




RUTGERS

School of Arts and Sciences

TRIAD
Annual Report
2017-2018



Transforming STEM courses
Research in STEM education
Instructional practices
Assessment of learning
Dissemination

TRIAD Annual Report

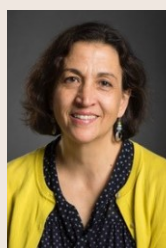
2017-2018

TRIAD Leadership Team



Ron Ransome

Director, SAS Office of STEM Education; Dean of Mathematical and Physical Sciences, School of Arts and Sciences; Professor, Department of Physics and Astronomy



Suzanne White Brahmia

Assistant Professor, Department of Physics, University of Washington



Eugenia Etkina

Distinguished Professor of Science Education, Graduate School of Education

Background and History of TRIAD

Prior to the establishment of the Office of STEM Education and the TRIAD Coalition, course transformation projects were associated with the Math and Science Learning Center (MSLC) in partnership with specific science or math departments and the Graduate School of Education (GSE).

The [TRIAD Coalition](https://sasose.rutgers.edu/triad-coalition) (<https://sasose.rutgers.edu/triad-coalition>) was officially convened in July 2016 by Ron Ransome, SAS Dean of Mathematical and Physical Sciences, based on a proposal by Dr. Suzanne Brahmia and Dr. Mary Emenike. The Office of STEM Education was also established at this time. For the first semester, TRIAD activities were directed by Suzanne Brahmia, a physics education researcher in the Department of Physics and Astronomy, and supported by Dr. Eugenia Etkina, a physics education researcher in the GSE, and Mary Emenike, a chemistry education researcher in the Department of Chemistry and Chemical Biology. In January 2017, Brahmia moved to the University of Washington and Emenike assumed the directorship of the TRIAD Coalition, with support from Etkina and Dr. Charles Ruggieri, a postdoctoral research associate in physics education research. In July 2017, Dr. Geraldine Cochran, a physics education researcher in the Department of Physics and Astronomy, joined the TRIAD Coalition leadership team.

Mission Statement

The TRIAD Coalition was established to create a community of practice characterized by communication and interaction among STEM faculty across disciplinary boundaries.

TRIAD's threefold mission is:

- to broaden and strengthen capacity to improve the quality of undergraduate science, technology, engineering, and mathematics education,
- to develop a community of post-secondary teaching professionals implementing the products of discipline-based education research,
- to create a rich, multi-disciplinary collaborative community of STEM education researchers.

TRIAD Annual Report

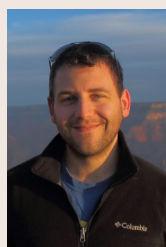
2017-2018

TRIAD Leadership Team



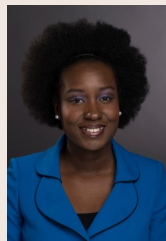
Mary Emenike

Director, TRIAD Coalition;
Assistant Professor of Professional
Practice, SAS and Department of
Chemistry and Chemical Biology



Charles Ruggieri

Assistant Professor of Professional
Practice, SAS and Department of
Physics and Astronomy



Geraldine Cochran

Assistant Professor of Professional
Practice, SAS and Department of
Physics and Astronomy

Accomplishments

TRIAD efforts have contributed to the School of Arts and Sciences' (SAS) mission to provide high-quality undergraduate education for a diverse student population through several teaching and mentoring activities. TRIAD members are rethinking lectures by incorporating student-centered learning strategies via discussion and reasoning questions which support student interactions and create a cohesive community of learning. TRIAD members facilitate faculty development workshops that disseminate and demonstrate the use of pedagogical tools, provide reviews of literature relevant to improving STEM education, and promote high impact in-class interactions supported by evidence from the research literature. In this report, we describe TRIAD's achievements over the past 2017-2018 year and align those achievements with the Mission Priorities of the 2016-2020 SAS Strategic Plan:

SAS Strategic Plan 2016-2020

Mission Priorities

Achieving Excellence

Teaching and Mentoring

Discovery and Innovation

Creating Opportunity

Promoting Diversity and Inclusion

Strengthening the Community

Engaging the Public

Building Leadership

Leadership at Rutgers

Leadership Nationally and Internationally

TRIAD Annual Report

2017-2018

Achieving Excellence

TRIAD members are actively seeking effective ways to provide innovative, high-quality undergraduate education to a diverse student population across STEM disciplines. TRIAD members lead and support several grant-funded course transformations in physics, chemistry, and biology, which emphasize student-centered learning and faculty engagement in research-based pedagogical practices. TRIAD members co-founded the Active Learning Community that promotes continued development of active-learning classroom spaces servicing thousands of students in a wide variety of STEM courses. TRIAD members have also been actively engaged in sponsored research, including support from the National Science Foundation and the Spencer Foundation. TRIAD members disseminated the results of their work at Rutgers and nationally.

