Virginia Commonwealth University (VCU)

SEED Proposal

TABLE OF CONTENTS

VCU SEED Project Narrative

Purpose: The purpose of the Virginia Commonwealth University (VCU) SEED proposal is to: (1) recruit, prepare, license, and retain effective teachers, focused in STEM fields, by expanding the Richmond Teacher Residency (RTR) program to three additional school districts and (2) evaluate RTR's impact on teacher effectiveness, retention, and student achievement in high-needs schools. This proposal addresses **Absolute Priority 1**, Supporting Effective Teachers and **Competitive Preference Priority**, Promoting Science, Technology, Engineering, or Math (STEM) Education.

Introduction: Project Partners/Background and Context

Profile of Partners: Virginia Commonwealth University (VCU) is an urban, public institution of higher education enrolling over 31,000 undergraduate and graduate students in Richmond. VCU faculty attracts more than $275 million in sponsored research funding. VCU is one of only 28 institutions nationwide to receive the Carnegie Foundation's designation as a Research University with Very High Research Activity and Community Engagement. The VCU School of Education is ranked 26th among the top graduate schools of education in the U.S. by *US News & World Report* (2018).

Richmond Public Schools (RPS) , the original RTR school district partner, serves nearly 24,000 students in 27 elementary, 8 middle, and 8 high schools. Thirty-one percent of the students in RPS live in households that are 100% below the federal poverty level, more than half of families in Richmond are headed by single parents, and the median income of families in RPS is less than 60% of the average in the greater Richmond area. Twenty-five out of 43 schools are not fully accreditated due to poor student achievement. RPS typically hires 300 teachers per year.

Petersburg City Public Schools (PCPS), the first expansion site, serves 4,165 students in four elementary schools, one middle school, and one high school. The average income in Petersburg is $31,798. Nearly half of all children in Petersburg live in poverty, the second highest child poverty level in Virginia. Nearly 1 in 4 residents over the age of 25 has not earned a high school diploma/equivalent. PCPS had over 100 vacancies out of 300 teaching positions on July 1, 2017. With no schools accredited, PCPS is one of the lowest performing school districts in the state, ranked in the bottom 5 of all 132 districts on all five Standards of Learning (SOL) student achievement tests in 2016.

Chesterfield County Public Schools (CCPS) and Henrico County Public Schools (HCPS), two additional expansion sites, are large suburban districts in the metro-Richmond area. As Table 1 indicates, both of these districts have high-needs schools that mirror the demographics of RPS and PCPS. The VCU SEED proposal will focus on the schools in all of our partner districts where the need for effective teachers is greatest.

Table 1. RTR Expansion Area – School Demographics

	Percent					
	Economic Disadvantage	**English Learner**	**Black**	**White**	**Latinx**	**Asian**
HIGH NEED LEAs						
Richmond	**61.3%**	**10.2%**	**69.1%**	**12.1%**	**15.4%**	**1.2%**
Petersburg	**70.7%**	**4.4%**	**91.1%**	**2.5%**	**5.0%**	**0.5%**
SUBURBAN LEAs with POCKETS of POVERTY						
Chesterfield – All	**32.3%**	**8.9%**	**25.7%**	**50.2%**	**15.6%**	**3.4%**
Bensley Elementary	77.4%	49.4%	24.4%	6.5%	66.6%	0.3%
Bellwood Elementary	74.7%	27.0%	22.6%	29.2%	41.3%	2.9%
Falling Creek Middle	63.2%	27.5%	43.7%	7.4%	43.7%	2.0%
Providence Middle	52.5%	17.3%	37.0%	28.7%	25.7%	2.9%
Meadowbrook High	52.8%	20.0%	46.8%	7.4%	40.1%	2.4%
LC Bird High	38.6%	7.9%	38.9%	32.9%	21.5%	2.6%
Henrico – All	**35.8%**	**9.8%**	**35.9%**	**38.8%**	**9.6%**	**10.9%**
Montrose Elementary	74.3%	1.3%	79.9%	9.4%	5.9%	0.5%
Glen Lea Elementary	51.0%	3.4%	88.8%	2.7%	6.3%	0.7%
Brookland Middle	61.6%	27.2%	45.2%	18.6%	25.3%	5.1%
John Rolfe Middle	60.6%	1.6%	79.0%	11.1%	5.4%	0.3%
Highland Springs High	51.9%	2.6%	81.2%	9.7%	5.3%	0.8%
Varina High	50.4%	1.3%	68.1%	23.2%	4.2%	0.4%

Background of SEED Partnership: VCU has a strong history of working with Local Education Agencies (LEAs) to facilitate the educational success of students and the development of teachers and education leaders. Beginning in the early 1990's, VCU established seven Professional Development Schools in the metro-Richmond area, included within our SEED partner LEAs—RPS, CCPS, and HCPS. In 2001, the Metropolitan Educational Training Alliance (META), a partnership among four local LEAs (including RPS, CCPS, and HCPS) and VCU, was established to promote student learning by improving the preparation, effectiveness, and retention of high-quality teachers. VCU SEED is a mature partnership that builds on this long history of VCU and local LEAs working together to improve outcomes for students. Specifically, VCU SEED builds on two earlier Teacher Quality Partnership (TQP) grants received in 2010 and 2014 to design, implement, refine, and expand the RTR program which forms the foundation of this proposal. In 2018-2019, RTR will prepare the 8th cohort of residents for RPS, the second cohort of residents in CCPS, and the first cohort of residents in PCPS.

RTR is housed within the Center for Teacher Leadership (CTL) at the VCU School of Education. CTL has an established record of developing strong collaborative partnerships in the local community to achieve the goals of multiple stakeholders (see Appendix G).

Context for VCU SEED Proposal: Despite overwhelming research that teacher quality is the most important school-based factor in student achievement--and that teacher effects on student learning have been found to be cumulative and long-lasting--by every measure of teacher qualifications — including SAT scores, GPA, licensing, major, selectivity of undergraduate institution, experience, and others — high-poverty students and students of color are least likely to be taught by well-prepared, profession-ready teachers (Cochran-Smith et al., 2015; Darling-Hammond, 2008; *Teacher Shortages, What's the Problem,* National Commission on Teaching and America's Future, 2016). Virginia has a 2.8 out of 5 teacher equity rating, using indicators of the ratio of uncertified and inexperienced teachers in high versus low minority schools and in the number of teachers of color (*Understanding Teacher Shortages: A State-by-State Analysis of the Factors Influencing Teacher Supply, Demand, and Equity*, Learning Policy Institute, September 15, 2016). Moreover, almost twice as many teachers in RPS are in their first five years of teaching, compared to Virginia's average of 22% (National Center for Education Statistics, Schools and Staffing Survey, Public Teachers Data File 2011-2012). This revolving door of teachers in high-needs schools comes with a huge price tag—$6 million each year for RPS (National Commission on Teaching and America's Future Teacher Leaver Calculator, 2014; National Commission on Teaching and America's Future, 2007)--and a high cost to students in terms of the lack of stability in schools and its negative impact on student achievement (Ingersoll, 2001; Ronfeldt, Loeb, & Wyckoff, 2013). The teacher shortages in Virginia are dire. In 2016-2017 there were 1,080 unfilled positions in the Commonwealth when the school year began and 935 at the beginning of the 2017-2018 school year. Shortages are in every content area and grade level (Virginia Department of Education, 2016). The teacher shortage is most acute in high-needs schools and school districts (see Table 3 on p. 8), as is teacher turnover (see Table 2). This often leads to poor student academic performance and the denial of state accredication for these schools.

Table 2. Accreditation Status of Partner School Districts and Teacher Turnover Rate

School District	Schools Not Accredited	Schools Accredited with Conditions	Schools Accredited	State Avg. Turnover Rate: 10.6%
Richmond	19 (43%)	6 (14%)	19 (43%)	22.6%
Petersburg City	3 (50%)	3 (50%)	0	28.5%
Chesterfield	0	1 (2%)	60 (98%)	10.9%
Henrico	5 (7%)	8 (12%)	54 (80%)	10.9%

Source: Virginia Department of Education (2016-2017)

Section A. Quality of Project Design

<u>A.1. An Exceptional Approach to the Priority Areas:</u> Richmond Teacher Residency (RTR) is designed to address these educational inequities in teacher quality by recruiting, preparing, supporting, and retaining highly effective teachers in our most challenged schools. Originally funded through a $5.8 million Teacher Quality Partnership (TQP) grant from the U.S. Department of Education (USDOE), RTR began as a partnership between VCU and RPS to improve student achievement in low-performing schools by creating a sustainable pipeline of highly-effective teachers committed to the students of RPS for the long term. Our partners recognized that we had to address the high turnover of teachers in high-needs schools. However, even the best traditional teacher preparation programs often fall short in adequately preparing individuals for urban schools. As Haberman noted, "Completing a traditional program of teacher education as preparation for working in . . . [urban, high-need schools] is like preparing to swim the English Channel by doing laps in the university pool" (1995, p. 2). Urban teachers must be prepared in the context within which they will teach. While traditional teacher preparation was not fully preparing individuals for urban classrooms, neither were fast-track alternate routes; research shows that preparation <u>does</u> matter. Teachers who are unprepared in curriculum, teaching methods, child development, and with no student teaching experience leave at double the rate of teachers who have had this type of training (Darling-Hammond, 2003).

