



ARISE

Advancing Research & Innovation in the
STEM Education of Preservice Teachers
in High-Need School Districts



Grant No. DUE-1548986

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.

WEBINAR

Agenda

➤ Introduction



Dr. Jennifer E. Carinci
AAAS



➤ 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



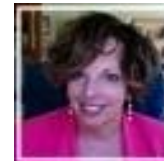
Dr. Richard M. Ingersoll
University of Pennsylvania



Dr. Courtney Preston
Florida State University



Dr. Miray Tekkumru-Kisa



Dr. Sherry A. Southerland



Mr. Christopher Wright
Baltimore County Public Schools

About ARISE



The AAAS seeks to
“advance science, engineering, and innovation throughout the world
for the benefit of all people.”



ARISE

Advancing Research & Innovation in the
STEM Education of Preservice Teachers
in High-Need School Districts

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?



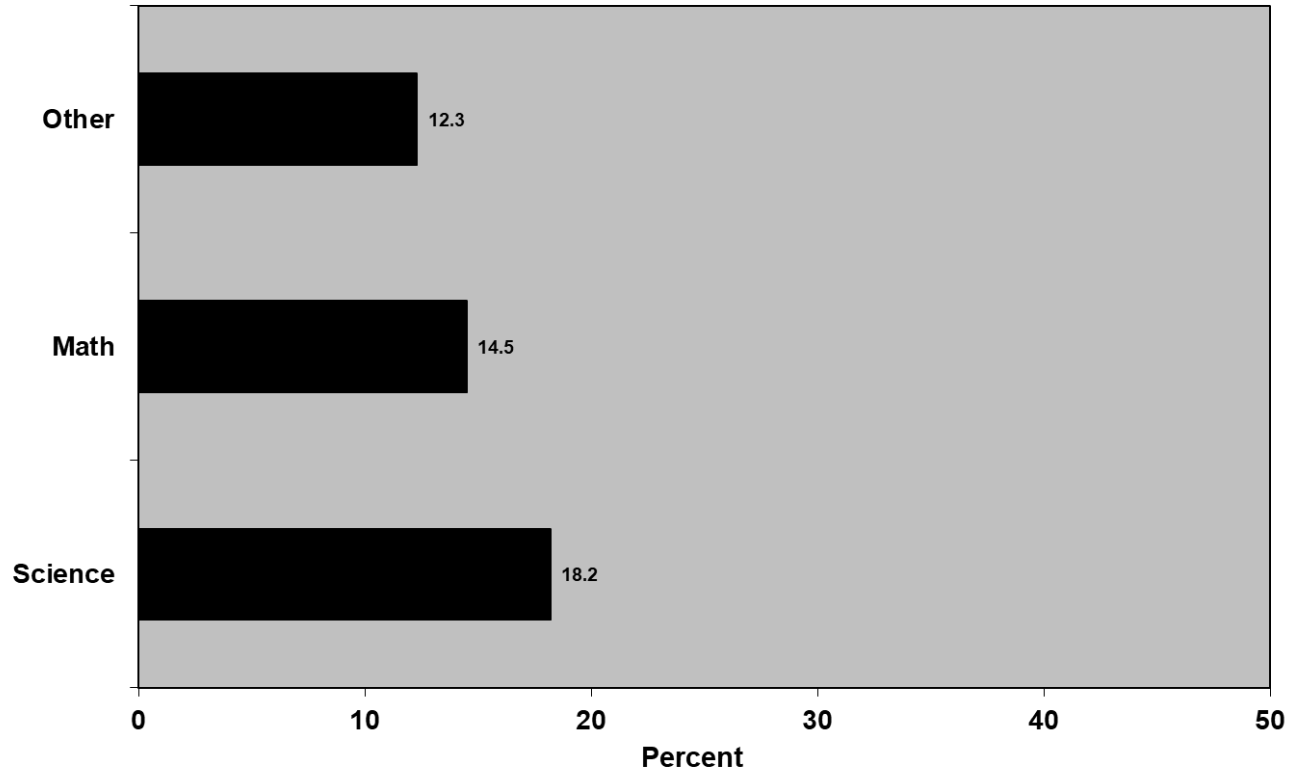
Richard M. Ingersoll, Ph.D.