Teaching and Mentoring

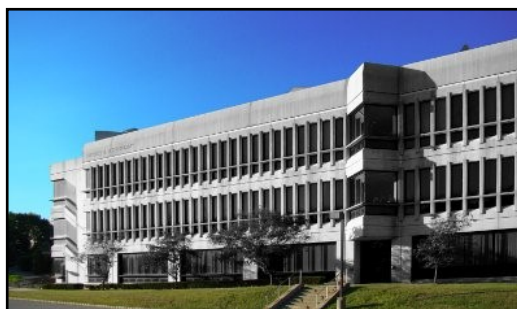
Ruggieri was awarded the [2017-2018 Open and Affordable Textbook Award by Rutgers University Libraries](#) for offering students in a large-enrollment physics course the option to use a free online textbook alternative through OpenStax, supplemented by free online resources such as videos, simulations, and apps. This effort reduced student costs, provided broader perspectives, and encouraged independent research.

The [Assessable Learning Objectives project](#) in the Department of Physics and Astronomy was developed to engage physics faculty in the pedagogical practice of articulating their shared values in the form of objectives. [These objectives](#) include physics concepts as well as the higher level thinking skills and habits of mind valued by physicists. Articulating learning objectives aligns course activities and assessments, supports continuity through faculty rotations, and improves student course experiences.

Cochran and Ruggieri enhanced the transformation of the Extended Analytical Physics I course in AY 2017-2018 by utilizing undergraduate learning assistants in the lecture, which allowed the use of interactive problem solving during the lecture period. Centering lecture around discussion questions and facilitating student-student and instructor-student dialogue created a cohesive community of learning, lowering the barrier for student buy-in and emphasizing the importance of communication and teamwork. The second semester of this course saw a DFW rate of 4% (percentage of students who dropped the course, or earned a final grade of D or F), and an average final grade of 3.066.

RUTGERS
OPEN ♥ AFFORDABLE
TEXTBOOKS

Department of Physics and Astronomy



Rutgers' Serin Physics Building.

TRIAD Annual Report

2017-2018

Achieving Excellence

Teaching and Mentoring (continued)

Emenike started collaborating with chemistry faculty members in the organic chemistry course in Fall 2016 who were interested in transforming the large-enrollment, problem-solving sessions that had historically replaced traditional recitations. Several instructors have participated in developing and implementing curriculum for these workshops. Four to five sections of the active learning workshops have consistently been offered in the active learning classrooms, utilizing undergraduate learning assistants to support the facilitation of the cooperative learning pedagogies.

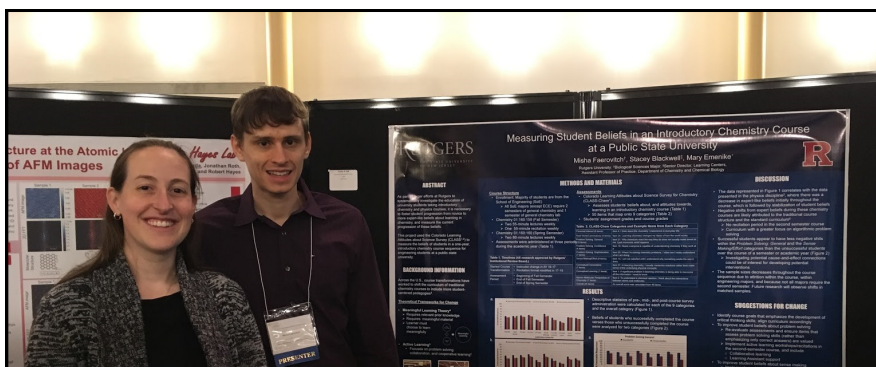
Department of Chemistry and
Chemical Biology



Rutgers' [new Chemistry and Chemical Biology building](#).



Faculty engaging in a workshop in an active-learning classroom in the new Academic Buildings on College Avenue Campus during the [2018 Active Learning Symposium](#).



Mary Emenike with an undergraduate research student, Misha Faerovitch, analyzing chemistry course data as part of an IRB-approved study. Misha is funded by Emenike's NSF grant: Preparing STEM Leaders at Rutgers University.

TRIAD Annual Report

2017-2018

Achieving Excellence

Teaching and Mentoring (continued)

Emenike is a founding member of the Active Learning Community's leadership team, along with staff from the Learning Centers, Digital Classroom Services, and the Office of Scheduling and Space

Management. The Active Learning Community hosts [an annual Symposium that started in 2016](#) with introductory-level workshops and sessions, but has since evolved into a forum for faculty and staff at Rutgers, and at other institutions in the region, to come together to showcase different approaches to collaborative learning, share insights from their experiences, and explore different teaching techniques. [The 2018 event](#) included 15 presenters from STEM disciplines - including 3 sessions facilitated by the team of faculty who transformed the general biology courses - and 180 attendees from 9 institutions.