In addition, strategies must be in place not only to recruit highly qualified teachers for urban classrooms, but also to retain them (Darling-Hammond, 2010). An important component of retaining beginning teachers is an effective and comprehensive induction program (Villar, 2004). The types of induction support most positively associated with retention include intensive mentoring (Stanulis & Floden, 2009; Wang, Odell, & Schwille, 2008), common planning time and regularly scheduled collaboration with other teachers (Smith & Ingersoll, 2004), an external network (Ingersoll, Smith, & Dunn, 2007), quality support from administration (Stockard & Lehman, 2004), and adequate instructional resources (Johnson & Birkeland, 2003).

The VCU SEED proposal builds on eight years of knowledge and experience in recruiting teacher candidates (called residents) and preparing them through an intensive, school-based teacher preparation model guided by the National Center for Teacher Residencies (NCTR) Seven Principles of Teacher Residencies. These principles were derived from the literature on developing and retaining effective teachers in urban schools and form the basis of the theoretical model that guides the RTR program (Berry, Montgomery & Snyder, 2008). The seven principles are: (1) tightly weave education theory and classroom practice together; (2) focus on learning alongside an experienced, effective mentor; (3) group teacher candidates in cohorts; (4) build constructive partnerships with districts, schools, communities, universities, and unions; (5) serve school districts; (6) support residents once they are hired as teachers of record; and (7) establish and support differentiated career roles for veteran teachers.

Teacher residency programs combine the best of traditional and alternate route teacher preparation programs, ensuring that outstanding candidates are well-prepared to make a positive impact on student learning on their very first day as teachers of record. The RTR teacher preparation model combines the NCTR residency principles with New Teacher Center (NTC) mentoring support for both residents and graduates. The NTC mentoring model was originally designed as induction support for beginning teachers. RTR has adapted it for pre-service teachers, providing an exceptional approach to preparing and supporting effective teachers (Absolute Priority 1). The NTC support throughout the residents' preparation and early teaching careers is central to the RTR model. Specifically, the **RTR/NTC program components include**:

- **Targeted recruitment and selection of residents aligned with district needs:** Candidates are accepted based on an academic major, a 3.0 GPA, and completion of a rigorous on-site selection process conducted by VCU and district professionals.
- **An intensive medical-style residency in which residents co-teach alongside a master teacher for an entire year.** The residency year begins on the first day that teachers report to work and ends on the last day of school, allowing residents to scaffold their learning through an extended period of well-supervised clinical practice guided by both university faculty and master teachers. This year-long integration of theory and practice is distinct from traditional programs in which classroom-based practicums typically start halfway into the program.
- **A rigorous selection process and training for mentor teachers** that includes unannounced classroom observations, 8 full days of NTC mentor-teacher training, and monthly mentor forums to enhance their coaching skills.
- **A master's degree and weekly seminars** that integrate the theory and instructional strategies learned in coursework with the reality of urban classrooms. VCU faculty provide three semesters of master's level coursework designed to address challenges specific to the urban classroom, using evidence-based practices as part of our teacher preparation programs. Appendix B provides documentation of VCU's eligibility as an applicant and specific examples of instructional practices found in VCU coursework aligned with the What Works Clearinghouse (WWC) Practice Guides.
- **Post-residency support from an NTC-trained content-specific Career Coach** who works with residents at least one hour a week for the first two years of their career.

The VCU SEED proposal provides an exceptional approach to Absolute Priority 1, Supporting Effective Teacher Development, and Competitive Preference Priority, Promoting

Science, Technology, Engineering, or Math (STEM) Education, by enhancing and expanding RTR teacher recruitment, preparation, and support to high needs schools across three additional school districts; enhancing science and mathematics (math) content knowledge and teaching skills for elementary and special education teachers; and providing required coursework and induction support for provisionally licensed math and science teachers. The evaluation of this enhancement and expansion of RTR to other school districts and to provisionally licensed STEM teachers will provide critical data on how the RTR model can be expanded to different types of high-need schools and school districts and strategies others can use to implement this model within their unique context.

Based on strong theory, the logic model in Appendix E, and data on the staffing needs of our partner LEAs, the VCU SEED objectives focus on recruiting, preparing, licensing, and retaining effective teachers, especially in STEM fields, within our partner LEAs through expanding and evaluating the impact of the RTR and the NTC model. We have four objectives:

Objective 1: Recruit, prepare, and support 190 new RTR teachers over 3 years (338 over 5 years) in our partner LEAs based on their highest staffing needs. Each year we will confer with the Human Resources offices of our partner LEAs to determine what content areas and grade levels are the highest need. Table 3 below shows current needs.

Table 3: Positions filled by provisionally licensed teachers or long-term substitutes
(2017-2018 as reported by school division)

School District	Special Education	Math	Science	Elementary	English	Social Studies
Richmond	30	13	12	58	11	11
Petersburg	1	3	4	28	0	1
Chesterfield	99	17	17	20	9	9
Henrico	66	28	12	35	12	7

Continuing to recruit and prepare teachers in critical shortage areas for RPS and other LEA partners will not only help the school districts meet their staffing needs, it will also allow us to continue to study the impact of the residency model on teacher effectiveness, teacher retention, and student achievement. With the end of our current federal grant in September 2019, five cohorts will have completed their 3-year service agreement in RPS. With the expansion into two other school districts in the 2018-2019 school year, it is imperative that we continue to evaluate the impact of the RTR model and what adaptations may be needed as we move into different contexts. In Year 2, we will add an additional LEA partner, HCPS, and we expect to add at least one rural LEA in the future (see Eric Jones letter of support). Testing the RTR model for our state in three distinct LEA settings (urban, suburban with concentrations of poverty, and rural) is especially timely as the Virginia General Assembly is considering expanding funding for residencies to hard-to-staff schools outside of Petersburg, Norfolk, and Richmond (see letter of support from Delegate Kirk Cox, Speaker of the House). Kneebone and Berube in *Confronting Suburban Poverty in America* (Washington: Brookings Institution, 2013) provide a further rationale for expanding RTR into suburban LEAs with concentrations of poverty. “Between 2000 and 2008--2012, the number of suburban poor living in distressed neighborhoods grew by 139 percent—almost three times the pace of growth in cities. " (p. 4).

Outcome: Improvement in teacher effectiveness, student achievement, and retention in high-needs schools.

Objective 2: Strengthen the teaching of math and science through summer professional development opportunities for elementary and special education (SPED) teachers. RTR residents who plan to teach high school math or science are required to have a major in those fields. If they choose to teach middle school math or science, they must have at least 21 hours in those fields as designated by the state. However, we recognize that in our other two tracks (SPED and elementary), support is needed to strengthen the teaching of STEM areas.

RTR is a provider in the NCTR Transformational Center funded through the Gates Foundation. As such, a Teacher Prep Inspection (TPI) Team has evaluated the RTR program for the past two years. Our most recent evaluation indicated that residents in our SPED track need more instruction in math and how to teach it effectively. Historically, elementary teachers also have been weak in both math and science content. For this reason, RTR will offer additional summer professional development opportunities for elementary and SPED teachers so they can receive additional content instruction based on the Virginia Standards of Learning. We will develop one week summer institutes that deliver content and pedagogy to these teachers. The institutes will focus on very specific grade bands in math and science (K-2, 3-5, middle school, high school). We will engage mathematics and science faculty and classroom teachers in the development and delivery of these institutes. We project that 120 teachers from our partner LEAs will participate in these summer institutes each year (15 per year for each of the 8 grade bands listed above). Therefore, VCU SEED will support 360 teachers in three years and 600 teachers over five years if we receive funding beyond the original grant period.

Outcome: Stronger professional practice and math and science content knowledge among elementary and SPED teachers.

Objective 3: Provide coursework and tutoring for licensure tests for provisionally licensed STEM teachers in our partner LEAs moving them towards full licensure. The RTR program and an NSF-funded Noyce Program support local LEAs in filling teaching positions for the shortage areas of science and math teachers in the Richmond Metro region. However, the districts are challenged to fill all of their STEM positions with fully licensed teachers (see Table 3) and have had to recruit and hire individuals on a provisional license. To further support our partner LEAs, we propose providing the required licensure courses with content and pedagogy supports to these teachers. The Virginia Department of Education (VDOE) allows districts to award a three-year, non-renewable provisional license to individuals who hold a baccalaureate degree from a regionally accredited institution and satisfy one or more specific endorsement areas (teaching areas). These individuals must pass Praxis II for their endorsement area and must within the three years complete 3-credit hours in each of the following areas: (1) Human Growth and Development; (2) Curriculum and Instructional Procedures; (3) Classroom and Behavior Management; (4) Foundations of Education; and (5) Reading in the Content Area.

