WESTERN REGIONAL
NOYCE
NETWORK

Community Discussion about Designing & Publishing Results from our Noyce Track 1, 2, and 3 Projects

INTRODUCTIONS

Sanlyn Buxner, Associate Research Professor and Senior Scientist, University of Arizona and Planetary Science Institute

Adem Ekmekci, Director of Research, Clinical Associate Professor, Rice University School Math Project

Jenna Porter, Professor & Chair, Teaching Credentials College of Education, Sacramento State

*This event is supported by the National Science Foundation award #2230997. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

Please share

Who you are

Your kind of Noyce project

Your experience and interest in research

Agenda

Introductions

Presentations of Noyce research studies

Discussion about research studies related to Noyce

Track 4 of Noyce - Research

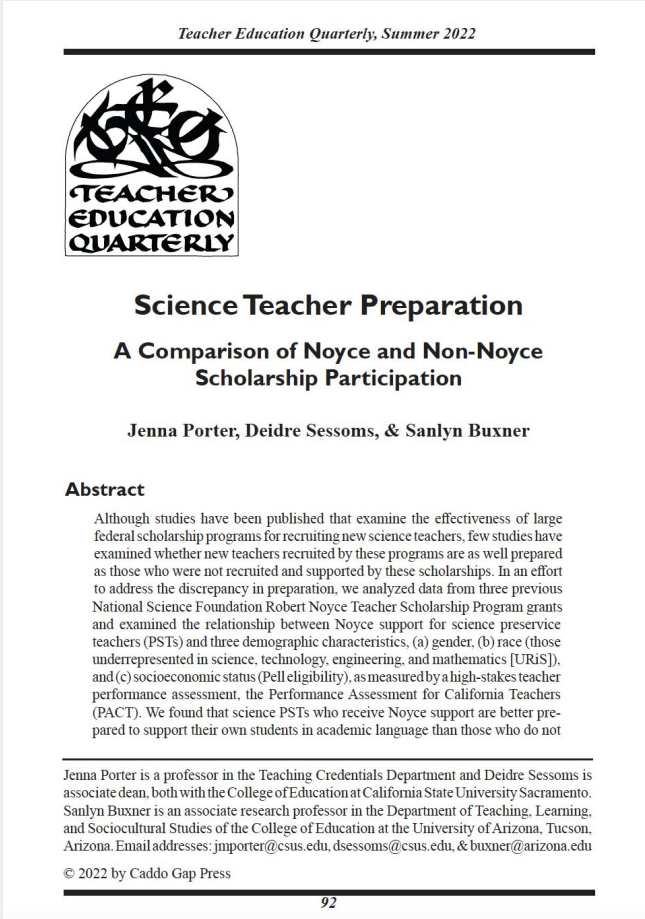
Challenges of publishing (IRB, data collection expertise, data analysis etc.)

Group work

SCIENCE TEACHER PREPARATION: A COMPARISON OF NOYCE & NON-NOYCE SCHOLARSHIP PARTICIPATION

BACKGROUND/CONTEXT:

- Already had a Track 1; Sought data to support a Track 3 proposal
- Found 0 published studies about preparedness of Noyce Scholars
- Our Track 1 external eval showed Noyce felt **less** prepared
- I saw a need to evaluate teacher preparedness as measured by something other than self-report (that could be published and disseminated)
- Used existing data from Teacher Performance Assessment



Teacher Education Quarterly, Summer 2022

TEACHER EDUCATION QUARTERLY

Science Teacher Preparation

A Comparison of Noyce and Non-Noyce Scholarship Participation

Jenna Porter, Deidre Sessoms, & Sanlyn Buxner

Abstract

Although studies have been published that examine the effectiveness of large federal scholarship programs for recruiting new science teachers, few studies have examined whether new teachers recruited by these programs are as well prepared as those who were not recruited and supported by these scholarships. In an effort to address the discrepancy in preparation, we analyzed data from three previous National Science Foundation Robert Noyce Teacher Scholarship Program grants and examined the relationship between Noyce support for science preservice teachers (PSTs) and three demographic characteristics, (a) gender, (b) race (those underrepresented in science, technology, engineering, and mathematics [URiS]), and (c) socioeconomic status (Pell eligibility), as measured by a high-stakes teacher performance assessment, the Performance Assessment for California Teachers (PACT). We found that science PSTs who receive Noyce support are better prepared to support their own students in academic language than those who do not