**ACTIVE LEARNING
SYMPOSIUM**



**Rutgers
Learning Centers**

**Rutgers
Office of Scheduling and
Space Management**



David Wyrzten of Rutgers [Digital Classroom Services](#) and the Active Learning Community leading the welcome ceremony in an active-learning lecture hall setting within the new Academic Buildings on College Avenue Campus during the [2018 Active Learning Symposium](#).

ISLE Investigative Science Learning Environment

Achieving Excellence

Teaching and Mentoring (continued)

Prior to 2015, course transformation and curriculum development projects were supported through the Math and Science Learning Center. Four main projects secured NSF grant funding during this time, and the curricular products and course structures continue to be implemented in Rutgers courses.

- **Investigative Science Learning Environment (ISLE): Science and Cognition Combined (2001-2003; NSF CCLI #0088906)**: Alan Van Heuvelen (PI), Rutgers; Eugenia Etkina (Co-PI), Rutgers; Suzanne Brahmia (Co-PI), Rutgers; Xueli Zou (Co-PI), California State University, Chico. This project developed and tested a unique multifaceted epistemological learning system- Investigative Science Learning Environment (ISLE) - for large enrollment introductory physics courses that replicates systematic discovery methods used by practicing scientists.
- **Using Formative Assessment to Develop Introductory Physics Skills (2003-2006; NSF DUE #0241078)**: Eugenia Etkina (PI), Alan Van Heuvelen (Co-PI). This project developed activities that integrate knowledge building and formative assessment in the evaluation of learning at the introductory physics level. Included in this effort was the development of research-based formative assessment tools.
- **Collaborative Project: Developing Proportional Reasoning in a Physics Context with Invention Tasks (2011-2014; NSF TUES #1045250)**: Suzanne Brahmia (PI), Rutgers; Kathleen Scott (Co-PI), Rutgers; Eugenia Etkina (Co-PI), Rutgers. Collaborators: Andrew Boudreaux (Co-PI), Western Washington University; Stephen Kanim (Co-PI), New Mexico State University. This project developed curricular materials to strengthen the ability of students to reason in the context of the topics regularly covered in introductory physics courses.
- **Transforming the General Biology Laboratory for Undergraduate Students (2011-2014; NSF TUES #1044699)**: Martha Haviland (PI), Rutgers; Gregg Transue (Co-PI), Rutgers; Andrew Vershon (Co-PI), Rutgers; Melanie Lenahan (Co-PI), Rutgers. The new courses supported by this grant built upon the established lecture curricula and provide students with new engaging laboratory experiments, field experiences, and a peer-led workshop.

TRIAD Annual Report

2017-2018

We gratefully acknowledge
support from:

Rutgers Research Council



PER Topical Group Organizer Grant

Achieving Excellence

Discovery and Innovation: Research Grants

- **G. Cochran (PI)** and A. Knaub (co-PI). [Creating a Space for People of Color in Physics Education Research](#). Physics Education Research Topical Group Organizer Grant, **\$1600**. Awarded May 2018.
- **G. Cochran (PI)**. Assessing Equity in a Learning Community as a Predictor of Success within an Introductory Physics Course for Engineering Students. Rutgers Research Council Grant, **\$5,000**. Awarded May 2018.
- **M.E. Emenike (PI)**. Database for Learning about Learning (DbL2): Investigating student performance in general chemistry courses. Rutgers Research Council Grant, **\$2,000**. Awarded May 2018.
- **G. Cochran (PI)**. [A Conference on Equity in Discipline-Based Education Research in the Mathematical and Physical Sciences](#). Spencer Foundation, **\$48,867**. Awarded May 2018.
- D. Brookes (PI), P. Bohacek (co-PI), **E. Etkina (co-PI)**, M. Vonk (co-PI). [Learning physics by practicing it with physical apparatus or using interactive video: is there a difference?](#) National Science Foundation, **\$597,781**. Awarded September 2017.
- B. Cunningham (PI), **G. Cochran (co-PI)**, C. Singh (co-PI). [Diversifying the US Physics Community through Applications of Best Practices](#). National Science Foundation, **\$110 543**. Awarded June 2017.
- C. Miller (PI), **G. Cochran (co-PI)**, K. Woodle (co-PI), T. Hodapp (co-PI). [APS Graduate Education Conference](#); February 2017 in College Park, MD. National Science Foundation, **\$50,412**. Awarded February 2017.
- **G. Cochran (PI)**. [NSF INCLUDES: A National Network for Access and Inclusion in Physics Graduate Education, Subaward](#). American Physical Society, **\$22,925**. Awarded January 2017.
- R. Wright (PI), T. Nguyen (co-PI), J. Stout (co-PI), **G.L. Cochran (co-PI)**, E. Zundl (Former co-PI). [Computer Science Living-Learning Community for Women at Rutgers](#). National Science Foundation, **\$249,999**. Awarded June 2015, Amended December 2016.
- M. Plisch (PI), T. Hodapp (co-PI), J. Posselt (co-PI), **G.L. Cochran (co-PI)**, C. Miller (co-PI). [NSF INCLUDES: A National Network for Access and Inclusion in Physics Graduate Education](#). National Science Foundation, **\$299,787**. Awarded September 2016.
- D. Shernoff (PI), **E. Etkina (co-PI)**. Implementation of the Next Generation of Science Standards. New Jersey Department of Education: MSP, **\$760,000**, Awarded July 2016



STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION

TRIAD Annual Report 2017-2018

Publications in
Peer-Reviewed Journals:



the SPS Observer



Achieving Excellence

Discovery and Innovation: Research Grants (cont'd)

- **Emenike, M. E.** (PI), Blackwell, S. (co-PI). [Preparing STEM Leaders at Rutgers University](#). National Science Foundation, **\$318,127**. Awarded September 2014.



Preparing STEM Leaders at Rutgers University LA Alumni Panel Seminar, this photo includes panelists and attendees

Discovery and Innovation: Publications & Invited Articles

- Bjorkquist, R., Bogdan, A., Campbell, N.L., Chessey, M., **Cochran, G.L.**, Cunningham, B., Esquivel, J., Gladstone, L., Gosnell, N.M., Guruswamy, S., Hallinen, K.M., Harris, C., Johnson, A., Johnson, J.L., Jones, C., Jorgenson, R.A., McCullough, L., McNeese, M.D., Presley, T.D., Quist, N., Richardson, A., Seidel, S., & Singh, C. (Expected 2018). Women in Physics in the United States: Reaching toward equity and inclusion.
- McCullough, L., Chessey, M., **Cochran, G.L.**, Cunningham, B., Johnson, A., & Singh, C. (Accepted). Gender bias in physics: An international forum, Proceedings of the 6th International Conference on Women in Physics
- Richards, A.J., & **Etkina, E.** (Accepted) How Students Combine Resources to Make Conceptual Breakthroughs", *Research in Science Education*
- **Cochran, G.L.**, & White, G. D. (2018). [Continuing conversations on equity in the physics classroom](#). *The Physics Teacher*, 56(3), 3-5.
- **Cochran, G.L.**, Hodapp, T., & Brown, E.A. (2018). [Identifying barriers to ethnic/racial minority students' participation in graduate physics](#), *PERC Proceedings [Cincinnati, OH, July 22-26]*.
- **Etkina, E.**, Gitomer, D., Iconangelo, C., Phelps, G., Seeley, L., & Vokos, S. (2018) [Design of an assessment to probe teachers' Content Knowledge for Teaching: An example from energy in HS physics](#), *Physical Review, Physics Education Research*, **14**, 010127. DOI: 10.1103/PhysRevPhysEducRes.14.010127

TRIAD Annual Report

2017-2018

Publications in Peer-Reviewed Journals:



Achieving Excellence

Discovery and Innovation: Publications & Invited Articles (cont'd)

- Posselt, J.R., Hernandez, T., **Cochran, G.L.** (2017). [Metrics First, Diversity Later? Making the Short List and Getting Admitted to Physics Ph.D. Programs.](#) Paper presented at the meeting of the American Educational Research Association, New York City, NJ.
- **Cochran, G.L.**, & White, G.D. (2017). [Unique voices in harmony: Call-and-response to address race and physics teaching.](#) *The Physics Teacher*, 55(6), 324.326.
- **Cochran, G.L.** (2017). [Understanding and promoting diversity and inclusion in physics.](#) *SPS Observer*, Winter 2017 feature.
- Blackwell, S., Katzen, S., Patel, N., Sun, Y., & **Emenike, M.** (2017) [Developing the Preparation in STEM Leadership Program For Undergraduate Academic Peer Leaders](#), *The Learning Assistance Review*, 22(1), 50-84.
- Gregorcic, B., Planinsic, G., & **Etkina, E.** (2017) [Doing science by waving hands: Talk, symbiotic gesture, and interaction with digital content as resources in student inquiry.](#) *Physical Review, Physics Education Research*, 13, 020104. DOI: 10.1103/PhysRevPhysEducRes.13.020104
- Gregorcic, B., **Etkina, E.**, & Planinsic, G. (2017) [A new way of using the interactive white board in high school physics classroom: a case study.](#) *Research in Science Education*, 25 pages DOI:10.1007/s11165-016-9576-0.
- **Etkina, E.**, Gregorcic, B., & Vokos, S. (2017) [Organizing physics teacher professional education around productive habit development: A way to meet reform challenges.](#) *Physical Review, Physics Education Research*, 13, 010107, DOI: 10.1103/PhysRevPhysEducRes.13.010107.