Professor of Education and Sociology

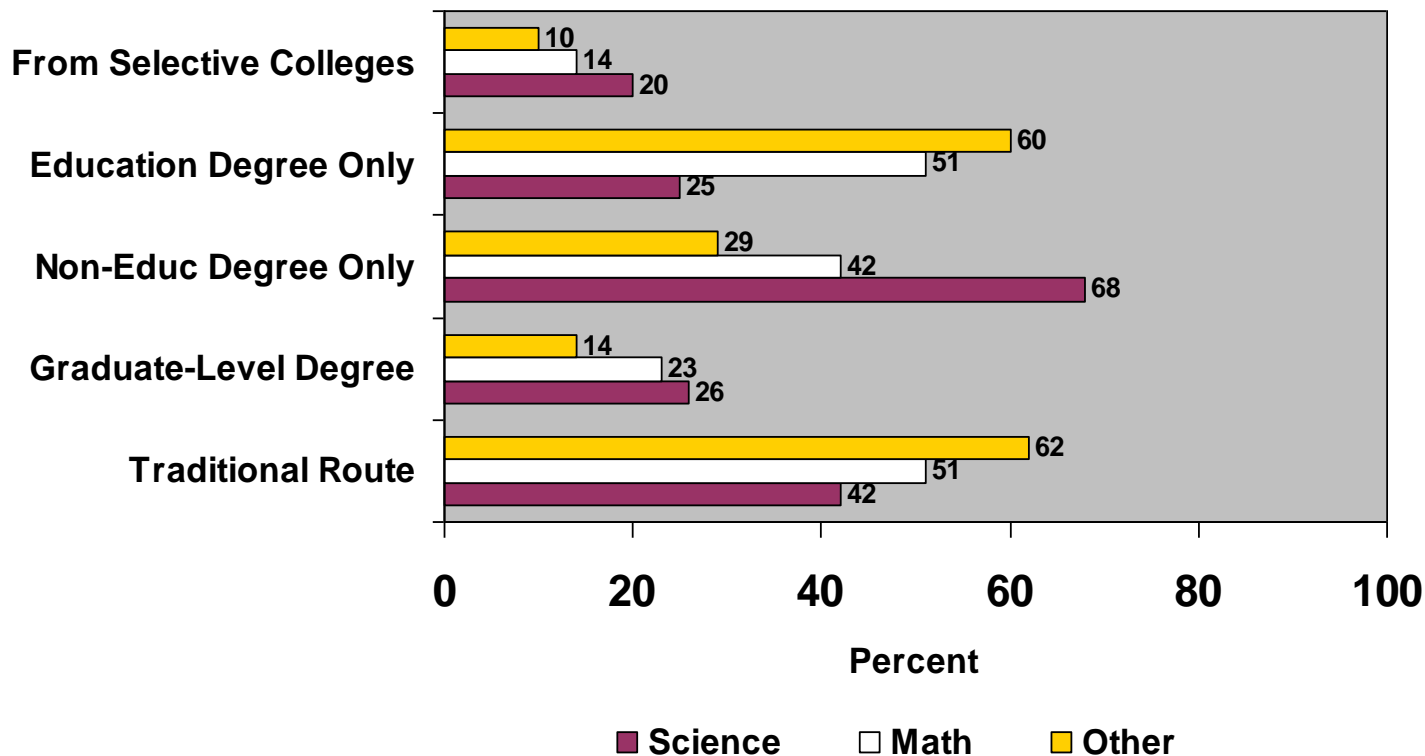
University of Pennsylvania and Consortium for Policy Research in Education

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.