Jenna Porter is a professor in the Teaching Credentials Department and Deidre Sessoms is associate dean, both with the College of Education at California State University Sacramento. Sanlyn Buxner is an associate research professor in the Department of Teaching, Learning, and Sociocultural Studies of the College of Education at the University of Arizona, Tucson, Arizona. Email addresses: jmporter@csus.edu, dsessoms@csus.edu, & buxner@arizona.edu

Study Overview

Research Questions

- To what extent are science Preservice Teachers (PSTs) who received Noyce support prepared for teaching compared to those who did not receive Noyce support?
- To what extent do individual demographic characteristics, such as gender, race/ethnicity, and SES, relate to PSTs' preparedness (as measured by PACT)? What, if any, differences exist between these demographic groups?
- To what extent do individual demographic characteristics (gender, race/ethnicity, and SES) and Noyce participation relate to PSTs' preparedness (as measured by PACT)?

N= 93 (22 Noyce; 71 Non-Noyce)- SCIENCE PSTs

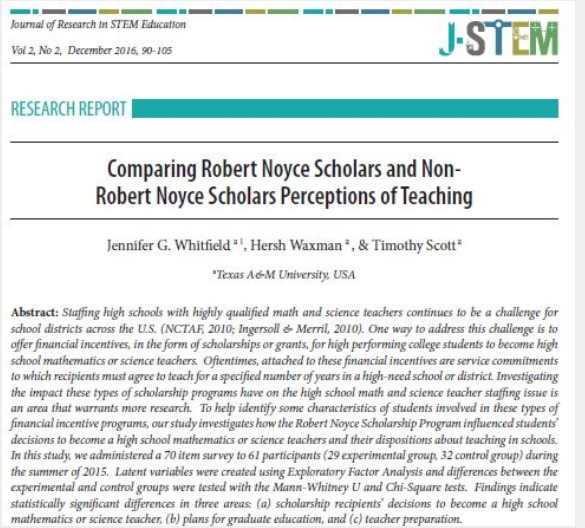
Findings

- Noyce PSTs are better prepared to support their students in Academic Language (AL)
- No demographic differences *between* characteristics BUT *within* (Noyce male and URiS more prepared in domain of AL; Noyce more prepared in domain of Assessment and Overall if Pell eligible).

THE PUBLICATION PROCESS

- Presented research at conferences to get feedback from community (Noyce and general STEM Teacher Ed)
- Identifying a Journal
  - Science teacher/research journal vs Teacher education journal
  - Goal was to disseminate findings to inform teacher preparation programs
    - Noyce- yes- but also wonder if other scholarships like Noyce help recruit and prepare STEM teachers

COMPARING NOYCE SCHOLARS & NON-NOYCE SCHOLARS' PERCEPTIONS OF TEACHING



Journal of Research in STEM Education
Vol 2, No 2, December 2016, 90-105
J-STEM

RESEARCH REPORT

Comparing Robert Noyce Scholars and Non-Robert Noyce Scholars Perceptions of Teaching

Jennifer G. Whitfield [a1], Hersh Waxman [a], & Timothy Scott [a]

[a]Texas A&M University, USA

Abstract: *Staffing high schools with highly qualified math and science teachers continues to be a challenge for school districts across the U.S. (NCTAF, 2010; Ingersoll & Merril, 2010). One way to address this challenge is to offer financial incentives, in the form of scholarships or grants, for high performing college students to become high school mathematics or science teachers. Oftentimes, attached to these financial incentives are service commitments to which recipients must agree to teach for a specified number of years in a high-need school or district. Investigating the impact these types of scholarship programs have on the high school math and science teacher staffing issue is an area that warrants more research. To help identify some characteristics of students involved in these types of financial incentive programs, our study investigates how the Robert Noyce Scholarship Program influenced students' decisions to become a high school mathematics or science teachers and their dispositions about teaching in schools. In this study, we administered a 70 item survey to 61 participants (29 experimental group, 32 control group) during the summer of 2015. Latent variables were created using Exploratory Factor Analysis and differences between the experimental and control groups were tested with the Mann-Whitney U and Chi-Square tests. Findings indicate statistically significant differences in three areas: (a) scholarship recipients' decisions to become a high school mathematics or science teacher, (b) plans for graduate education, and (c) teacher preparation.*

Goal of the Study

- Comparing Noyce Scholars' and non-Noyce Scholars' perceptions of teaching and teaching profession and decisions about becoming a teacher, staying in the teaching profession, and plans for graduate education.