VCU through the *Virginia Initiative for Science Teaching and Achievement* (VISTA, i3 funded project) provided two of the five required courses--secondary science methods I and secondary science methods II (Classroom Management)--as part of the Secondary Teachers Program. The secondary program, comprised of these two courses and coaching model, received recommendation with reservation from the WWC in 2017 (https://ies.ed.gov/ncee/wwc/ReviewedStudies#/FWWFilterId:2,RatingId:2,OnlyStudiesWithPositiveEffects:false,SetNumber:1). Additionally, the program design and instructional model for support used in the VISTA Secondary Teachers received recognition from *Change the Equation* and was entered into their STEMworks Database (https://stemworks.wested.org).

We estimate that VCU SEED will support 60 provisionally licensed STEM teachers over the course of three years (10 science and 10 math per year) and 100 teachers over five years. In addition, we know that many of the provisionally licensed teachers in STEM and other content areas have difficulty passing the state licensure tests, especially the Virginia Communications and Literacy Assessment (VCLA) and Praxis Core Math. Therefore, we will provide tutoring support for applicants to RTR, STEM provisional teachers, and other provisionally licensed teachers (45 per year) within our partner LEAs. During 2017-2018 we hosted eight review sessions for both Praxis Core Math and the VCLA, along with individual tutoring, for RTR applicants who needed these services. We also provided this support to provisional teachers in PCPS. Our success rate for VCLA is 100% and 75% for Praxis Core Math. Results for the current PCPS expansion are not yet available.

Outcome: Increased numbers of fully-licensed math and science teachers in partner LEAs.

Objective 4: Implement a two-year induction model for provisional science and math teachers to support and retain these teachers. The current shortage of highly qualified secondary science and math teachers is linked to low retention rates. Of particular note, Ingersoll (2007) argued that the shortage of science and math teachers is due to the large number of teachers (40-50%) who leave the profession within their first five years of teaching. Ingersoll identified several contributing factors including low salaries, lack of support from school administrations, student discipline problems, and the lack of teacher input into school decision making. This is supported by more recent work by Darling-Hammond et al. (2016). The fact that such a high proportion of math and science teachers leave the profession long before retirement, demonstrates the critical need to curtail these losses through improved induction experiences.

To address retention, VCU SEED will provide an NTC-trained career coach who will work with the STEM provisional teachers for at least an hour a week modeling teaching strategies and providing support in lesson planning, classroom management, and other skills they may need. Through the use of the NTC formative assessment tools, the career coach also will be able to collect data on the practice of these provisional teachers to help monitor and facilitate their growth. In addition, VCU SEED will leverage the expertise VCU has acquired through our Noyce grants by including the provisional STEM teachers in an induction program currently implemented for our VCU Noyce Phase II and upcoming Phase III Scholars. Through Noyce funding, RTR math and science graduates will also participate. Novice teachers report the sessions are helpful and that they learn from their colleagues through the use of structured protocols that focus on classroom management, working with diverse students, and school leadership support.

The induction program will consist of the teachers attending monthly dinner meetings that will provide a forum for sharing instructional and school-related issues. Members will be trained in the use of the Tuning Protocol (McDonald, Mohr, Dichter, & McDonald, 2007) to discuss lessons, projects, pedagogical, and management issues. The Tuning Protocol is a problem-solving tool that allows teachers to receive and reflect on feedback on their practice (McDonald et al., 2007). This training will provide teachers with a methodology to confront and seek solutions to a range of teaching-related issues in a supportive environment. The sessions will be facilitated by trained program staff. The focus of the induction sessions will evolve to meet the needs of the teachers over a two-year period.

Outcome: Improvement in STEM provisional teacher retention in high-needs schools.

A. 2a. A Closer Look at Quality--*WWC Evidence and Impact Data*. The RTR mentoring and induction component for residents and first- and second-year teachers is aligned with the nationally recognized New Teacher Center (NTC) mentoring model. Two federally funded quasi-experimental studies of the NTC mentoring model document its positive impact on student achievment. The effectiveness of the NTC mentoring model has met the U.S. Department of Education's Work Works Clearinghouse (WWC) standard for Randomized Controlled Trial (RTC) studies and as such meets the moderate tier of evidence as defined by the federal government (see NTC Evidence of Effectiveness Form). These studies were conducted in high poverty/high-minority schools, the same type of schools VCU SEED will serve. Through a 2006

State Council of Higher Education in Virginia (SCHEV) grant, CTL completed the rigorous process of becoming licensed to conduct the NTC training for Virginia.

All Clinical Resident Coaches (CRC)s and Career Coaches participate in the NTC powerful *Professional Learning Series for Mentors and Coaches* that focuses on the knowledge, skills, and understandings critical for those who work with beginning and veteran teachers to improve instruction. In addition to the evidence of impact on student achievement provided by the RCTs of the NTC mentoring model used by RTR, there is ample evidence that RTR is addressing critical shortage areas in RPS high-needs schools. Graduating our first cohort in 2012 we have prepared 105 teachers which will grow to 142 with June 2018 graduation. RTR graduates teach in 31 of 43 RPS schools reaching over 9,500 students. RTR prepared over half of the fully licensed secondary and elementary SPED teachers hired by RPS in 2015-2016, 100% of the fully licensed social studies and fully licensed elementary SPED teachers hired by RPS for the 2017-2018 school year, and 21% of the fully licensed elementary teachers hired this year. In addition, in each of the past three years more than 40% of our residents have been people of color, demonstrating our commitment to and success in diversifying the teaching force.

Impact of RTR on Teacher Effectiveness, Student Learning, and Retention: RPS principals in a 2017 survey rated 78% of RTR graduates extraordinary or above average in teaching effectiveness compared with other teachers of comparable experience and 93% were rated as contributing positively to school culture. In our 2014 evaluation, students of RTR graduates teaching science had significantly higher Standards of Learning scores than students of their non-RTR counterparts. Additionally, preliminary findings from an ongoing 2017-18 study of the new RTR Liberal Studies in Elementary Education (LSEE) strand indicate that elementary students (grades 2 to 5) of RTR graduates (n = 175) are making faster gains in reading (oral reading fluency) and mathematics (computation) compared students of non-RTR teachers (n = 180) on curriculum-based measures (Deno, 2003; Fuchs & Fuchs, 2005). The RTR model also adds value by improving the teaching skills and commitment of veteran teachers. Additionally, the RTR content-specific career coaches hired to mentor RTR alums during the first two years of their teaching careers currently mentor all RPS beginning teachers in English, science, social studies, and SPED, providing an additional support for student achievement. In terms of teacher retention, while nationally 44% to 74% of teachers leave within the first 3 years in urban schools (Ingersoll, 2004; Papay et al., 2017), 96% of RTR graduates have been retained for one year, 90% for two years, and 77% of RTR graduates have been retained for 3 or more years.

RTR's impact is recognized at the local, state, and national levels. Community support for RTR continues to grow with new funding from the Robins Foundation, Altria, and The Community Foundation. Virginia's Joint Legislative Audit and Review Commission (JLARC) recommended RTR as a long-term strategy for improving low performing schools in a report to the General Assembly (*Low Performing Schools in Urban High Poverty Communities*, June 2014). In 2016, RTR received Fiscal Year 15 state surplus funds that enabled us to add the elementary track and recruit more residents. In April 2017, the General Assembly appropriated $1 million for teacher residencies in Petersburg, Norfolk, and Richmond, doubling the amount of state support for this critical work. RTR was featured in the April 2017 *U.S. News and World Report* issue on BestGrad Schools in America. As part of a Bill & Melinda Gates Foundation initiative to transform teacher preparation, RTR was selected as an original provider with the National Center for Teacher Residencies (NCT) Transformational Center, one of five centers funded in the nation, affirming the innovative work that the VCU School of Education is doing in partnership with local LEAs to prepare highly effective urban teachers.

As a result of the success of RTR, a small foundation-funded pilot with three residents is being conducted this year in one elementary school in CCPS. During 2018-2019, CCPS will add two more residents in this school. Through state, district, and private foundation funding, PCPS will be piloting the RTR model with 4 residents each in two elementary schools.

A. **2b. A Closer Look at Intensity and Duration of the Selection, Preparation, and Support for RTR Teachers and Other VCU SEED Services:** Individuals with at least a bachelor's degree are accepted into RTR based on an academic major, a 3.0 GPA, a written application, and the completion of a rigorous on-site selection process that includes: (1) teaching a mini-lesson in front of students; (2) participating in a group discussion activity around an urban issue; (3) a personal interview conducted by both a VCU and district professional; and (4) an on-demand writing sample in which candidates respond to feedback on their mini lesson to assess their writing skills, self-reflection, and coachability. By including district professionals in all aspects of the Selection Day assessments, RTR ensures that residents will be a good fit for the district before they are invited to become a part of the program**.** We also are the only residency program in the nation that invites the students participating in the mini-lesson to evaluate the candidates during Selection Day.