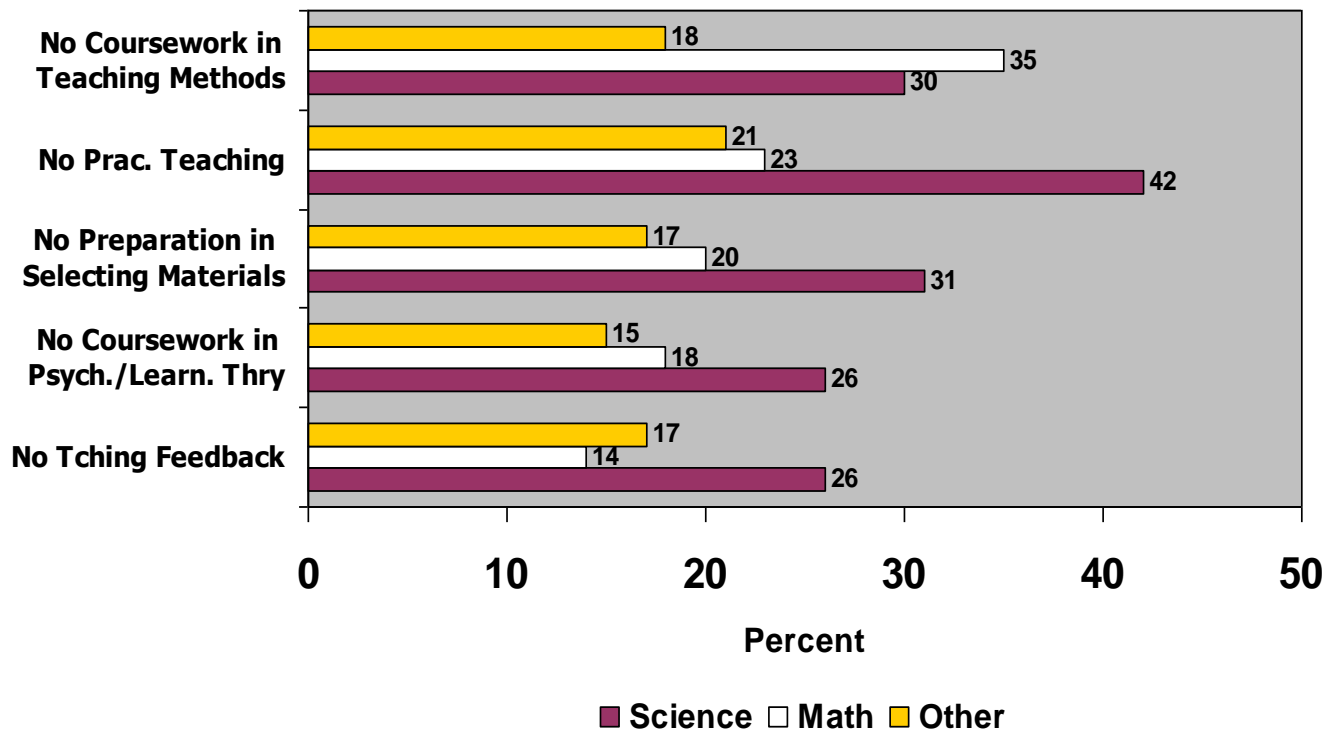
Percent Beginning Teacher Attrition After First Year, by Field



