The Role of Teacher Preparation Programs in Retention of STEM Teachers in High-Need Schools

Richard M. Ingersoll, Ph.D.
Courtney Preston, Ph.D.
Miray Tekkumru-Kisa, Ph.D.
Sherry A. Southerland, Ph.D.
Christopher Wright, M.S.
Agenda

➢ Introduction

➢ Multiple Stakeholder Presentations
  ➢ National Researcher
    ➢ Q & A
  ➢ Preparation Program Principal Investigators
    Q & A (6 minutes)
  ➢ STEM Teacher Leader
    ➢ Q & A

➢ Closing
  ➢ Overall Q&A, Takeaways, Resources
The AAAS seeks to “advance science, engineering, and innovation throughout the world for the benefit of all people.”

Overarching ARISE Goal:

This project, organized by the American Association for the Advancement of Science (AAAS) Education and Human Resources Programs, seeks to provide resources, tools, and a community to foster research and evidence-based innovation in STEM preservice teacher education and leadership development programs for high-need schools.
About the ARISE Community Webinar Series

Focus on: *Evidence-Based Transformative STEM Teacher Preparation*

- intended to encourage engagement with current research and experimentation to advance knowledge and solutions to persistent challenges in STEM teacher preparation, particularly for high-need school districts.

**OBJECTIVES**

As part of ARISE's outreach strategy, this webinar series seeks to:

- collect and share information about topics and strategies for research and evidence-based approaches, and
- provide quality presentations and opportunities for attendee engagement.
The Effects of Teacher Education and Preparation on Beginning Math and Science Teacher Attrition?

Richard M. Ingersoll, Ph.D.
Professor of Education and Sociology
University of Pennsylvania and Consortium for Policy Research in Education

This research was supported by a grant (# 0814295) from the Research and Evaluation on Education in Science and Engineering (REESE) program of the National Science Foundation.
Percent Beginning Teacher Attrition After First Year, by Field

- **Other**: 12.3%
- **Math**: 14.5%
- **Science**: 18.2%
Percent Beginning Teachers with Different Types of Education, by Field

<table>
<thead>
<tr>
<th>Type of Education</th>
<th>Science</th>
<th>Math</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Selective Colleges</td>
<td>10%</td>
<td>14%</td>
<td>20%</td>
</tr>
<tr>
<td>Education Degree Only</td>
<td>14%</td>
<td>25%</td>
<td>51%</td>
</tr>
<tr>
<td>Non-Educ Degree Only</td>
<td>29%</td>
<td>42%</td>
<td>68%</td>
</tr>
<tr>
<td>Graduate-Level Degree</td>
<td>14%</td>
<td>23%</td>
<td>26%</td>
</tr>
<tr>
<td>Traditional Route</td>
<td>42%</td>
<td>51%</td>
<td>62%</td>
</tr>
</tbody>
</table>
Percent Beginning Teachers without Different Types of Pedagogical Preparation, by Field

- No Coursework in Teaching Methods
- No Prac. Teaching
- No Preparation in Selecting Materials
- No Coursework in Psych./Learn. Thry
- No Tching Feedback

<table>
<thead>
<tr>
<th>Category</th>
<th>Science</th>
<th>Math</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Coursework in Teaching Methods</td>
<td>30</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>No Prac. Teaching</td>
<td>23</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>No Preparation in Selecting Materials</td>
<td>31</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>No Coursework in Psych./Learn. Thry</td>
<td>26</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>No Tching Feedback</td>
<td>26</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>
Percent Beginning Teachers Who Received Different Pedagogical Preparation Packages, by Field

- **Little or No Pedagogy**
  - Science: 13
  - Math: 20
  - Other: 26

- **Comprehensive Pedagogy**
  - Science: 31
  - Math: 23
  - Other: 23

Percent

- Science
- Math
- Other
Attrition of Beginning Teachers, by Different Pedagogical Packages

- **Little or No Pedagogy**: 24.6%
- **Comprehensive Pedagogy**: 9.8%

Percent

0 10 20 30 40 50

Comprehensive Pedagogy

Little or No Pedagogy
The Leaky Bucket
Further Information, Copies of Articles, Reports, etc.