Discovery and Innovation: Invited Presentations

- **Etkina, E.** (2018, July). From teacher preparation to professional practice: Nurturing a teacher learning community, 2018 Summer AAPT Meeting, Washington DC.
- Vokos, S., Seeley, L., & **Etkina, E.** (2018, July). Organizing teacher professional education around habit development, 2018 Summer AAPT Meeting, Washington DC.
- Bugge, D., & **Etkina, E.** (2018, July). Role reversal: What we learn from our physics students, 2018 Summer AAPT Meeting, Washington DC.
- **Etkina, E.** (2018, June). Pedagogical Content Knowledge for Teaching Energy: The Design of the Framework and the Findings of the Assessment, Gordon Research and Education Conference, Smithfield, RI.

TRIAD Annual Report

2017-2018

Invited Presentations within the
following conferences and
professional societies:



Achieving Excellence

Discovery and Innovation: Invited Presentations (cont'd)

- Cochran, G.L. (2018, May). [Identifying barriers to applying to graduate physics programs: An intersectional approach](#), 49th Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics, Fort Lauderdale, FL.
- Etkina, E., & Ruggieri, C. (2018, April). Facilitating and Assessing the Development of Scientific Habits of Mind: Course Transformation using assessable Learning Objectives and Investigative Science Learning Environment (ISLE), Department of Physics and Astronomy at Rutgers University, Piscataway, NJ.
- Etkina, E. (2018, April). Helping our students to learn physics by doing physics, Department of Physics at the University of Washington, Seattle, Washington.
- Etkina, E. (2018, January). Defining and studying physics teacher content knowledge for teaching energy, AAPT Winter meeting, San Diego.
- Etkina, E. (2017, November). How do we help all students be successful when learning physics? North Eastern meeting of the American Physical Society, Newark, NJ.
- Andres, D., Ruggieri, C., Etkina, E., & Brahmia, S.W. (2017, July). [A large-enrollment course transformation centered on ISLE labs: learning objectives help develop a shared vision with non-PER faculty](#), Physics Education Research Conference 2017, Cincinnati, OH.
- Etkina, E. (2017, March). Investigative Science Learning Environment (ISLE): Making your students collaborative participants in the practice of physics, Ohio Section of the AAPT.
- Etkina, E. (2017, February). What is PER and how to use it to help our students meet 21st century, Department of Physics at Simon-Frasier University, Burnaby, Canada.
- Etkina, E. (2017, January). Conceptual Model of Physics Teacher Preparation: Developing Habits of Mind and Practice through Apprenticeship in a Community, April Meeting of the American Physical Society, Washington DC.

TRIAD Annual Report

2017-2018



*Advancing Hispanics/Chicanos
& Native Americans in Science*



Creating Opportunity

TRIAD members have been engaged in research and outreach to support diversity and inclusion at a variety of levels, including local, national, and international levels. Contributions included serving as a mentor or panelist at national conferences, editing a themed journal in physics education, and facilitating faculty workshops. For Rutgers faculty members interested in improving teaching and learning in STEM courses, [TRIAD members facilitated workshops](#) and hosted symposium series of external speakers. Moreover, TRIAD members engage with the public by serving on committees within the local community and supporting the [Rutgers Future Scholars Program](#) for high school students by developing a physics course for students entering 9th grade and providing internship opportunities in STEM education research for students entering 11th grade.

Promoting Diversity and Inclusion: Conferences & Articles

- Cochran served as Guest Editor for the themed issue on Race and Physics Teaching for [The Physics Teacher](#)
- Cochran mentored students at [Dia de La Fisica \(Day of Physics\)](#) at the 2017 Society for Advancing Hispanic/Chicano and Native American Scientists (SACNAS)
- Cochran mentored student presenters and judged posters at the [2017 Annual Bio-medical Research Conference for Minority Students](#)
- Cochran served as a Panelist at the [Conference on Undergraduate Women in Physics](#) held at Rochester Institute of Technology in Rochester, NY.