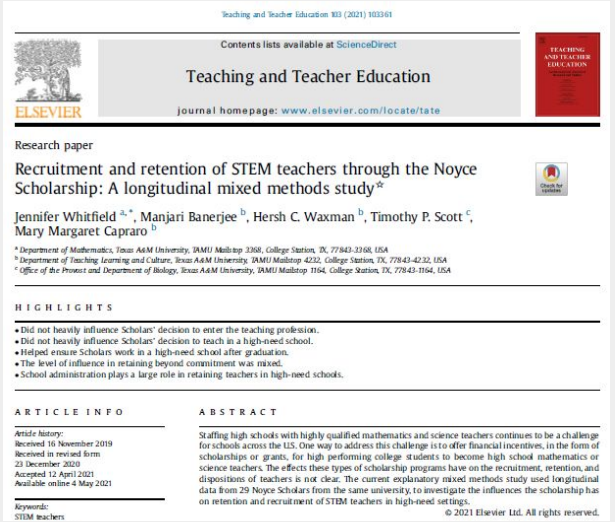
Methods

- Cross-sectional (comparison) with 32 non-Noyce and 29 Noyce Scholars– certified through the same teacher preparation program from 2002-2014 to teach math or science (grades 7-12)
- Survey instrument: 70 items adapted from Schools & Staffing Survey and Noyce Evaluation (Univ. of Minnesota)

Findings

- Decision to become a STEM teacher (Non-Noyce influenced more by flexibility/autonomy and being conducive to family life; Noyce scholars at earlier ages)
- Graduate education (Noyce Scholars earning more graduate credits and degrees)
- Teacher preparation (Noyce with opportunities to interact with children from diverse backgrounds)
- More Noyce Scholars teach in high-need schools

RECRUITMENT AND RETENTION OF STEM TEACHERS THROUGH THE NOYCE SCHOLARSHIP



Teaching and Teacher Education 103 (2021) 103361

Contents lists available at ScienceDirect

Teaching and Teacher Education

journal homepage: www.elsevier.com/locate/tate

Research paper

Recruitment and retention of STEM teachers through the Noyce Scholarship: A longitudinal mixed methods study*

Jennifer Whitfield [a, *], Manjari Banerjee [b], Hersh C. Waxman [b], Timothy P. Scott [c], Mary Margaret Capraro [b]

[a] Department of Mathematics, Texas A&M University, TAMU Mailstop 3368, College Station, TX, 77843-3368, USA
[b] Department of Teaching, Learning and Culture, Texas A&M University, TAMU Mailstop 4232, College Station, TX, 77843-4232, USA
[c] Office of the Provost and Department of Biology, Texas A&M University, TAMU Mailstop 1164, College Station, TX, 77843-1164, USA

HIGHLIGHTS

- Did not heavily influence Scholars' decision to enter the teaching profession.
- Did not heavily influence Scholars' decision to teach in a high-need school.
- Helped ensure Scholars work in a high-need school after graduation.
- The level of influence in retaining beyond commitment was mixed.
- School administration plays a large role in retaining teachers in high-need schools.

ARTICLE INFO

Article history:
Received 16 November 2019
Received in revised form
23 December 2020
Accepted 12 April 2021
Available online 4 May 2021

Keywords:
STEM teachers

ABSTRACT

Staffing high schools with highly qualified mathematics and science teachers continues to be a challenge for schools across the U.S. One way to address this challenge is to offer financial incentives, in the form of scholarships or grants, for high performing college students to become high school mathematics or science teachers. The effects these types of scholarship programs have on the recruitment, retention, and dispositions of teachers is not clear. The current explanatory mixed methods study used longitudinal data from 29 Noyce Scholars from the same university, to investigate the influences the scholarship has on retention and recruitment of STEM teachers in high-need settings.