Richard M. Ingersoll, Ph.D.

www.gse.upenn.edu/faculty/ingersoll
Investigating the Relationships between STEM Teacher Preparation, Instructional Quality, and Retention among Noyce Scholars

Courtney Preston, Ph.D.  
Assistant Professor  
Florida State University

Miray Tekkumru-Kisa, Ph.D.  
Assistant Professor  
Florida State University

Sherry A. Southerland, Ph.D.  
Director and Professor  
Florida State University
What We Know About Teacher Turnover and Retention

- Higher turnover among younger and less experienced teachers (Ingersoll & Smith, 2003; Perda, 2013)
- Teacher shortages more likely due to early career attrition than too few teachers being prepared (Ingersoll, 2001)
- Secondary STEM teachers are more likely to leave than elementary teachers and teachers of other subjects (Allen, 2005; Guarino, Santibanez, & Daley, 2006; Ingersoll & May, 2012)
What We Know About Teacher Quality

- Teachers sort into schools:
  
  - High-need schools have teachers with fewer educational credentials and less experience (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008; Darling-Hammond, 2003; Gansle, Noell, & Burns, 2012; Goldhaber, Lavery, & Theobald, 2015)
  
  - High-need schools are more likely to have less effective teachers (Sass, Hannaway, Xu, Figlio, & Feng, 2012)
Teacher Quality or Quality of Teaching?

- Much of the research focusing on teachers in under-resourced settings focuses on *teacher quality* measured by preparation pathways or years of experience, etc.
- These teacher characteristics are a proxy for the quality of instruction students receive.
- Our research changes that focus: we focus on the nature of the instruction students in high-need schools receive - that is, we focus on *quality of teaching*.
- This move allows us to tap into and contribute to the literature on instructional quality.
What We Don’t Know

- RQ1: How do various features of teacher preparation and induction contribute to instructional quality?

- RQ2: How do these features contribute to teacher retention?

- RQ3: What is the relationship between teacher retention and quality of instruction?
Our Purpose

1. Understand how the features of Noyce teacher preparation programs (field work, coursework, and induction) are related to
   i. Quality of Noyce math and science teachers’ instruction
   ii. Retention through the Noyce commitment
   iii. Retention beyond the Noyce commitment

2. Understand whether Noyce teachers who leave before their commitment is fulfilled have higher or lower instructional quality than those who fulfill their commitment

3. Understand whether Noyce teachers who stay past their commitment have higher or lower instructional quality than those who leave after they fulfill their commitment
Our Approach

- Measure the quality of Noyce math and science teachers’ instruction
- Establish relationships between features of preparation/induction and quality of instruction
- Establish relationships between features of preparation/induction and retention
- Determine if quality of instruction is higher for those who stay or those who go
Who?

- 7 universities with Phase I or Phase II Noyce programs
  - Florida State University
  - North Carolina State University
  - Georgia Southern University
  - Colorado State University
  - The College of New Jersey
  - Mercy College
  - California State University- Sacramento
What?

- Measuring instructional quality through:
  - Instructional Quality Assessment in math (IQA; Boston, 2014)
  - Instructional Quality Assessment in science based on Tekkumru-Kisa, Stein, & Schunn, 2015, 2017

- 3 waves of data collection
  - 2 challenging tasks that teachers assigned to students in class
  - 6 associated student work samples per task
Our Instructional Quality Measures

- Recognize instructional quality as instruction that has academic rigor
  - Degree to which students engage in high levels of thinking and sense-making
  - Meaningfully engage in disciplinary practices as they work on cognitively demanding tasks (Stein, Smith, Hennigsen, & Silver, 2009; Tekkumru-Kisa, Stein, & Schunn, 2015)
Teacher Preparation Features of Interest

<table>
<thead>
<tr>
<th>Coursework</th>
<th>Fieldwork</th>
<th>Induction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject matter</td>
<td>Early field experience hours</td>
<td>Mentoring</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>Duration of student teaching</td>
<td>PD for novice teachers</td>
</tr>
<tr>
<td>Foundations</td>
<td>University supervision</td>
<td>Novice teacher networks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observation and feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length</td>
</tr>
</tbody>
</table>
Data Analysis

RQ1

Coursework
Fieldwork
Induction

Instructional Quality

RQ2

Coursework
Fieldwork
Induction

Retention

SCHOOL

RQ3

Instructional Quality

Retention

SCHOOL
Data Collection to Date

- 42 math and science teachers
  - 6 instructional tasks each
  - 6 associated student work samples
    - 2 high, 2 medium, 2 low quality
References


Contact for Further Information

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NSF Grant No. DUE- 1661400
Perspective from a Teacher Leader

Christopher Wright, M.S.
Secondary Mathematics Resource Teacher
Baltimore County Public Schools
My Teacher Preparation Program

- I didn’t know it at the time, but the experience offered to me by my program was unique in several ways.
  - Immediate and consistent immersion into schools.
  - Full year, 5th year internship residency model.