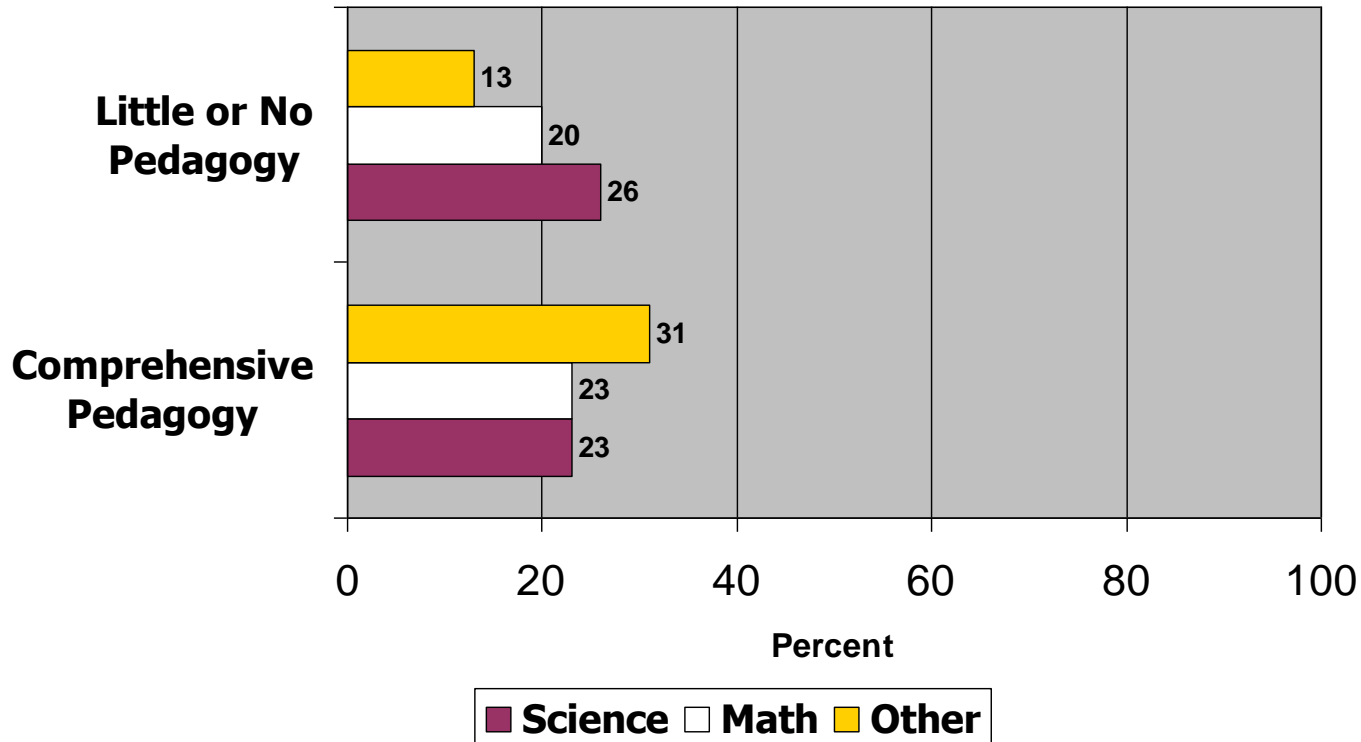
Percent Beginning Teachers with Different Types of Education, by Field