Goal of the Study

- The impact of Noyce Scholarship on the recruitment, retention, and dispositions of teachers

Methods

- Longitudinal mixed-methods 29 Noyce Scholars–certified from 2002-2014 to teach grades 7-12 math or science
- Instruments: Survey (2015-17)–80 items adapted from Schools & Staffing Survey and Noyce Evaluation (Univ. of Minnesota) & semi-structured interview (2015) adapted from Noyce Evaluation (Univ. of Minnesota)

Findings

- No significant impact on initial decision to become a teacher but helped ensure teaching in high-need schools
- Reduction of financial burden (not having to work part-time, graduating on time, pursuing MS degree or work in a lower paying school district) and improved sense of well-being
- Equipped with skills to teach in high-need settings–70% still taught in high-need schools beyond commitment
- School administration plays a large role in retaining teachers in high-need schools

TRACK 4 COLLABORATIVE STUDY

Collaborative Research: Exploring the Impact of Noyce MTF Programs on Teacher Retention: The Role of Motivation, Leadership, and School-Work Environment

DUE #1950019 (Lead) RICE

DUE #1949925 MIDDLE TENNESSEE STATE UNIVERSITY, KENNESAW STATE UNIVERSITY

DUE #1949927 UNIVERSITY of LOUISIANA

DUE #1949969 SIU CARBONDALE

DUE #1949985

DUE #1950001 UNIVERSITY of ROCHESTER

DUE #1950002 THE UNIVERSITY OF ARIZONA

Goal of the Study

- Role of human, social, structural, and psychological capital in STEM teacher retention and comparison of MTFs with non-MTFs

Methods

- Cross-sectional quasi-experimental and qualitative with 85 MTFs (2011-2020) and 82 non-MTFs (K-12 STEM)
- Instruments: Survey–37 items adapted from previously developed and validated scales (self-efficacy, leadership engagement, teacher-school fit, diversity dispositions, and community connections; Social Network Surveys; and Semi-Structured Interviews

Findings

- Teacher-school fit positively associated with retention
- Leadership engagement, leadership network size, bridging, and geographic span negatively associated with retention, positively associated with shifting to administrative role
- MTFs have higher self-efficacy, larger geographic span (teaching network), and larger network size, more bridging and larger geographic span (leadership network); and tend to shift earlier in their teaching career
- MTFs are more likely to shift!

Impacts of the STEM Teacher and Researcher (STAR) Program on Teachers, Students, and Classrooms

Goal of the Studies

- Understand how engaging in pre-service research experiences impacts their
  - Mindsets (1)
  - Classroom practices (2)

Methods

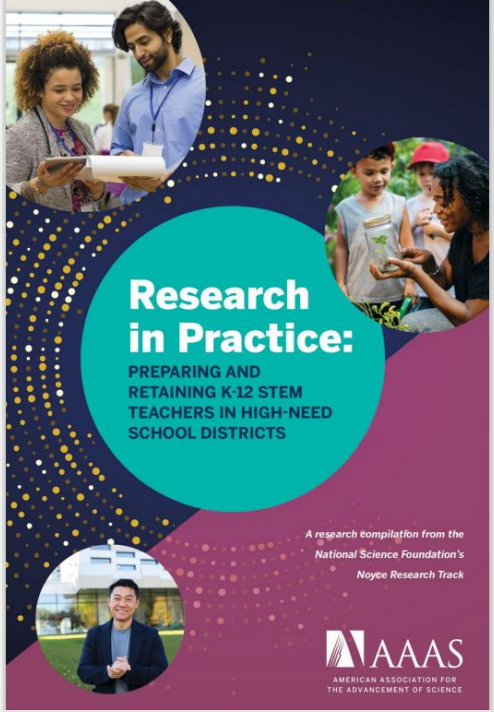
- Pre and post surveys before and after research, delayed follow-up (1)
- Surveys, interviews, and student surveys across one year with a comparison group (2)