VCU faculty and RTR staff with theoretical and practical knowledge of effective urban teacher preparation, effective schools, and mentoring, have been central to reworking the master's coursework (theory) and designing the residency year experiences (practice) to ensure that RTR graduates will be effective urban teachers. After an intensive summer of 16-21 credit hours of graduate-level coursework, residents spend an entire academic year in a high-needs classroom, co-teaching alongside master teachers four days a week and spending at least one evening and Fridays applying theory to practice through rigorous coursework. CRCs are selected through a careful screening process that includes: (1) a written application with recommendations from administrators; (2) evidence of student learning gains; (3) strong content knowledge and pedagogical skills, including the ability to differentiate instruction to meet the needs of students; (4) use of formative and diagnostic assessments to improve student learning; (5) unannounced classroom observations; and (6) post-observation debriefing interviews to determine the extent to which the teacher is a reflective practitioner. CRCs participate in eight full days of NTC mentor teacher training and monthly mentor forums. These forums are designed to: (1) continue to strengthen mentoring/coaching skills learned during the formal NTC training; (2) reinforce and calibrate the use of NTC formative assessment tools and mentor protocols; (3) provide a supportive environment where CRCs can discuss the challenges they face in working with residents and engage in problem-posing/problem-solving activities; (4) identify additional training needs; and (5) provide time for reflection and practice in refining coaching skills. CRCs are provided a $3,500 stipend to compensate them for summer training and the additional work they undertake in their role as teacher educators. In 2017 data collected through NCTR to evaluate our program, 96% of CRCs report that being an RTR mentor makes them a more effective teacher.

In addition to the accomplished CRCs, RTR provides a residency coordinator/site manager who serves as a liaison between school sites and RTR to monitor the implementation of the program. The residency coordinator supports the CRC/resident partnership by supporting the CRCs' use of the NTC electronic formative assessment tools (with an emphasis on the coaching cycle tools) to document resident growth; monitoring and facilitating ongoing formative and summative assessments of residents; and troubleshooting problems that arise at the school site.

Once hired as the teacher of record, RTR graduates also receive ongoing support and professional development opportunities, including a content-specific Career Coach (CC) who works with them at least one hour each week through their first two years as teachers of record. CCs also participate in the same NTC training and monthly professional development forums as the CRCs. Training veteran teachers as CRCs and Career Coaches not only enhances the skills of exemplary teachers, but also provides meaningful leadership roles that will lead to increased retention of the districts' most outstanding teachers. The thoughtful, deliberate development of leadership skills in RTR graduates also will ensure a strong pipeline of teacher leaders.

Table 4. Summary of Intensity and Duration of VCU SEED Services

Service	Description of intensity and duration
Preparation and support for new RTR teachers	• In Y1, **residents** learn theory and best practices in urban education through three semesters of master's coursework. Friday Seminars in the fall blend theory with practice. • In Y1, **residents** co-teach for an entire year with a carefully selected and NTC-trained CRC (4 days a week in fall; 5 days a week in spring). A Gradual Release Calendar helps residents scaffold their learning with the CRC as the lead teacher in the fall and the resident as the lead teacher in the spring; an extended period of solo teaching takes place from January – April; CRCs continue to collect data on residents' practice during this time and provide instructional coaching. • In Y2, **residents become teachers of record,** supported at least an hour a week by an NTC-trained Career Coach. • In Y3, **RTR graduates** continue to receive support from the Career Coach at least an hour every other week, unless more support is needed.
Preparation and support for CRCs (mentor teachers) and Career Coaches	• In Y1, **new CRCs and Career Coaches** receive 8 full days of NTC training to learn how to effectively support a resident/graduate. • In Y2 and Y3, **veteran CRCs and Career Coaches** participate in 2 full days of NTC training to enhance their skills as instructional coaches. • In Y1, Y2, and Y3, **all CRCs and Career Coaches** attend 3-hour after school monthly forums to continue to strengthen their mentoring/coaching skills and discuss challenges. • In Y1, Y2, and Y3, **all CRCs and Career Coaches** get individual, differentiated support from a Residency Coordinator who observes coaching sessions, models the use of formative assessment tools, and assists as needed. School visits take place at least once every other week to provide whatever support the **CRC or resident** may need.

Math and science professional dev.	• In Y1, Y2, and Y3, eight 40-hour summer institutes in math & science content and pedagogy are provided to **elementary and SPED teachers (RTR and non-RTR).**
Support for provisionally licensed teachers	• In Y1, Y2, and Y3 five courses (45-contact hours) needed for full licensure are offered to **STEM provisional teachers**. • In Y1-Y3, tutoring for **STEM and other provisional teachers** for VCLA and Praxis Core Math (eight 2-hour sessions for each test; additional individual tutoring as needed) • In Y1 and Y2, **provisional STEM teachers** receive support for at least an hour a week from an NTC-trained Career Coach during their first two years of teaching. • Y2 and Y3, **provisional STEM teachers** receive Noyce induction support (seven 3-hour after school sessions a year) and attend professional math and science conferences.

A.3. Collaboration of Project Partners to Maximize Effectiveness of Project: The strong partnership between VCU and RPS, through which the RTR model of teacher preparation and support was developed, serves as the foundation for the VCU SEED expansion of RTR to additional LEA partners. As noted, VCU has a long history of working collaboratively with regional school districts through the Metropolitan Educational Training Alliance (META) and the Metropolitan Education Research Consortium (MERC). These long-standing and on-going partnerships will maximize the effectiveness of the VCU SEED project services. Evidence of the extent to which all partners are committed to bringing to the table resources that will ensure the success of the VCU SEED proposal can be found in the letters of support. All LEA partners have agreed to a shared investment model for sustaining the expansion of the RTR model by providing the stipends for the CRCs, costs of NTC training and monthly mentor forums, career coaches, and access to the data for the research/evaluation of the project. The VCU School of Education is providing a cohort tuition rate for residents. MERC will conduct the rigorous evaluation of the VCU SEED proposal, ensuring that the results will be used for continuous improvement through this expansion time, and shared within our region to school districts who have expressed interest in joining the VCU SEED proposal, including rural districts. The expertise that CTL has developed through its long history of providing NTC support to RTR residents and beginning teachers adds further credence to the ability of the project partners to maximize the effectiveness of the project services. Finally, the expertise that the VCU School of Education has developed through its highly successful Noyce grants demonstrates the leveraging of the expertise and commitment of all partners to the success of the VCU SEED project.

A.4 and A.5. Serving those with the Greatest Need: The VCU SEED proposal is partnering with two of the three highest-need school districts in Virginia—RPS and PCPS. In addition, the two suburban districts that will be served in VCU SEED have individual schools within their districts that mirror the demographics of RPS and PCPS (see Table 1). Objective 1 of the proposal will address the most urgent need of these hard-to-staff schools—ensuring that highly-qualified teachers will be prepared for these settings. The RTR/NTC model has proven to be effective in recruiting, preparing, and supporting individuals with a passion for working in high-needs schools so that they will be retained. Expanding the model within and beyond RPS is a well docmented need as evidenced by the number of positions filled by long-term substitutes or provisionally licensed teachers (see Table 3) and by the financial commitment that all LEA partners are making to fund residents in their hard-to-staff schools. Objective 2 addresses the need identified by RTR graduates and RTR evaluations for additional math and science content and pedagogy for elemenatary and SPED teachers. Objective 3 and 4 address the need to ensure that provisionally licensed STEM teachers are provided the coursework, tutoring for licensure tests, and induction support to ensure that they can be fully licensed and retained.

Section B: Significance

B. **1. Magnitude of the Results of the VCU SEED Project:** As stated earlier, the VCU SEED proposal builds on eight years of experience in addressing critical shortage areas in RPS. In our

2014 TQP grant proposal, we argued that there was strong support among Virginia's state and national leaders for RTR. They believed that the teacher residency model held great promise as a long-term, sustainable approach to meeting the staffing needs of high-needs schools, reducing teacher attrition, and increasing student achievement. Momentum was building within the state to support teacher residency programs as evidenced by the June 2014 JLARC report to the General Assembly that recommended RTR as a long-term strategy for staffing and improving low-performing schools. We argued that the longitudinal data that a continuation of RTR in RPS would provide could help to consolidate the political support necessary to generate more local and state funding streams that would enable RTR to continue after federal funds end.