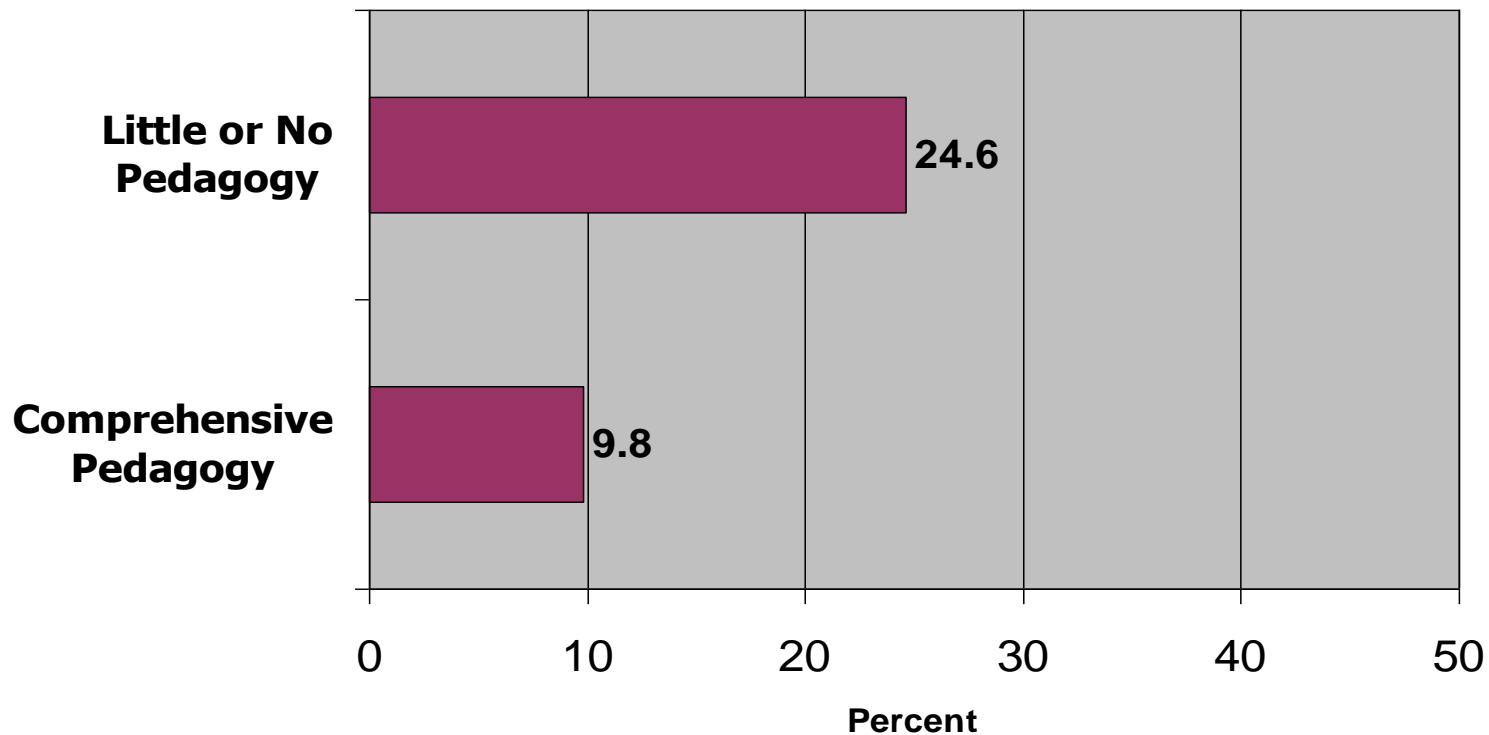
Percent Beginning Teachers without Different Types of Pedagogical Preparation, by Field