Findings

- Infusing explicit instruction on productive mind-sets has a positive impact on preservice teachers' own mind-sets and the strategies that they plan to use with their students (1)
- There are differences both in how teachers describe their classroom practices and in how students perceive these practices and their own interests and skills, specifically in STEM career awareness, perception of the value of STEM learning, and student perseverance (2)

AAAS Book of Early TRACK 4 Studies

1. An Exploratory Study: The Role of Social Networks and Self-Efficacy in the Retention of Noyce Teachers 3
   Meltem Alemdar, Jessica Gale, Christopher Cappelli, and Katherine Boice
2. Impacts of an Undergraduate STEM Teacher Recruitment and Preparation Program on Prospective Teachers' Aspirations and Understanding 77
   Stacey L. Carpenter, Erik Arevalo, Meghan Macias, and Julie A. Bianchini
3. Opportunity Openers for Preservice Science Teachers Experiencing the "Two-Worlds Pitfall" 153
   Caroline Long, Soo-Yean Shim, Mark Windschitl, and Karin Lohwasser
4. Impacts of the STEM Teacher and Researcher (STAR) Program on Teachers, Students, and Classrooms 203
   Sanlyn Buxner, Stamatis Vokos, John Keller, Catherine Good, Dermot Donnelly-Hermosillo, Larry Horvath, Deidre Sessoms, Elsa Bailey, Martyna Citkowicz, Melissa Yisak, Dan Moreno, Bo Zhu, Eleanor Fulbeck, Charlotte Chen, and Max Pardo



Editors: Lauren Manier, Travis T. York, & Betty Calinger

https://doi.org/10.1126/aaas.add8007

AAAS Book of Early TRACK 4 Studies

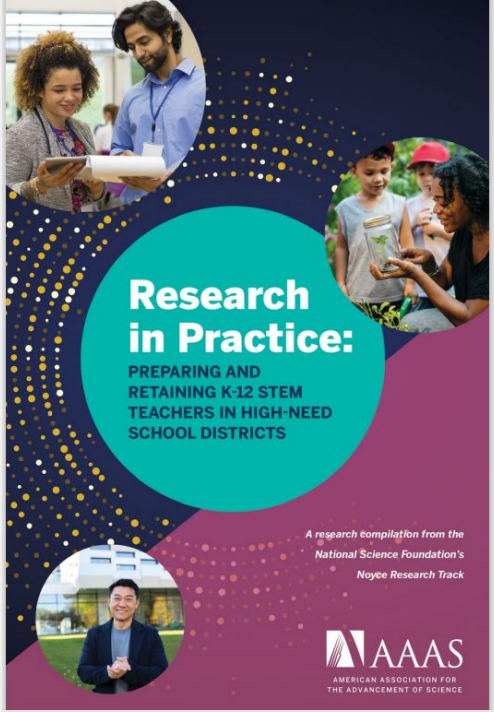
5. Understanding High Need: Exploring School and District Employment and Retention Patterns of Noyce Scholars in Texas . . . 239
Toni Templeton, Chaunté White, Michelle Tran, and Catherine Horn

6. Making Sense of Science Teacher Retention: Teacher Embeddedness and Its Implications for New Teacher Support . . . 277
Douglas B. Larkin, Liz Carletta, Suzanne Poole Patzelt, and Khadija Ahmed

7. How Early-Career Science Teachers Negotiate Their Beliefs and Practices During an Online Induction Program 323
Joshua A. Ellis, Natalie Carro, Andrew Marichal, Preethi Titu, and Gillian H. Roehrig

8. Viewing STEM Teacher Leadership Through a Communities-of-Practice Lens 357
Brett Criswell, Wendy M. Smith, Jan Yow, Christine Lotter, Sally Ahrens, Greg Rushton, Amanda Gonczi, S. Justin Polizzi, and Steve Barth

Closing 397



Other studies from your work?

Please share!

Track 4 of Noyce - Research

Track 4: Noyce Research up to $1,000,000, with a duration of up to 5 years	Research effectiveness and retention of K-12 STEM teachers in high-need school districts (a.k.a. high-need LEA)	N/A	N/A

- For Track 4: Noyce Research, the PI team must include at least one individual with expertise and experience in STEM education research and at least one individual with an advanced degree in a STEM discipline.