This has, in fact, happened. The Virginia General Assembly appropriated $500,000 in 2015 to expand the residency model to Petersburg and Norfolk which, along with RPS, are Virginia's most challenged school systems. In 2017, the General Assembly increased funding to $1 million and included RPS as an eligible partner. This enabled us to implement an elementary residency track in RPS in the 2016-17 school year. Because of Virginia's critical teacher shortages in all areas, there is a now a need to determine how the RTR model can be expanded to other high-need LEAs—urban, suburban with high poverty/high minority schools, and rural school districts. While the General Assembly has provided some funds to expand RTR into PCPS, the 2018-2019 pilot is very small—8 elementary residents (4 each in two schools).

However, these funds do not include a robust evaluation of RTR nor expansion into critical STEM areas at the secondary level. While it is under consideration, there is no state funding yet for suburban or rural LEAs with high concentrations of poverty. The VCU SEED proposal would provide both the roadmap and data needed to help state and local leaders determine how best to target funding for residencies throughout the Commonwealth—and what the LEAs' investment needs to be in a shared investment model. In addition, other universities and LEAs have sought VCU's advice in how to structure residency programs. If funded, this proposal will provide the data needed by state and local policymakers to understand the residency model and possibly expand it into diverse high-need settings. As such, RTR would serve as both a state and national resource for others wishing to implement a residency model within their own unique setting. As detailed in the Project Evaluation, in addition to formative performance feedback and periodic assessment of the project's progress toward the intended teaching outcomes (e.g., # of RTR teachers recruited to high-needs schools, improvements in STEM teaching), the evaluation plan is aligned with WWC standards to gather valid and reliable evidence of the effects of RTR on students' learning in math and science, using a combination of proximal (e.g., curriculum-based measures) and distal (e.g., Virginia annual statewide Standards of Learning/SOL tests) achievement measures.

B. 2. Reasonableness of Costs/Anticipated Results and Benefits: Table 5 below provides an estimate of the number of new and experienced teachers served each year of the proposal. The most costly program, the RTR expansion, will recruit, prepare, and support 190 new teachers over three years (338 over 5 years) in some of the highest needs schools in Virginia and prepare and support 190 CRCs, increasing their skills and commitment to the profession. A federal investment in the VCU SEED proposal will leverage the already strong financial commitment of the General Assembly, our LEA partners, and VCU to scale up the residency model in multiple contexts. Our LEA partners have already agreed to cover the cost of the CRC stipends, eight days of NTC training and monthly mentor forums, career coaches who support the RTR graduates for the first two years of their teaching career, and in the case of CCPS and HCPS, an $18K stipends for their residents. The cost of the resident stipends for RPS and PCPS will be provided through state appropriations and private foundation funding (see Appendix D).

Table 5: Estimated Number of Educators Served

Obj. 1. RTR Expansion —#New RTR teachers	**Y1**	**Y 2**	**Y3**	**Y4**	**Y5**
Richmond	40	40	40	40	40
Petersburg	8	14	18	18	18
Chesterfield	2	8	8	8	8
Henrico		4	8	8	8
Obj. 1. RTR Expansion--#Experienced teachers (CRCs) prepared and supported in all 4 LEAs	50	66	74	74	74
Obj. 2: STEM Summer Institutes (8*15 each)	120	120	120	120	120
Obj. 3: Licensure courses for STEM provisional teachers	20	20	20	20	20
Obj. 3: Tutoring for VCLA & Praxis Math	45	45	45	45	45
Obj. 4: 2-year induction for STEM provisional teachers	20	20	40	40	40
Total Educators Served/Impacted*	305	319	373	373	373

*There will be some overlap with the some of the same STEM provisional teachers served in Objectives 3 and 4.

In addition, VCU SEED also will improve the math and science content knowledge and pedagogy of 360 elementary and SPED teachers over 3 years (600 over 5). Through licensure coursework and induction support (Obj. 3 & 4) we expect to increase the retention of STEM teachers by supporting 60 provisional STEM teachers over 3 years (100 over 5), along with an additional 75 non-STEM provisional teachers in 3 years (125 in 5) through VCLA and Praxis Core Math tutoring support.

Finally, in determining the reasonableness of costs, we have to consider what the costs are to students, school districts, our state, and our nation if we do not do this work. The research is clear. The quality of the teachers in our schools is the most important school-based factor in student achievement (Cochran-Smith et al., 2015; Darling-Hammond, 2008). With the changing demographics of our state and nation—Virginia public schools are now over 50% minority—we can no longer ignore the inequities that exist in our community, state, and nation in providing effective teachers for <u>all</u> students (Virginia Department of Education, 2017).

B. 3. Potential of Incorporation of Project Purposes and Benefits after Federal Funding:

The impact of the proposal is far greater than the number of teachers prepared, licensed, and supported. As noted in letters of support from Senators Mark Warner and Tim Kaine, Representative Donald McEachin, Delegate Kirk Cox, Speaker of the House, Mr. Atif Qarni, Secretary of Education for Governor Ralph Northam, Dr Steven Constantino, Acting Superintendent for Public Instruction in Virginia, Dr. Peter Blake, Executive Director of the State Council of Higher Education in Virginia, and Jim Livingston, President of the Virginia Education Association, the VCU SEED proposal is considered essential in helping to meet our state's most critical teaching shortages, not only in our partner LEAs, but also as a model for expanding residency programs throughout the Commonwealth of Virginia. The strong financial commitment of the state, LEAs, and VCU to a shared investment model ensures that the work funded through VCU SEED will continue after federal funds end.

B. **4. Dissemination Strategies**: VCU is already seen as a leader in designing and implementing a teacher residency model and improving STEM instruction, both in our state and nationally. The RTR director, Dr. Terry Dozier, advises multiple LEAs and universities as they seek to implement a residency model in their localities. She presented at the 2017 Governor's Conference on Teacher Shortages, the USDOE Teach to Lead Summit on Teacher Preparation, and to the General Assembly education committees and other policymakers. In addition, VCU hosted a statewide Sustainable Residency Funding Symposium in January, attended by representatives from 9 universities, 22 LEAs, private foundations, advocacy groups, and state policymakers. The symposium has already resulted in all of our LEA partners contributing significant dollars to support residency programs in their districts as noted earlier (see letters of support). VCU faculty involved with RTR's implementation and program evaluation have disseminated findings at national and regional venues, including the annual American Education Research Association (AERA) conference and the Eastern Evaluation Association conference.

STEM work at VCU has been recognized at the national level and information disseminated locally, regionally, and nationally. The VISTA (i3 funded, round 1) project was recognized by *Change the Equation* and entered into their STEMworks Database (https://stemworks.wested.org) and was highlighted by the U.S. Chamber of Commerce, in February 2014, as an excellent example of a nonprofit building strong partnerships. The VCU Noyce project is completing its 10th year and recently was awarded funding for an additional 5 years (NSF DUE#1340012 and 1758385). Presentations about this work have occurred at the Noyce Regional Conferences in South Carolina and Alabama, National Association for Research in Science Teaching (NARST), Association of Science Teacher Educators (ASTE), National Council of Teachers of Mathematics (NCTM), American Educational Research Association, and state conferences for math and science teachers.

Dissemination of the VCU SEED work will continue at regional, state, and national levels. In addition, results of the VCU SEED will be shared annually at the MERC research conference attended by educators from across the state. This work, along with other aspects of the project, will be shared at the semi-annual meetings of the Virginia Association of Colleges of Teacher Education and Virginia Association of Teacher Educators. Edmondson will share results of the program with educators at annual conferences of the AERA, National Association for Research in Science Teaching (NARST), the Association of Science Teacher Educators (ASTE), the National Council for Teachers of Mathematics (NCTE) and other professional societies. Additionally, papers will be published sharing the impact of the work with education research and practitioner communities.

Because the VCU SEED project is intentionally designed to test the implementation of the RTR model in diverse contexts and its impact on teacher effectiveness, retention, and student learning, the project design incorporates a study of strategies that others can use to implement this model within their unique settings. In addition, the STEM work we will do strengthening math and science content and pedagogical knowledge for elementary and SPED teachers will be a focus of our dissemination efforts to those interested in the RTR model. Expanding the RTR partnership to support provisional STEM teachers meets a critical need within our state. Determining its impact on teacher retention and student learning will be essential if LEAs are to support and sustain this work after federal funding ends.

Section C: Quality of Management Plan

C. **1 and C.2. Measureable Project Goals and Management Plan**: Below is a work plan to implement all project goals with clearly specified and measurable objectives and outcomes .