*My job is not to teach students – it is to ensure each student learns.*

- I truly felt as though I had already completed a full year of teaching before I even stepped into my own classroom for the first time as an instructor.
Working in High-Need Schools

- Baltimore County Public Schools is the 25th largest school district in U.S.; 3rd largest in Maryland

**SAT: Average Mathematics Score for Grade 11 SAT Day Test-Takers**

<table>
<thead>
<tr>
<th>Category</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Students</td>
<td>491</td>
</tr>
<tr>
<td>Advanced Academics</td>
<td>546</td>
</tr>
<tr>
<td>Free/ Reduced-price Meals</td>
<td>448</td>
</tr>
<tr>
<td>English Language Learner</td>
<td>375</td>
</tr>
<tr>
<td>Special Education</td>
<td>388</td>
</tr>
</tbody>
</table>

SOURCE: http://www.bcps.org/system/data/academics/
My Role as an Albert Einstein Fellow

- My role in the K-12 space included congressional oversight of State implementation of the Every Student Succeeds Act (ESSA).

- In the higher education space, I worked on our committee reauthorization of the Higher Education Act.
  - Title II – Teacher Quality Enhancement
    - Title II, Part A – Teacher Quality Partnership Grants
    - Title II, Part B – Other Competitive Grant Programs
  - TEACH Grant program under Title IV
    - A $4,000 per year grant for prospective teachers in exchange for an agreement to serve for four years in a STEM or other high-need content area in a school serving students from low-income families.
My Role as a Teacher Leader (Post-Fellowship)

- My experiences as an Einstein Fellow have afforded me several opportunities since returning to my Resource Teacher position last month.
  - I have had conversations with some district administrators regarding ESSA clarification and how State and Federal laws are affecting our local classrooms.
  - I have developed new relationships with teacher preparation programs near my school district, and hope to work with them in the future as I earn my administration credential from Johns Hopkins University.
  - As part of a team of mathematics coaches, we have the opportunity to serve on the front lines, fighting for fair treatment of our new, inexperienced, and struggling mathematics teachers, helping to ensure that they not only survive, but thrive in their teaching atmosphere.
Contact for Further Information

Christopher Wright, M.S.
cwright4@bcps.org

https://science.energy.gov/wdts/einstein

APPLICATIONS DUE: November 15
WEBINAR SUMMARY
Overall Q & A
Takeaways & Action Steps

In the Question panel, write in your favorite learnings from today.

In the Question panel, identify an action step you will take based on your participation today.
Webinar Key Points

- Attrition of beginning teachers with little or no pedagogical preparation is greater.
- Preparation programs attention to minimizing early career attrition would be more productive toward decreasing shortages of STEM Teachers than efforts to enroll more teacher candidates alone.
- Research designs focusing on the nature of instruction students in high-need schools receive is necessary to go beyond black box studies of preparation pathways.
- Studies investigating the teaching quality of teachers who leave, particularly in relation to specific aspects of preparation received, is much needed.
- Being up-to-date, involved in, and taking advantage of Federal Policy related to teacher retention is critical for teachers, teacher educators, and researchers.
- “Whatever our task, our main goal is always to increase student achievement and enable learning through our support” of teachers as researchers, teacher educators, and teacher leaders woke to STEM teacher retention issues.
Resources

THE ROLE OF TEACHER PREPARATION PROGRAMS IN RETENTION OF STEM TEACHERS IN HIGH-NEED SCHOOLS

WEBINAR HELD: Thursday, September 27 from 3:30 – 5:00 p.m. EDT

Shared by National Researcher - Dr. Richard Ingersoll, University of Pennsylvania:


Shared by Preparation Program Principal Investigators – Dr. Courtney Proctor, Dr. Miray Tekkum-Kiaa, & Dr. Sherry Sutherland, Florida State University:


Shared by STEM Teacher Leader – Mr. Christopher Wright, Baltimore County Public Schools:

- This is the website for the Albert Einstein Distinguished Educator Fellowship. Applications are open for the 2019-2020 school year, and are due on November 15, 2019. http://science.energy.gov/ede/fellowship
- This Learning Policy Institute website provides a calculator that estimates the cost of teacher turnover for your school and/or district: https://learningpolicyinstitute.org/product/the-cost-of-teacher-turnover
- It is important to keep up-to-date on developing Federal Policy on teacher recruitment and retention. Here are the websites for the Republican and Democratic starting points for a reauthorized Higher Education Act:

Upcoming ARISE Webinar

Supporting ALL Learners Using Active Learning Pedagogy
Featuring:
Dr. Jose Blackorby, Director of Research and Development for CAST
Webinar: October 25 at 3:30pm EDT
Thanks to generous support from the National Science Foundation (NSF) under Grant No. DUE-1548986 -Stimulating Research and Innovation in STEM Teacher Education. Any opinions, findings, interpretations, conclusions or recommendations expressed in this material are those of its authors and do not represent the views of the AAAS Board of Directors, the Council of AAAS, AAAS’ membership or the National Science Foundation.
We Want Your Feedback
Contact for Further Information on ARISE or to Share Your Work

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