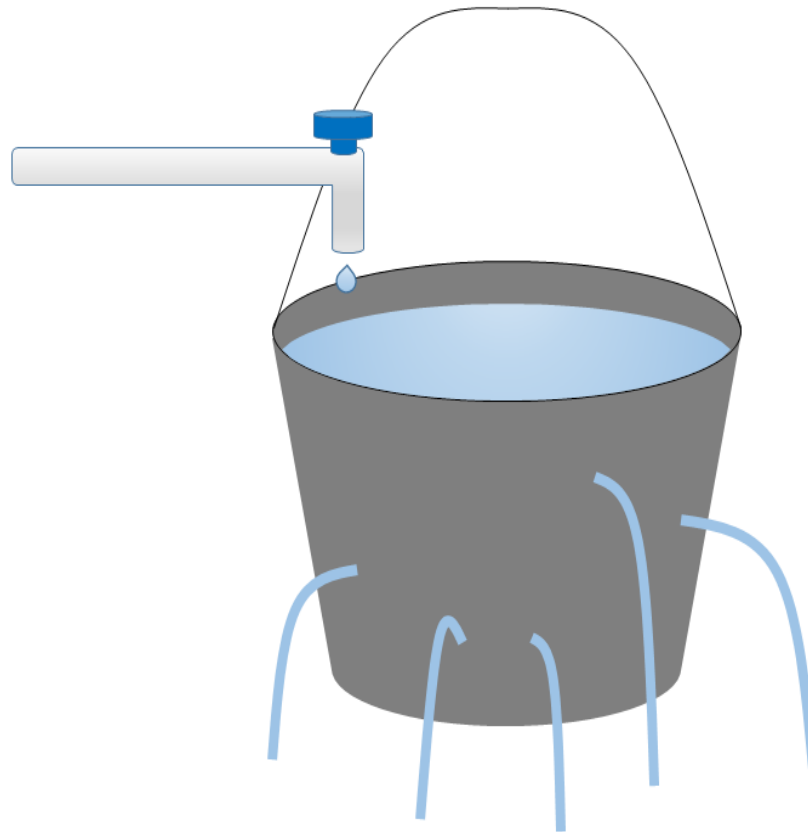
Percent Beginning Teachers Who Received Different Pedagogical Preparation Packages, by Field



Attrition of Beginning Teachers, by Different Pedagogical Packages



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 in high poverty and low performing schools (Boyd, Lankford, Loeb, & Wyckoff, 2005, 2013)
- 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

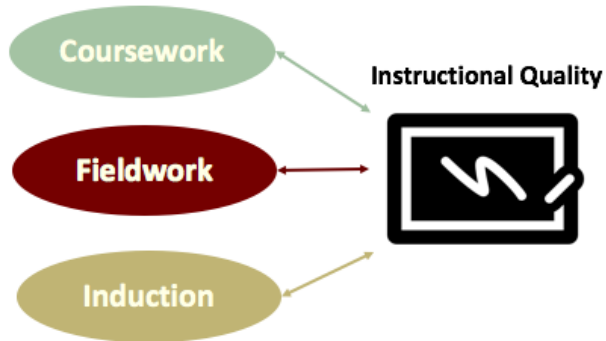


Coursework	Fieldwork	Induction
Subject matter	Early field experience hours	Mentoring
Pedagogy	Duration of student teaching	PD for novice teachers
Foundations	University supervision	Novice teacher networks
		Observation and feedback
		Length