Table 6. Project goals, workplan, objectives, and measureable outcomes

Project Goal: To recruit, prepare, license, and retain effective teachers, especially in STEM fields, by expanding the RTR/NTC model to three additional school districts and evaluating its impact on teacher retention and student achievement in high-needs schools.		
Objective 1: Recruit, prepare, and support 190 new RTR teachers over 3 years (338 over 5) in our partner LEAs based on their highest staffing needs.		
Major Project Milestones	**Timeline**	**Persons Responsible**
Conduct Selection Day assessment activities	November 2018 & March 2019	RTR Director of Recruitment and Student Affairs
Recruit CRCs	Spring 2019	Residency Coordinators/Site Mangers
Residents begin their master's coursework	Summer 2019	Residents/VCU faculty
Place residents with CRCs for residency year	Summer 2019	Residency Coordinators/Site Managers
Provide NTC training & ongoing support to CRCs and CCs	Summer 2019--spring 2020	NTC Trainers//Residency Coordinators
Residents complete master's coursework	Spring 2020	Residents/VCU faculty
LEA partners hire RTR graduates	Spring/Summer 2020	LEA HR Directors
Provide ongoing support for RTR grads for at least the first two years of their careers	Fall 2020--spring 2021	LEA Career Coaches

<u>Outcomes of Objective 1</u>: **RTR Model Expansion** (*measured by RTR/NTC coaching participation log)* • Expansion to three additional LEAs • Increase the number of residents served per year regionally • Increase the number of CRCs trained per year **Teacher Quality and Effectiveness** • Improved professional practice among participating teachers *(measured by classroom videos, resident interviews/focus groups, annual teacher evaluation survey)* • Improved teacher content and pedagogical content knowledge *(measured by math and science content knowledge and pedagogical concept inventories)* • Improved coaching skills among CRCs and CCs *(measured by resident-mentor dyad weekly logs, mentor survey)* **Student Achievement** • Improved achievement in math, reading, and science for students on proximal measures (3x per year; *measured by curriculum-based measures*). • Improved achievement in math, reading, and science SOL scores for students (annually, *measured by VA SOL reading, math, and science scores*) • Improved student attitudes towards math and science (*measured by Student Attitudes toward STEM surveys)* **Teacher Retention** *(measured by retention data; e.g., hire date – present; and categorically :move, stay, leave)* • Improved retention rates of new teachers across target levels and subject focus (i.e., STEM, SPED, Elementary).		
Objective 2: Strengthen the teaching of math and science through summer professional development for elementary and special education teachers.		
Recruitment of Participants	Spring of 2019, 2020, and 2021	Edmondson, Kirk, and GA
Development of content sessions for each grade band	Spring of 2019, 2020, and 2021	Kirk and mathematicians and scientists who will co-facilitate
Delivery of 8 sessions	Summer of 2019, 2020, and 2021	Edmondson, Kirk, mathematicians, and scientists
<u>Outcomes of Objective 2</u>: Teacher Quality and Effectiveness • Improved professional practice among participating teachers *(teacher interviews/focus groups)* • Improved teacher content and pedagogical content knowledge *(measured by math and science content knowledge and pedagogical concept inventories)*		
Objective 3: Provide coursework and tutoring for licensure tests for provisionally licensed mathematics and science teachers in our partner LEAs to move them towards full licensure.		
Recruitment of Participants	Late summer and early fall 2018, 2019, 2020	Edmondson in collaboration with the districts
Coursework delivery and completion	Fall, spring, summer 2019-2022	Edmondson and other content specific faculty
<u>Outcomes of Objective 3</u>: Increase number of fully licensed mathematics and science teachers *(data on fully vs. provisionally licensed math and science teachers obtained from LEAs).*		
Objective 4: Implement a two-year inducation model for provisionally licensed science and mathematics teachers in our partner LEAs to support and retain these teachers.		
NTC support for provisional STEM teachers	Fall-spring each year starting in Years 1	NTC-trained STEM career coach

Induction Meetings	Fall-spring each year starting year 2; 7 sessions per year	Edmondson and GA
Outcomes of Objective 4: Teacher Retention *(measured by retention data; e.g., hire date – present; and categorically:move, stay, leave)* • Improved retention rates of new teachers across target levels and subject focus (i.e., STEM, SPED, Elementary).		

Note: Four additional cohorts of residents will complete the same process outlined in Objective 1 above. In *red* are secondary data obtained from Virginia DOE and LEAs; in *blue* are primary data collected by the Virginia Commonwealth research and evaluation team. See Table 8 for full description of measures.

C. **3. Procedures for Feedback and Continuous Improvement:** Over the past eight years, RTR has been developed through continuous improvement methods. Data on the program are collected through mid- and end-of year NCTR surveys and focus groups with residents, CRCs, and career coaches conducted as part of our basic evaluation plan. In addition, as part of our membership in the NCTR Transformational Center, for the past two years we have engaged in a week-long assessment of our program by a 4-member Teacher Preparation Inspection (TPI) team who observe our residents, CRC-resident coaching sessions, review VCU course syllabi, and interview residents, RTR graduates, principals, CRCs, career coaches, VCU course instructors, RPS central office staff, and RTR staff. Stakeholder meetings are held at least once a year to review data and to solicit suggestions for changes from all RTR participants and partners. Feedback from these various data sources has led to significant changes to RTR. For example, after the first year of implementation, data from the NCTR surveys revealed the need to develop an ongoing mechanism to provide interaction with RTR staff before the residency year and to better prepare residents for the transition from VCU coursework to their work in RPS classrooms. As a result, an RTR Summer Seminar Series and monthly seminars during the residency year were added. In addition, a Summer Teaching Academy for RTR graduates, CRCs, and other district colleagues will be launched in June focused on topics that our graduates have consistently identified as areas in which they would like more preparation. This summer the week-long workshops will focus on Restorative Justice, English Language Learners, Collaborative Teaching and Universal Design of Learning, and Instructional Technology. We plan to seek feedback from participants on both the relevance of these workshops and other topics we can include in the future. Last year's TPI evaluation identified a weakness in our secondary classroom management course. As a result, we totally redesigned the course and ensured that it is co-taught by an RTR graduate or CRC with specific attention towards management issues unique to high-need urban classrooms. We were pleased that this past March, the TPI team cited our secondary classroom management course as "good." We also made changes to our NTC mentor teacher training schedule and mentor forums based on last year's TPI feedback that indicated that our CRCs were not focusing enough on student learning in their coaching sessions. This year's visit recorded some improvement in this area, but we are continuing to revise our mentor forums and training to stress more explicitly the importance of CRCs making the connection to student learning as they work with their residents. RTR's immediate response to program evaluation data and requests from graduates demonstrate our ongoing commitment to assessing and responding to the needs of our graduates and improving the effectiveness of our program. This focus on using different forms of feedback to inform continuous improvement efforts will continue as RTR expands to other localities and to the STEM-focused aspects of the VCU SEED proposal.

Continuous improvement has been ensured through an RTR Leadership Team that meets at least once a month to monitor the progress of RTR and review ongoing formative assessment and evaluation data to determine needed revisions to program components. With the expansion into other LEAs, an RTR Advisory Board will be created to provide a forum to discuss evaluation data and implications for program adjustments. The board will include the RTR director, SEED project directors for each LEA partner, a VCU representative, and liaisons for each partner school district. In addition, CTL oversees the day-to-day governance and management of RTR. While VCU serves as CTL's fiscal agent, CTL is not a part of the School of Education's teacher preparation program and has a track record of bridging K-12 and higher education through coordination of META, a partnership between VCU and four local school districts (including RPS, CCPS, and HCPS).

Qualifications of Key Personnel and Responsibility for Project Implementation:

Therese (Terry) A. Dozier, Project Director: Dr. Dozier will oversee all aspects of the project. She will be responsible for ensuring that all project activities are developed and implemented according to prescribed timelines, directing the efforts of project staff, ensuring that all funds are expended in a timely manner, and representing the project at the Project Director's meeting. Dozier's background makes her uniquely qualified to ensure the quality of services and ongoing collaboration with all LEA partners. Dozier directs both CTL and RTR and chairs META. She has served as PI for federal, state, and private foundation grants totally more than $23 million. Prior to joining the VCU faculty, Dozier served as Senior Advisor on Teaching to former U.S. Secretary of Education Richard W. Riley, serving as the Clinton Administration's top policy advisor on all teaching issues. As such, she was responsible for the development and implementation of a strategic plan to improve teacher recruitment, preparation, and ongoing professional development, including overall leadership in research, evaluation, and data collection on teacher quality.

Dr. Elizabeth Edmondson, Co-Director: Dr. Edmondson will lead the summer institute development for science and math (objective 2), coordinate the recruitment of science and math teachers who are provisionally licensed for participation in the licensure coursework (objective

3), and coordinate the induction model for 60 teachers (objective 4). Edmondson’s background involves teaching high school science, and working with preservice and inservice teachers across the K-12 spectrum. She currently is PI for VISTA ELIS and MELIS, VDOE Math and Science Partnership grants, involving professional development and coaching support in science and literacy for K-8 high-needs schools that are a part of this VCU SEED grant. She is also the PI for the VCU Noyce Phase II grant and was recently awarded Phase III that involves the induction model to be used (Objective 4). **(**Full resumes for the personnel above and other key personnel can be found in Appendix A.)