Promoting Diversity and Inclusion: Workshops & Panels

- Cochran, G.L., Connelly, J., Johnson, A., Miller, C., and Wagner, D. (2018, January). [Inclusivity in Physics](#). Conference for Undergraduate Women in Physics at Rochester Institute of Technology, Rochester, NY.
- Cochran, G.L. (2018, February). [An intersectional approach to understanding barriers to success in STEM](#). Princeton Science and Intersectionality Workshop at Princeton University, Princeton, NJ.
- Cochran, G.L. (2018, March). Gender equality in STEM. Uniting Jersey for the Global Goals Symposium at Kean University, Union, NJ.
- Cochran, G.L. (2018, April). [Diversity, Inclusion, and Equity in STEM Education](#). Office of STEM Education and TRIAD Faculty Workshops at Rutgers University, Piscataway, NJ.
- Agwu, N., Prescod-Weinstein, C., Cochran, G.L., (2018, May). [Underrepresented women in STEM: The dimensions of the problem and the pathway to its solution](#). Creativity in STEM CUNY Research Summit, Bronx, NY.
- Cochran, G.L. (2018, June). [Recruiting and retaining students from groups underrepresented in physics](#). Diversity + Career Development workshop at Brookhaven National Lab, Upton, NY.

TRIAD Annual Report

2017-2018

Creating Opportunity

Strengthening the Community

- **OSE/TRIAD Symposium Series** - Dr. Luanna Prevost, Assistant Professor in the Department of Integrative Biology at the University of South Florida, presented a seminar on the *Automated assessment of student writing in biology* and facilitated a workshop on *Using written assessments to examine student thinking: rubric development and automated approaches* to 15 OSE members. She also met with OSE members in small groups to discuss biology education and the interdisciplinary group for the Automated Analysis of Constructed Responses (AACR), which is relevant to the eLearning systems being developed at Rutgers within the Center for Innovation and Research in Cyberlearning (CIRC).

Office of STEM Education

Spring 2018 Symposium Series



Using written assessments to examine student thinking: rubric development and automated approaches.

A workshop led by: Dr. Luanna Prevost

Assistant Professor, Department of Integrative Biology, University of South Florida

Prevost, L.B., M.K. Smith, and J.K. Knight, 2016. Using student writing and lexical analysis to reveal student thinking about the role of stop codons in the central dogma. *CBE Life Sciences Education*
<https://doi.org/10.1187/cbe.15-12-0267>



- **OSE/TRIAD Meetings** - In the AY 2017-2018 academic year, OSE/TRIAD offered two faculty workshops each semester. Ruggieri facilitated the first two workshops in the fall semester: [Measurable Learning Objectives](#) (8 faculty members from across the mathematical and physical science disciplines attended) and [Learning Styles](#) (6 faculty members attended). Emenike facilitated the first workshop in the spring semester: [Cooperative Learning](#) (8 faculty members attended). Cochran facilitated the final workshop: [Diversity, Inclusion, and Equity in STEM Education](#) to 29 faculty from 12 disciplines and units.

TRIAD Annual Report

2017-2018



RUTGERS FUTURE SCHOLARS SNAPSHOT

- 200 7TH GRADERS PER YEAR
- ACADEMICALLY PROMISING
- FIRST IN THEIR FAMILY TO ATTEND COLLEGE
- LOW-INCOME
- THE PATHWAY TO FREE COLLEGE
- ATTEND ONE OF THESE SCHOOL DISTRICTS



Creating Opportunity

Engaging the Public

- Cochran has served on the board of two local organizations, the Civic League of Greater New Brunswick and the United Way of Central New Jersey. Faculty and graduate students in physics supported the [United Way of Central Jersey Women's Pre-K STEM events at JFK Elementary School in Jamesburg, NJ](#). This has strengthened Rutgers previously existing relationship with the two organizations.



Geraldine Cochran at the United Way of Central New Jersey's Women's Pre-K STEM event at JFK Elementary School in Jamesburg, NJ.

- Students from programs in the Civic League participated in the [Hidden Figures event at Rutgers Cinema](#) honoring the late Dr. Jewel Plummer Cobb, organized by the Rutgers Division of Student Affairs.
- Cochran spoke at the graduation ceremony of the Whitney M. Young, Jr. and Rosa L. Parks Summer Institute, New Brunswick, NJ.
- High school students have engaged with members of TRIAD through the Rutgers Future Scholars (RFS) program.
 - ▶ Emenike supervised 5 RFS students during July 2015 and 3 RFS students during July 2016 by partnering with this program that connects high school students with Rutgers faculty or New Brunswick community partners for a week-long summer internship before the students' junior year. During these internship experiences, the students were provided with a set of anonymous data from mid - or end-of-semester evaluations of study groups or recitations associated with the Learning Assistant Program. The high school students learned basic functions in Excel to tabulate and organize data to explore questions they generated about the data and compile their findings into a PowerPoint presentation. Through the internship experience, these students were exposed to STEM education research and learning opportunities in undergraduate STEM courses (e.g., joining study groups, becoming an LA).
 - ▶ Cochran developed curricular materials for and taught a physics course for 20 rising 9th grade students participating in the Rutgers Future Scholars program in July 2018.