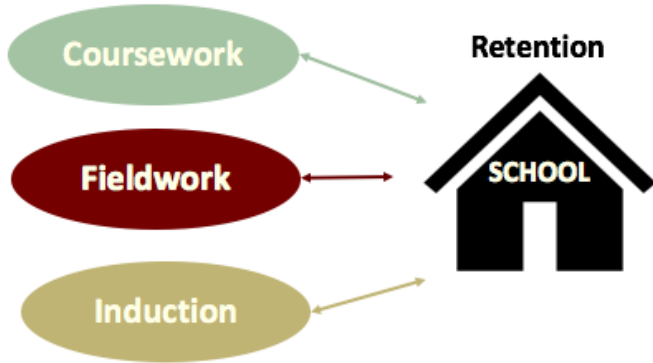
Data Analysis



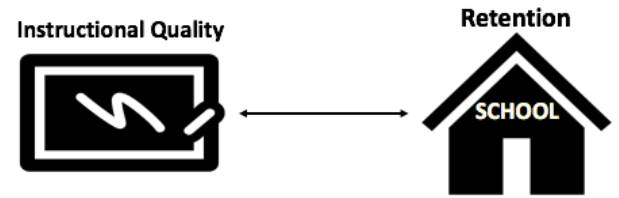
RQ1



RQ2



RQ3



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



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- Allen, M. B. (2005). *Eight questions on teacher recruitment and retention: What does the research say?*. Washington, DC: Education Commission of the States.
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- Sass, T. R., Hannaway, J., Xu, Z., Figlio, D. N., & Feng, L. (2012). Value added of teachers in high-poverty schools and lower poverty schools. *Journal of Urban Economics*, 72(2-3), 104–122.
- Stein, M. K., Smith, M. S., Henningsen, M. A., & Silver, E. A. (2009). *Implementing standards-based mathematics instruction: A casebook for professional development* (Second Edition). New York, NY: Teachers College Press.
- Tekkumru-Kisa, M., Stein, M. K., & Schunn, C. (2015). A framework for analyzing cognitive demand and content-practices integration: Task analysis guide in science. *Journal of Research in Science Teaching*, 52(5), 659-685.
- Tekkumru-Kisa, M., Schunn, C., & Stein, M. K. (in press). Identifying cognitively demanding science tasks for providing opportunities for students to engage in three-dimensional learning. *The Science Teacher*.

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.

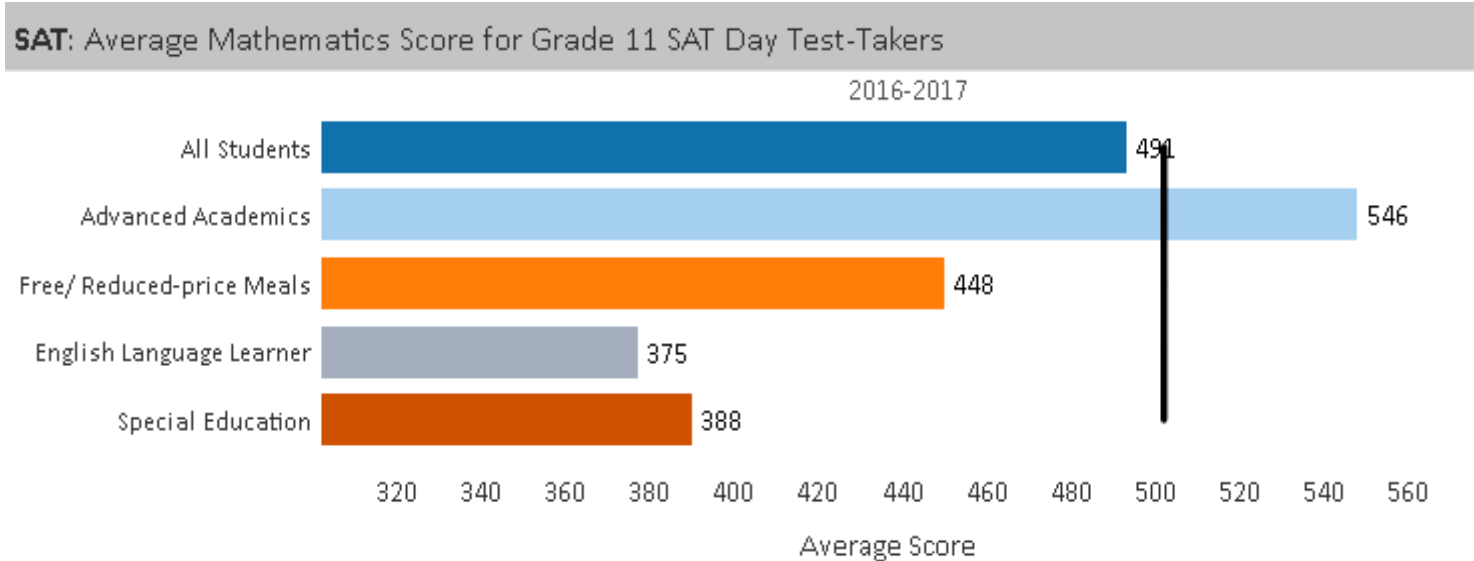
My job is not to teach students – it is to ensure each student learns.