Section D: Quality of the Evaluation Plan

The Metropolitan Educational Research Consortium (MERC), an independent research center based within the VCU School of Education, will coordinate the evaluation. MERC conducts evaluation and applied research in the metro-Richmond area in collaboration with local LEAs, institutions of higher education, nonprofits, and state agencies including the VDOE and the State Council of Higher Education in Virginia. MERC’s research and evaluation work has involved a range of quantitative, qualitative, and mixed method designs. MERC has strong research relationships with regional school districts and the VDOE that will support data collection efforts. MERC also has the technical resources and infrastructure to complete the evaluation of the VCU SEED project in an unbiased, objective manner that meets existing standards for credible and effective research and evaluation.

The lead evaluators on this project will be Dr. Jesse Senechal, Interim Director of MERC; Dr. Lisa Abrams, Associate Professor of Research and Evaluation; and Dr. Christine Bae, Assistant Professor of Educational Psychology. Senechal and Abrams are also currently engaged as the lead evaluators for a federal Teacher Quality Partnership Grant studying teacher retention and student achievement in the RTR/NTC model and have experience as PIs designing and conducting program evaluations for a variety of funded programs in the areas of teacher professional development and teacher quality. Abrams has served as the PI on an NIH funded Science Education Parntership Award that provided professional development to secondary science teachers. Bae has served as a Co-PI on a California Math and Science Partnership (CaMSP) Science Partnership For Instructional Innovation, and a Co-PI on a NSF DRK12 project to examine science teacher preparation.

The evaluation will use a rigorous mixed method design that includes a quasi-experimental study (Shadish, Cook, & Campbell 2002) supported by comparative and case study (Yin, 2014) design components in the participating sites over a 5-year period (2019–23, pending renewal). The evaluation will follow a cohort of new teachers for 3 years each.

Evaluation Questions

The evaluation questions are organized according to three main focal areas: (1) treatment fidelity of implementation and development of the RTR/NTC model in the study region; (2) impact of the RTR/NTC model of support on STEM teachers' content and pedagogical content knowledge, teacher effectiveness, and student achievement; and (3) impact of the RTR/NTC model on retention of new teachers.

Table 7. Evaluation questions

Treatment Fidelity of Implementation (TFQ 1 - TFQ 4). The evaluation will assess adherence to and ongoing context- specific adaptations of the RTR/NTC and STEM program including key components, inputs, outputs, and fidelity thresholds as sites implement the full model under typical district conditions.
TF 1 - What is the variation in the implementation of RTR/NTC model across the participating districts? What contextual factors influence the implementation of the model? TF 2 - Considering the needed adaptations across districts and school sites, is the model implemented with fidelity? TF 3 - How does the implementation of the RTR/NTC model change over time as additional sites are added? TF 4 - How is the STEM course work and NTC support implemented over the course of the grant? What contextual factors influence the implementation of the model? How effective is the STEM coursework and licensure tutoring in moving teachers from provisional to full licenses?

RTR/NTC Model Impact Study Evaluation Questions (EQ 1 - 3). The impact study will examine key outcomes related to teacher content and pedagogical content knowledge, teacher effectiveness, and student achievement using a quasi-experimental design to meet WWC standards with reservations.
EQ 1 - Is there a positive impact of the RTR/NTC model and STEM PD on the content knowledge and pedagogical content knowledge of teachers compared to teachers in the non-RTR condition? EQ 2 - Is there a positive impact of the RTR/NTC model and STEM PD on the teaching practices of teachers in STEM disciplines compared to teachers in the non-RTR condition? EQ 3 - Is there a positive impact on students' math, science, and reading achievement of the RTR/NTC teachers compared to students of teachers in the non-RTR condition?
RTR/NTC Retention Study (EQ 4 - 6)
EQ 4 - What is the impact of participation in the RTR/NTC teacher model and STEM induction on teacher retention across participating districts? EQ 5 - What are the school level factors that are most closely associated with teacher retention? How does experience of these factors vary between RTR/NTC prepared and the non-RTR teachers? EQ 6- What are the components of the RTR/NTC model most closely associated with teacher retention?

D. **1. Produce Evidence that Meets the WWC Standards with Reservations.** Following the WWC version 3.0 guidelines, baseline equivalence for the quasi-experimental component of the evaluation will be established for groups in the analytic samples (teachers and students in the RTR/treatment vs. Non-RTR) to meet the WWC standards with reservations. Baseline equivalence is satisfied if the reported difference of any baseline characteristic is equal to or less than .25 SD in absolute value (Ho, Imai, King, & Stuart, 2007). For differences between .05 and .25 SD, the analysis will include statistical adjustment for the baseline characteristic.

A quasi-experimental design with matched sample of teachers will be used, in which matching of RTR/NTC (treatment condition) to a non-RTR/NTC condition (including teachers who undergo traditional or alternative teacher preparation programs) teachers will be based on demographic characteristics (e.g., # years teaching, grade level, subject area, gender, ethnicity) and of the schools (e.g., %FRL, % minority, % Disabilities) which they serve. The baseline survey that will provide the data for matching teachers will be collected at the beginning of the project (fall 2018). We will match non-RTR/NTC to treatment cases in terms of 4 or 5 variables. Data reduction methods to obtain scores on 4 or 5 central dimensions determined using exploratory factor analysis in MPlus*8* with oblique PROMAX rotation on responses to baseline survey items to identify distinctive factors. Each RTR/NTC teacher will be matched to the two closest comparison cases. The 65 RTR/NTC residents and roughly 130 comparisons cases will constitute the base number of individuals for whom we will calculate attrition (retention) and obtain measures of teacher outcomes among non-attriting members. Within each grade level (or across adjacent grade levels if sample sizes at a given grade level are very small), a logistic regression model—with student demographics, and the prior year's achievement, as conditional variables—will be used to compute propensity scores (all student data in the regression will be obtained from the year prior to being taught by study teachers). Demographic variables will include ethnicity, economically disadvantaged status, special education status, and limited English proficiency status. We will explore both sub-classification and one-to-one matching with replacement (Dehejia & Wahba, 1999; Michaelopoulos, Bloom, & Hill, 2004). We anticipate about 3,000-3,200 students in the analysis.

A power analysis was conducted to determine the required sample size to detect impacts on student achievement assessed at the end of years 2 - 5 for the project for each cohort. We expect student achievement scores of approximately 65 RTR/NTC and 130 matched teachers each year. Accounting for an expected attrition of approximately 10%, yielding 59 RTR/NTC and 117 comparison teachers, respectively. For a conservative power analysis, we reduced the number of teachers in the RTR/NTC condition to 55 and for the comparison condition to 110. These represent the number of teachers we expected to be in elementary and secondary grades for whom we will obtain SOL scores (to assess both equivalence and impact) directly from the VDOE. We assumed n = 25 students per teacher after attrition and matching, power 80%, .05 level of significance for Type-I error, R-squared values of .70 and .50 for teacher and student-levels, respectively. The minimum detectable effect size for student achievement is approximately .15, and for teachers is .30, similar to values of prior quasi-experimental and RCT studies of teacher preparation programs (e.g., Schmidt et al., 2017; Glazerman et al., 2006). We expect larger effect sizes for teacher outcomes because they are more proximal to the target components of the RTR/NTC program.

D.2. **Performance Feedback/Assessment of Progress toward Outcomes.** In addition to the primary findings for the fidelity, impact, and retention studies (described below), we will engage in ongoing interim reporting of key descriptive information for formative feedback and program improvement, including emerging findings from surveys, interviews, and content assessments of teachers and students, to provide timely feedback to improve the program towards the intended outcomes. Findings will include teachers' math and science content knowledge and pedagogical content knowledge gains each year, trends in students' math and science achievement over the course of the school year, and effectiveness of program from focus group interviews.

D.3. Objective Performance Measures Related to the Outcomes (*see Table 8*).

Evaluation Studies:

Treatment Fidelity Study (TF 1 - 4). A key component of the evaluation investigates and documents the implementation of the core program activities (RTR/NTC model) and STEM coursework model, across participating sites. This is especially important considering the RTR/NTC model expansion focus of the grant. In this regard the evaluation will collect and analyze data from multiple sources (e.g., annual surveys, interviews, document reviews) to account for adaptations in the model design required across the site contexts (e.g., between districts), as well as the fidelity of implementation of the specified treatment.