Building Leadership

TRIAD members have participated in leadership roles within and outside of Rutgers. Within Rutgers, TRIAD members serve on the SAS Assessment Committee and LA Program's Advisory Board. External to Rutgers, TRIAD members have leadership roles in the Learning Assistant Alliance, the International Conference on Women in Physics, The American Physical Society's Forum on Education, Committee on Minorities, the American Association of Physics Teachers' Committee on International Education, and the National Mentoring Community Advisory Committee.

Leadership at Rutgers

- **Assessment Committee** - TRIAD members Cochran and Emenike serve on the SAS Assessment Committee, which reviews annual departmental assessment reports focusing on program-level assessments, including assessments of most service courses within the science and math departments.
- **Rutgers' LA Program's Advisory Board** - Emenike serves on the advisory board for Rutgers' Learning Assistant (LA) Program. The advisory board provides support to the Learning Center's Director of Integrated Academic Support, reviews faculty applications, recommends courses for inclusion in the program, and provides school, department, and disciplinary perspectives regarding program, policy, and funding decisions. Member of the advisory board informally serve as liaisons between the LA Program and their respective departments.



Participants at the [2017 LA Regional Workshop](#) (hosted at Rutgers) listen to a panel of Rutgers faculty members describe their experiences teaching with learning assistants and partnering with Rutgers' LA Program. (image credit: Joel I. Plummer)

TRIAD Annual Report

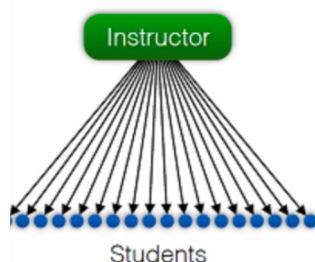
2017-2018

Building Leadership

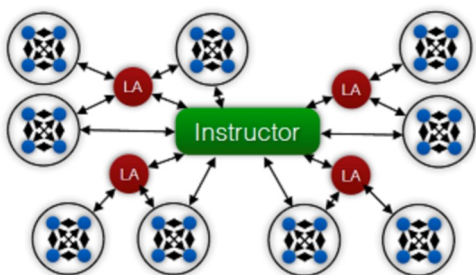
Leadership Nationally and Internationally

Learning Assistants are undergraduate students who, through the guidance of weekly preparation sessions and a pedagogy course, facilitate discussions among groups of students in a variety of classroom settings that encourage active engagement.

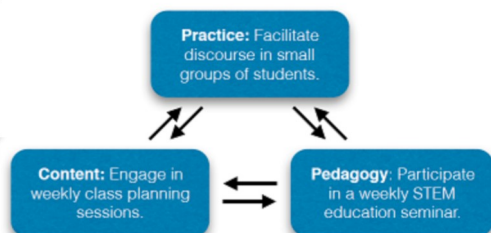
Traditional Model



LA Model



Pillars of the LA Experience



- Learning Assistant Alliance (LAA)** - Emenike has served as a Regional Coordinator (i.e., LAgent) within the national Learning Assistant Alliance since 2014. Emenike has co-organized two International LA Conferences (Fall 2016 and Fall 2017) at CU-Boulder, hosted a Regional LA Workshop at Rutgers (Spring 2017), and facilitated workshops at Regional LA Workshops at Rochester Institute of Technology (Spring 2016), George Mason University (Spring 2015) and Boston University (Spring 2015). Emenike serves as Chair of the LAA's Committed for Planning and Professional Development, which oversees the International LA Conference, Regional LA Workshops, Site Visits, and other workshops offered at disciplinary conferences.



Stacey Blackwell and Sari Katzen leading a breakout session on developing a pedagogy course as one of three essential components of an LA Program, taken at the [2017 LA Regional Workshop](#) hosted at Rutgers.



Charles Ruggieri and Christine Altinis-Kiraz scribing for groups of faculty at the mid-atlantic region during a breakout session on effective questioning practices, taken at the [2017 LA Regional Workshop](#) hosted at Rutgers.