- 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



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



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Albert Einstein
Distinguished Educator
Fellowship Program

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

APPLICATIONS DUE: November 15



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WEBINAR SUMMARY

Overall Q & A



Takeaways & Action Steps

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

The
TAKEAWAY

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


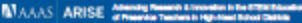


Webinar Key Points



- 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



RESOURCES

from
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:

- > Ingersoll, R., Merrill, L., & May, H. (2014). What are the effects of teacher education and preparation on beginning teacher attrition?. Research Report (RR-42). Philadelphia: Consortium for Policy Research in Education, University of Pennsylvania. <http://www.cpre.org/cpre-effects>
- > Ingersoll, R. M., & May, H. (2012). The magnitude, destinations, and determinants of mathematics and science teacher turnover. *Educational Evaluation and Policy Analysis*, 24(4), 435-464. <http://www.gse.upenn.edu/pdf/fms/MethodicalTeacherTurnover.pdf>
- > Ingersoll, R. M., & Perda, D. (2010). Is the supply of mathematics and science teachers sufficient?. *American Educational Research Journal*, 47(3), 563-594. <http://journals.aegapub.com/doi/abs/doi/10.3102/0002031210370711Ajl>
- > Ingersoll, R., Merrill, L., & May, H. (2012). Retaining teachers: How preparation matters. *Educational Leadership*, 69(8), 30-34. <http://www.gse.upenn.edu/pdf/fms/EL-May2012.pdf>
- > Ingersoll, R. M. (2011). Do We Produce Enough Mathematics and Science Teachers?. *Phi Delta Kappan*, 92(6), 37-41. http://www.gse.upenn.edu/pdf/fms/Enough_Math_Teachers.pdf

Shared by Preparation Program Principal Investigators - Dr. Courtney Preston, Dr. Miray Tekkurum-Klas, & Dr. Sherry Southerland, Florida State University:

- > Boston, M. D. (2014). Assessing instructional quality in mathematics classrooms through collections of students' works. In (Eds. Y. Li & E. Silver), *Transforming mathematics instruction: Multiple approaches and practices* (501-523). Switzerland: Springer International Publishing. [Report & PDF](#).
- > Tekkurum-Klas, M., Schunn, C., & Stein, M. K. [in press]. Identifying cognitively demanding science tasks for providing opportunities for students to engage in three-dimensional learning. *The Science Teacher*.
- > Tekkurum-Klas, M., Stein, M. K., & Schunn, C. (2015). A framework of cognitive demand and content-practices integration: Task Analysis Guide in Science. *Journal of Research in Science Teaching*, 52(5), 659-685. [Read PDF](#).

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, 2018: <https://science.ae.org.gov/wdr/winstein>
- > 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 be 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 a. The PROSPER Act - HR4508: <https://edworkforce.house.gov/prosper>
b. The Aim Higher Act - HR6543: <http://democrats-edworkforce.house.gov/aim-higher>

Robert Noyce Teacher Scholarship Program Proposal Preparation: Visit <http://www.rntsoyok.org>

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

ACTIVE LEARNING WEEK
October 22 – 26, 2018

AAAS
100KIN10
TAKE THE PLEDGE
<https://tinyurl.com/AAUW2018PLEDGE>

A banner for Active Learning Week. The top part has a red background with white text. Below is a photo of four diverse students in a lab setting, looking at a molecular model. To the right is the AAAS logo and the text '100KIN10 TAKE THE PLEDGE' with a URL.

OCTOBER IS
DISABILITY AWARENESS MONTH

Icons representing various disabilities: a person with a cane, a person with a hearing aid, a person with a white cane, a person with a hearing aid, and a person in a wheelchair.

A banner for Disability Awareness Month. The background is a colorful, abstract brushstroke pattern. The text 'OCTOBER IS DISABILITY AWARENESS MONTH' is in white. At the bottom are five white icons representing different types of disabilities.

Thanks to generous support

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We Want
Your
Feedback

Contact for Further Information on ARISE or to Share Your Work



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