Track 4 of Noyce - Research

The Research Track of the Robert Noyce Teacher Scholarship Program offers awards to support exploratory studies and research projects that address BOTH STEM teacher effectiveness and retention in high-need LEAs. Track 4 proposals that examine the impact of Noyce projects on student achievement as part of demonstrating teacher effectiveness are strongly encouraged. Methodologies should be selected based on research questions to be investigated. Qualitative, quantitative, and mixed methodologies are all welcome, as are research syntheses. Submissions informed by the *Common Guidelines for Education Research and Development* as well as basic tenets of Design-Based Implementation Research are encouraged.

Track 4 of Noyce - Research

Track 4: Noyce Research projects might examine teacher candidate characteristics and/or programmatic features that are shown to result in effective teachers who persist in teaching in high-need LEAs. Approaches to examining STEM teacher effectiveness might include investigating culturally relevant and inclusivity-focused aspects of effectiveness, including individual or institutional factors that contribute to effectiveness. It is imperative that Track 4: Noyce Research projects use evidence-based principles of diversity, equity, and inclusivity in studying the effectiveness and retention of STEM teachers. Track 4: Noyce Research submissions do not require a focus on Noyce teachers. However, projects may study effectiveness and retention of Noyce recipients as teachers in high-need LEAs beyond their service requirement. Studies that identify teacher or school experiences, characteristics, or models that result in retention of STEM teachers, including STEM teachers of color, are strongly encouraged.

Track 4 of Noyce - Research

Track 4: Noyce Research projects must include substantive collaboration among educational researchers (including those from the social and behavioral sciences, as applicable), faculty members (or persons) with expertise in a STEM discipline, and faculty members (or persons) with expertise in STEM education. Proposals must be theoretically grounded and include appropriate methodologies and strategies. The use of qualitative methodologies, as well as quantitative approaches, is welcome and should be selected based on the research questions to be investigated. Studies that involve examination of only a single institution's teacher preparation program are discouraged unless the proposal illustrates in what way the study may produce findings or theory with the potential to contribute to understanding of a broader community. Submissions are expected to contribute to the knowledge base of scholarly research in STEM education.

Track 4 of Noyce - Research

Track 4: Noyce Research projects must include substantive collaboration among educational researchers (including those from the social and behavioral sciences, as applicable), faculty members (or persons) with expertise in a STEM discipline, and faculty members (or persons) with expertise in STEM education. Proposals must be theoretically grounded and include appropriate methodologies and strategies. The use of qualitative methodologies, as well as quantitative approaches, is welcome and should be selected based on the research questions to be investigated. Studies that involve examination of only a single institution's teacher preparation program are discouraged unless the proposal illustrates in what way the study may produce findings or theory with the potential to contribute to understanding of a broader community. Submissions are expected to contribute to the knowledge base of scholarly research in STEM education.

Challenges related to publishing

IRB

Data collection

Data analysis

Where to publish?

Places to Publish

Journal of science teacher education (ASTE)

JMTE, Journal of Math Teacher Education

Mathematics Teacher Education

School science and mathematics

International Journal of STEM Education

International Journal of Science Education

International Journal of Science and Math Education

Science Teacher

Innovations in Science Teacher

Journal of Science Education and Technology

Professional Development in Education

Mathematics Educational Research Journal

Journal for STEM Education Research

International Journal of Leadership in Education

ASTE - peer

AMTE

NARST

AERA

RCML

NCTM

NSTA

Society for Information, Technology

School Science for Mathematics Education

ICME

Association of Teacher Educators

American Association of Colleges of Teacher Education (AACTE)

Choose your own adventure!

Introduction to evaluation (for anyone who wants to talk about that)

Discussion of collaborative studies we could engage in

Discussion about possible research designs

Other ideas?

Possible Designs

Comparative - Cross sectional (issues to consider: baseline equivalence)

Longitudinal - Multiple data collection over a period of time (Pre-post design, growth modeling etc.)

Quantitative - Survey, assessments, observations, lesson plan/video analysis

Qualitative - Interviews, focus groups, observations, lesson plan/video analysis

Mixed Methods - Triangulation of quantitative and qualitative data (e.g., survey followed by observation or interview)

Please provide session feedback!

https://bit.ly/wrnn24session