International Conference on Women in Physics

Building Leadership

Leadership Nationally and Internationally (continued)

- **American Physical Society (APS) Forum on Education** - Cochran serves as a member
- **APS Committee on Minorities** - Cochran serves as a member
- **APS National Mentoring Community Advisory Board** - Cochran serves as chair
- **American Association of Physics Teacher's Committee on International Education** - Cochran serves as a member
- **6th International Conference on Women in Physics held in Birmingham, UK** - Cochran served as a Team Lead to the U.S. Delegation



Attendees of the 6th Annual International Conference on Women in Physics, Birmingham, UK. (COPYRIGHT LIZ HINGLEY, IOP AND UNIVERSITY OF BIRMINGHAM 2017)

IOP Institute of Physics

TRIAD Annual Report

2017-2018

TRIAD Members, Collaborators, and Affiliates

School of Arts and Sciences

Christine Altinis-Kiraz

Assistant Teaching
Professor, Department of
Chemistry and Chemical
Biology

Andrew Baker

Professor, Department of
Physics and Astronomy

Anna Paula Centeno

Assistant Teaching
Professor, Department of
Computer Science

Jolie Cizewski

Distinguished Professor,
Department of Physics and
Astronomy

Denise Cullerton

Part-Time Lecturer,
Department of Chemistry
and Chemical Biology

Francesca Guerra

Assistant Teaching
Professor, Department of
Chemistry and Chemical
Biology

Martha Haviland

Associate Teaching
Professor, Director of the
Office of Undergraduate
Instruction, Division of Life
Sciences

School of Arts and Sciences (cont'd)

Patricia Irizarry

Assistant Professor of
Professional Practice

John Kerrigan

Part Time Lecturer,
Department of Mathematics

Thu Nguyen

Professor and Chair,
Department of Computer
Science

Andy Nieuwkoop

Assistant Professor,
Department of Chemistry
and Chemical Biology

Kathleen Scott

Professor, Department of
Cell Biology and
Neuroscience, Director of
the Math and Science
Learning Center

John Taylor

Associate Professor,
Department of Chemistry
and Chemical Biology

School of Engineering

Susan Albin

Professor, Department of
Industrial & Systems
Engineering

School of Engineering (cont'd)

Waheed Bajwa

Associate Professor,
Department of Electrical and
Computer Engineering

Philip Brown

Assistant Professor,
Department of
Undergraduate Education

Helen M. Buettner

Professor and Chair,
Department of Chemical and
Biochemical Engineering

Lydia Prendergast

Assistant Dean, Department
of Undergraduate
Education / Academic
Services

School of Environmental and Biological Sciences

Carrie Ferraro

Education and Outreach
Program Coordinator,
Department of Marine and
Coastal Sciences

Kyle Murphy

Assistant Teaching
Professor, Department of
Microbiology and
Biochemistry

Graduate School of Education

Juan Pablo Mejía Ramos

Associate Professor,
Department of Learning and
Teaching, and the
Department of Mathematics

Keith Weber

Professor, Department of
Learning and Teaching

Rutgers Learning Centers

Stacey Blackwell

Senior Director of Learning
Centers, Learning Assistant
Program

Sari Katzen

Program Coordinator of
Learning Centers, Learning
Assistant Program

Rutgers Student Affairs

Keisha Dabrowski

Executive Director of
Strategic Communication
and Initiatives

Karima Woodyard

Director of Student
Involvement



**Physics Union
Mathematics**

Appendix

Research Grants prior to 2016

- **Etkina, E.** Establish collaboration with the University of Ljubljana in physics teacher preparation and course reform. Physics Education Research Organizing Council, **\$2,500**. Awarded January 2013.
- Gitomer, D. (PI), & **Etkina, E. (co-PI)**. Collaborative Research: Assessing, Validating and Developing Content Knowledge for Teaching Energy. National Science Foundation, **\$1,644,400**. Awarded September 2012.
- Laffey, E. (PI), **Etkina, E.**, Weber, K., & Kalelkar, M. STEM for Education Scholarship Program. National Science Foundation, **\$990,521**. Awarded January 2012.
- **Etkina, E. (PI)**. Preparation for Future Learning in Physics. National Science Foundation, **\$98,000**. Awarded September 2008.
- **Etkina, E (PI)**, Van Heuvelen, A. (co-PI), & **Brahmia, S (co-PI)**. Physics Union Mathematics. National Science Foundation, **\$300,000**. Awarded September 2007.
- **Etkina, E (PI)**, Van Heuvelen, A. (co-PI), Hmelo-Silver, A. (co-PI), & Jordan, R. (co-PI). Transfer of Scientific Abilities. National Science Foundation, **\$510,000**. Awarded August 2005.
- **Etkina, E (PI)** & Van Heuvelen, A. (co-PI). Using Formative Assessment to develop introductory physics skills. National Science Foundation, **\$302,536**. Awarded August 2003.
- Cook, D. (PI), **Etkina, E (co-PI)**, & Catley, K. (co-PI). Urban Science Education Collaborative for Teacher Effectiveness. New Jersey Commission on Higher Education Teacher Effectiveness Grant, **\$500,000**. Awarded July 2001.



School of Arts and Sciences

Office of the Executive Dean
Rutgers University–New Brunswick
77 Hamilton Street
New Brunswick, New Jersey 08901

Nonprofit
US POSTAGE PAID
New Brunswick, NJ
08901
Permit 157