. Chemistry Teachers' Emerging Expertise in Inquiry Teaching: The Effect of a Professional Development Model on Beliefs

and Practice. Journal of Science Teacher Education. 2017 February 23; 22(1):23-52. Available from: https://www.tandfonline.com/doi/full/10.1007/s10972-010-9224-x DOI: 10.1007/s10972-010-9224-x

4. Adams A, Jessup W, Criswell B, Weaver-High C, Rushton G. Using Inquiry To Break the Language Barrier in Chemistry Classrooms. Journal of Chemical Education. 2015 September 24; 92(12):2062-2066. Available from: https://pubs.acs.org/doi/10.1021/ed500837p DOI: 10.1021/ed500837p

B. Positions and Honors

Positions and Employment

1995 - 1998	SCIENCE TEACHER, LOWER RICHLAND HIGH SCHOOL, HOPKINS, SC
1998 - 2002	SCIENCE TEACHER, SPRING VALLEY HIGH SCHOOL, COLUMBIA, SC
2004 - 2008	ASSISTANT PROFESSOR, KENNESAW STATE UNIVERSITY, KENNESAW, GA
2009 - 2015	ASSOCIATE PROFESSOR, KENNESAW STATE UNIVERSITY, KENNESAW, GA
2012 - 2018	ASSOCIATE EDITOR, JOURNAL OF CHEMICAL EDUCATION
2014 - 2014	VISITING ACADEMIC, CURTIN UNIVERSITY, PERTH, WA
2015 - 2018	ASSOCIATE PROFESSOR, SUNY-STONY BROOK, STONY BROOK, NY
2018 -	DIRECTOR, TN STEM EDUCATION CENTER, MIDDLE TN STATE UNIVERSITY, MURFREESBORO, TN
2018 -	PROFESSOR, CHEMISTRY, MIDDLE TN STATE UNIVERSITY, MURFREESBORO, TN

Other Experience and Professional Memberships

2000 -	MEMBER, AMERICAN CHEMICAL SOCIETY
2004 -	MEMBER, NATIONAL ASSOC RESEARCH IN SCIENCE TEACHING

Honors

2000	National Board Certification, Adolescent/Young Adult Science, NATIONAL BOARD FOR PROFESSIONAL TEACHING STANDARDS
2011	College Science Teacher of the Year, GEORGIA SCIENCE TEACHERS ASSOCIATION
2013	Distinguished Scholarship Award, KENNESAW STATE UNIVERSITY

C. Contribution to Education Research

1. 1. K-12 STEM Teacher Leadership. Teacher leaders are invaluable assets within

local teaching districts and communities given their expertise in their field, experiences, and leadership qualities. However, the process by which STEM educators in K-12 settings move along trajectories from novice to professional practitioner and finally to teacher leader is not well understood. We are particularly interested in the potential of developing STEM teacher leaders to address the loss of early and mid-career professionals to careers outside of the classroom. We have developed a teacher leader development framework that focuses on professional vision and professional identity to improve efficacy, engagement, and empowerment towards more effective leadership roles. We are also currently investigating the personal characteristics, school contexts, and leadership programs at eight NSF-funded sites that may influence teachers' decisions to stay in, move from, shift from, or leave their teaching positions.

a. Alemdar M, Cappelli CJ, Criswell BA, Rushton GT. Evaluation of a Noyce program: Development of teacher leaders in STEM education. Eval Program Plann. 2018 Dec;71:1-11. PubMed PMID: 30059795.
b. Criswell B, Rushton G, Nachtigall D, Staggs S, Alemdar M, Cappelli C. Strengthening the vision: Examining the understanding of a framework for teacher leadership development by experienced science teachers. Science Education. 2018 November; 102(6):1265-1287. Available from: http://doi.wiley.com/10.1002/sce.21472 DOI: 10.1002/sce.21472
c. Polizzi S, Head M, Barrett-Williams D, Ellis J, Roehrig G, Rushton G. The use of teacher leader roles in an online induction support system. Teaching and Teacher Education. 2018 October; 75:174-186. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0742051X17319066 DOI: 10.1016/j.tate.2018.06.010
d. Criswell B, Rushton G, McDonald S, Gul T. A Clearer Vision: Creating and Evolving a Model to Support the Development of Science Teacher Leaders. Research in Science Education. 2017; 48(4):811-837. Available from: http://link.springer.com/10.1007/s11165-016-9588-9 DOI: 10.1007/s11165-016-9588-9

2. Evidenced-based STEM Instruction in K-16 settings. How reforms are taken up in classrooms and their impacts on student achievement is an ongoing area of interest in our research group. Reorienting learning environments to prioritize student thinking, model construction and revision, and co-construction of scientific arguments challenges traditional norms and presents challenges for teachers and learners alike. Still, the investment into safe, inclusive, and engaging spaces has immediate and long-term benefits that can be spread through social contagion by change agents in egalitarian structures.

   a. Shah L, Butler Basner E, Ferraro K, Sajan A, Fatima A, Rushton G. Diversifying Undergraduate Chemistry Course Pathways to Improve Outcomes for At-Risk Students. Journal of Chemical Education.

2020 June 05; 97(7):1822-1831. Available from: https://pubs.acs.org/doi/10.1021/acs.jchemed.9b00972 DOI: 10.1021/acs.jchemed.9b00972

b. Shah L, Rodriguez C, Bartoli M, Rushton G. Analysing the impact of a discussion-oriented curriculum on first-year general chemistry students' conceptions of relative acidity. Chemistry Education Research and Practice. 2018; 19(2):543-557. Available from: http://xlink.rsc.org/?DOI=C7RP00154A DOI: 10.1039/C7RP00154A

c. Dass K, Head M, Rushton G. Building an Understanding of How Model-Based Inquiry Is Implemented in the High School Chemistry Classroom. Journal of Chemical Education. 2015 June 19; 92(8):1306-1314. Available from: https://pubs.acs.org/doi/10.1021/acs.jchemed.5b00191 DOI: 10.1021/acs.jchemed.5b00191

d. Hernández G, Criswell B, Kirk N, Sauder D, Rushton G. Pushing for particulate level models of adiabatic and isothermal processes in upper-level chemistry courses: a qualitative study. Chem. Educ. Res. Pract.. 2014; 15(3):354-365. Available from: http://xlink.rsc.org/?DOI=C4RP00008K DOI: 10.1039/C4RP00008K

3. STEM Teacher Professional Development. In light of the rapid increases in scientific knowledge and progress, our nation's K-12 STEM teachers need ongoing professional development (PD) to deliver a high-quality, relevant, and current science education curriculum to our future doctors, pharmacists, scientists, and other health professionals. We have developed a novel approach to effective PD that leverages a scaffold involving guided practice of new teaching approaches with underrepresented minority students involved in summer workshops and camps. Attempting to enact emerging skills with students outside the formal context of the school classroom affords greater risk taking, opportunities for community-based reflective practice, and improved self-efficacy. Further, we're interested in how evidenced-based practices impacts students from non-majority backgrounds with respect to STEM identity and achievement.

   a. Rushton G, Lotter C, Singer J. Chemistry Teachers' Emerging Expertise in Inquiry Teaching: The Effect of a Professional Development Model on Beliefs and Practice. Journal of Science Teacher Education. 2017 February 23; 22(1):23-52. Available from: https://www.tandfonline.com/doi/full/10.1007/s10972-010-9224-x DOI: 10.1007/s10972-010-9224-x

   b. Lotter C, Rushton G, Singer J. Teacher Enactment Patterns: How Can We Help Move All Teachers to Reform-Based Inquiry Practice Through Professional Development?. Journal of Science Teacher Education. 2017 February 22; 24(8):1263-1291. Available from: https://www.tandfonline.com/doi/full/10.1007/s10972-013-9361-0 DOI: 10.1007/s10972-013-9361-0

c. Adams A, Jessup W, Criswell B, Weaver-High C, Rushton G. Using Inquiry To Break the Language Barrier in Chemistry Classrooms. Journal of Chemical Education. 2015 September 24; 92(12):2062-2066. Available from: https://pubs.acs.org/doi/10.1021/ed500837p DOI: 10.1021/ed500837p
d. Dass K, Head M, Rushton G. Building an Understanding of How Model-Based Inquiry Is Implemented in the High School Chemistry Classroom. Journal of Chemical Education. 2015 June 19; 92(8):1306-1314. Available from: https://pubs.acs.org/doi/10.1021/acs.jchemed.5b00191 DOI: 10.1021/acs.jchemed.5b00191

4. Longitudinal Studies of US STEM Teacher Quality. Several large-scale efforts in the past two decades have sought to improve the supply of well-prepared physics teachers. We have been seeking to understand whether these national reforms have manifested in changes to the demographic make-up of our nation's teachers, with respect to both content preparation and diversity. Our analysis of several large-scale datasets indicate that in the physical sciences, most teachers in the US are teaching out-of-field, are increasingly inexperienced, and lack racial diversity. We are interested in how systemic reforms to improve the preparation and retention of high-quality STEM teachers is taken up by various stakeholder communities.

   a. Rushton G, Rosengrant D, Dewar A, Shah L, Ray H, Sheppard K, Watanabe L. Towards a high quality high school workforce: A longitudinal, demographic analysis of U.S. public school physics teachers. Physical Review Physics Education Research. 2017 October 23; 13(2):-. Available from: https://link.aps.org/doi/10.1103/PhysRevPhysEducRes.13.020122 DOI: 10.1103/PhysRevPhysEducRes.13.020122
   b. Rushton GT, Dewar A, Ray HE, Criswell BA, Shah L. Setting a Standard for Chemistry Education in the Next Generation: A Retrosynthetic Analysis. ACS Cent Sci. 2016 Nov 23;2(11):825-833. PubMed Central PMCID: PMC5126716.
   c. Polizzi S, Jaggernauth J, Ray H, Callahan B, Rushton G. Highly Qualified or Highly Unqualified? A Longitudinal Study of America's Public High School Biology Teachers. BioScience. 2015 August 01; 65(8):812-821. Available from: http://academic.oup.com/bioscience/article/65/8/812/240607/Highly-Qualified-or-Highly-Unqualified-A DOI: 10.1093/biosci/biv093
   d. Rushton G, Ray H, Criswell B, Polizzi S, Bearss C, Levelsmier N, Chhita H, Kirchhoff M. Stemming the Diffusion of Responsibility. Educational Researcher. 2014 November; 43(8):390-403. Available from: http://journals.sagepub.com/doi/10.3102/0013189X14556341 DOI: 10.3102/0013189X14556341

5. Large-Scale Longitudinal Content Knowledge Assessment of US K-12 Early Career Teachers. What do beginning K-12 biology teachers know about genetics,

evolution, or chemistry? To date, no large-scale, longitudinal study has been able to characterize what areas of strength or weakness exists for those expected to prepare postsecondary students for majors and careers in STEM professions. We have partnered with the Educational Testing Service to gain access to 10+ years of content knowledge exam data for the nation's Praxis II test takers to answer important questions about the state of our science education teacher preparation programs. STEM majors were the top performers in almost all categories, and education majors underperformed, often at the level of non-STEM majors, across all topics. We observed significant variations in exam participation and performance between men and women and those from different racial backgrounds.

a. Shah L, Schneider J, Fallin R, Linenberger Cortes K, Ray H, Rushton G. What Prospective Chemistry Teachers Know about Chemistry: An Analysis of Praxis Chemistry Subject Assessment Category Performance. Journal of Chemical Education. 2018 September 17; 95(11):1912-1921. Available from: https://pubs.acs.org/doi/10.1021/acs.jchemed.8b00365 DOI: 10.1021/acs.jchemed.8b00365
b. Shah L, Hao J, Rodriguez C, Fallin R, Linenberger-Cortes K, Ray H, Rushton G. Analysis of Praxis physics subject assessment examinees and performance: Who are our prospective physics teachers?. Physical Review Physics Education Research. 2018; 14(1):-. Available from: https://link.aps.org/doi/10.1103/PhysRevPhysEducRes.14.010126 DOI: 10.1103/PhysRevPhysEducRes.14.010126
c. Shah L, Hao J, Rodriguez C, Fallin R, Linenberger-Cortes K, Ray H, Rushton G. Analysis of Praxis physics subject assessment examinees and performance: Who are our prospective physics teachers?. Physical Review Physics Education Research. 2018; 14(1):-. Available from: https://link.aps.org/doi/10.1103/PhysRevPhysEducRes.14.010126 DOI: 10.1103/PhysRevPhysEducRes.14.010126

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

1914813, Directorate for Education & Human Resources — Gregory Rushton (PI) — 10/01/19-09/30/23
Collaborative Research: Investigating Classroom Discourse in Active Learning Environments for Large Enrollment Chemistry Courses
8.0% EFFORT
Role: PI

R305A180277, United States Department of Education — Gregory Rushton (PI) — 09/01/18-08/31/21

PDConnect: A Scalable Community Approach to Improving Instruction in AP Chemistry Nationwide
12.0% EFFORT
Role: PI

1853560, Directorate for Education & Human Resources Gregory Rushton (PI) 08/01/18-05/31/21
Collaborative Research: Teacher Leadership: Investigating the Persistence and Trajectories of Noyce Master Teaching Fellows
8.0% EFFORT
Role: PI

1949925, National Science Foundation Gregory Rushton (PI) 10/01/20-09/01/23
Collaborative Research: Exploring the Impact of Noyce Master Teaching Fellowship Programs on Teacher Retention: The Role of Motivation, Leadership, and School-Work Environment
8.0% EFFORT
Role: PI

Completed Research Support

grant.1660736, National Science Foundation - Directorate for Education and Human Resources
Gregory Rushton (PI) 04/15/17-03/31/20
Collaborative Research: A Research Study of Teacher Retention and Network Formation in Noyce Communities of Practice
2.5% EFFORT
Role: PI

1340019, National Science Foundation - Directorate for Education and Human Resources
Gregory Rushton (PI) 09/01/13-08/31/18
The Pipeline to Teacher Preparation in Chemistry and Physics
Role: PI

1557292, National Science Foundation - Directorate for Education and Human Resources
Gregory Rushton (PI) 04/01/16-03/31/18
Collaborative Research: Assessing the Longitudinal Impact of Noyce Awards on the Subject Matter Knowledge of Beginning STEM Teachers in the US: A Comparative Study
Role: PI

1035451, National Science Foundation - Directorate for Education and Human Resources
Gregory Rushton (PI) 12/15/10-11/30/17
Recruiting and Retaining Teacher Leaders in Physics and Chemistry
Role: PI