RTR/NTC model Impact Study (EQ 1 - 3). *Teachers' content (CK) and pedagogical content knowledge (PCK).* The impact of the RTR/NTC program on elementary and secondary teachers' content knowledge will be examined at the beginning and end of the school year, for 3 years, for each cohort. The content knowledge assessments include commonly used content measures of math and science that are not overly aligned with the program (Hestenes, 1992) (see *Teachers' Math and Science Concept Inventories and Pedagogical Content Knowledge- VCU Clinical Evaluation Continuum*, Table 8). *Teachers' instructional practice.* In line with the methodology of prior classroom video studies (e.g., Fishman, Borko, Osborne et al., 2017), we will ask a subset (*n*~10 per condition) of elementary and secondary teachers (treatment and comparison groups) for a video-recording of a math and/or science lesson that is representative of their teaching at the beginning and end of the school year. This purposive sampling approach (Mason, 2002) was chosen to establish a standardized set of classroom videos that represent what teachers consider to be good math or science instruction and reduces the chance of videos that do not represent teachers' optimal instruction due to various external factors that are out of their control. Trained observers will score each teacher at two time points—fall of the first year of teaching (baseline) and near the end of spring, using the *Teacher observation protocol for STEM practice* (Table 8). Observers will be blind to whether teachers were in the treatment or control condition. Inter-rater reliability will be established using Cohen's *kappa* ≥.70 (Brennan & Prediger, 1981). Findings from *teacher focus groups interviews* and *surveys* will also be triangulated with video-data to examine changes in teaching effectiveness.

Student math and science achievement. Students' math and science achievement will be examined using both proximal measures (*curriculum-based measures; CBMs*; Deno. 2003; Jenkins, Deno, & Mirkin, 1979; Table 8) of math and science that are closely tied to classroom activities, and thus, more sensitive to context and small but potentially significant intervention effects, and distal measures (math, science, and reading VA SOL test scores). The math and science CBMs will be collected at the beginning of the school year to establish a baseline (Aug-Sept), mid-year (Jan-Feb), and at the end of the school year (April-May). CBMs are a commonly used progress-monitoring system, in which brief samples of students' performance produce a graph of students' growth. It is a reliable, valid, and easy way to interpret scores that can be used to provide formative feedback and periodic assessment of progress towards student learning goals in science and math (Deno, 2003). Therefore, CBM scores will also be used to provide formative feedback regarding students' progress in math and science throughout the school year, as well as summatively to compare growth between treatment and comparison groups. Student-level *VA SOL math, science, and reading scores* from participating students will be obtained at the end of each school year.

RTR/NTC Retention Study (EQ 4-6). This component of the evaluation will address three questions (EQ 4, 5, 6) that explore the effects of the RTR/NTC model on the retention of new teachers. To evaluate retention in high-need schools, measures of retention will be collected for participants in each RTR/NTC cohort and matched non-RTR comparison groups as they continue in the LEA classrooms. This will allow for a longitudinal study of retention data that extends beyond the first five years teaching – a critical benchmark in the teaching profession. It is well documented that the first five years of teaching is a critical time for beginning teachers; according to Smith and Ingersoll (2004) between 40-50 percent of new teachers will leave the profession within the first five years. It will be possible to track the rate of retention for RTR/NTC participants due to the program documentation requirement of their teaching placement and the established partnership between VCU and the LEAs. The rates of attrition for RTR/NTC graduates will be compared with those of non-RTR graduates with similar characteristics (e. g., teaching assignment, grade level, content area). The same approach will be taken for the provisionally-licensed teachers in the 2-year induction model.

Data Sources: To answer these questions various teacher-level and student-level data will be collected and analyzed. These data include both system (secondary) and program-level (primary) data collection using assessments, surveys, observation, and interviews. Access to individual-level data (i.e., students, teachers) has been agreed to by participating districts as reflected in the letters of support. Prior to use as dependent measures in the evaluation effort, the technical adequacy of any new measures will be established.

Table 8: Elaborated table of data sources by data type with aligned evaluation questions

Data Type	Data Sources	Eval Qs
	TEACHERS	
Secondary data-Teachers	**Licensure scores.** Virginia Communication and Literacy Assessment; and Praxis II for Secondary Content; Reading Assessment (RVE) for Elementary and Special Education.	EQ 1, 4
	Retention rates. Teacher retention data will be collected from partner LEAs annually (*e.g., hire date – present; and categorically :move, stay, leave)*.	EQ 4, 5, 6
	Teacher evaluations. Annual teacher evaluation data will be collected from the LEAs.	EQ2
Primary data-Teacher instruments	**Teachers' math and science content knowledge.** Concept Inventories (CI) are assessment tools to access learning in math and science among teachers (Hestenes, 1992).Teachers' math and science content knowledge will be measured using validated CIs (NAEP Grade 12, 1990, Cronbach's alpha = .74; General Science Test: Level II, ACER, 1983, Cronbach's alpha = .71).	EQ1
	Teachers' math and science pedagogical content knowledge- VCU Clinical Evaluation Continuum. The continuum measures several key areas of pre-service and in-service teacher development with an emphasis on content knowledge and application of knowledge to developing lesson plans and instructional delivery. The internal consistency, or reliability indices, for the continuum are high, ranging from .89 to .97 across the five sub-sections comprising the measure.	EQ1
	New teacher survey. This survey will be adapted from several existing measures including the NCES Statistics School and Staffing Survey, and the New Teacher Center Induction Survey (Hermann, 2010) and the 5Essentials survey. The survey will measure constructs associated with teacher attrition including school climate, administrative support, satisfaction with their teaching assignment, perspectives on future in teaching, as well as specific components of the RTR/NTC model.	EQ 5
	Pre-service and mentor teacher surveys. The Pre-service and Mentor Teacher surveys will share a common set of core items to allow for comparisons of the type and focus of mentoring activities across the two groups.	EQ 6 TF1, 2, 3
	Resident-mentor dyad weekly logs. All coach-resident pairs complete a collaborative log each week throughout the residency year. The logs document	EQ 6 TF1, 2, 3

	basic quantatitve information about the time spent on teaching in different conditions, NTC tools used, types of support required and qualitative information about challenges, concerns and subsequent coaching focal areas. The logs serve as metacognitive tools and as measures of program implementation. The weekly logs are systematically analyzed using a set of quantitative and qualitative analytic codes designed to capture evidence log quality, program implementation, and resident professional growth. The analytic codes are aligned with the theoretical framework underlying the program as well as the data elements captured in the log document.	
	Teacher observation protocol for STEM practice. Classroom observation protocols for math and science (e.g., Inquiring into Science Instruction Observation Protocol; ISIOP; Minner & DeLisi, 2012; Reformed Teaching Observation Protocol; RTOP; Piburn & Sawada, 2000; Framework for Teaching; Danielson, 2013) will be adapted to document specific shifts in math and science instruction (e.g., integration of content and practice; equitable opportunities to engage students in authentic STEM learning) from the classroom videos. The extent to which certain pedagogies are present (e.g., classroom, asking for student explanations, formative assessments, opportunities for peer-to-peer discourse) will be coded. Finally, we will code for culturally responsive pedagogy, such as bridging to students' prior knowledge. Classroom video data will be analyzed both quantitatively (frequency and quality codes) and qualitatively. Inter-rater reliability will be established using Cohen's *kappa* ≥.70 (Brennan & Prediger, 1981).	EQ2
	Teacher interviews / focus groups . Semi-structured interviews and focus groups will be held with residents, CRCs, and new teachers to understand the experiences of and perspectives on the program model and the school contexts in which they work.	TF 1, 2, 3, 4
	STUDENTS	
District and school-level secondary data	**Virginia SOL scores.** Standardized achievement data for reading/language arts, science, and math will be accessed through the VDOE under a data sharing agreement with partnering districts. Existing SOL scores of science (in grades 5, 8, and Biology) and math (grades 3 to 8) will be obtained over the 4 years of the project (baseline achievement scores will be assessed with performance on the standardized score from the most comparable course in the previous year).	EQ3
Student primary math and science assessments	**Curriculum-based measures (CBMs**) *in science and mathematics.* Grade-specific CBMs (Deno, 2003) of science (e.g., science comprehension, Carlisle & Andrews, 1993; science vocabulary-matching probes, Espin et al., 1993) and math (e.g., computation, application, Fuchs & Fuchs, 2004) that have evidence of reliability (alternate form reliability r = .68-.854) and validity will be used to assess gains in students' math and science knowledge (Deno. 2003; Jenkins, Deno, & Mirkin, 1979). CBMs are brief assessments of specific skills, and scores from CBMs have shown to predict mastery on more global competencies in STEM, as well as performance on standardized tests (e.g., r = .57- .66) (Espin et al. 2012, 2013; Thurber et al., 2002). The use of CBMs in this project is particularly relevant as it is a common tool to screen students in special education settings, monitor student progress in specific subject areas. The CBMs identified here are well-validated for use in elementary and more recently, secondary settings and specific content areas (e.g., Deno, 1985; Carlisle & Andrews, 1993; Wayman et al., 2007).	EQ3
	The Student Attitudes toward STEM (S-STEM) Surveys will be used to	EQ3

	measure elementary, middle, and high school students' attitudes toward math and science, and careers in STEM fields (Faber, Unfried, Weibe, & Corn, 2013) using 5-point Likert scale. The S-STEM has been validated for use with elementary, middle and high school students, and was found to have a sufficient reliability (alpha = .83).	
	OTHER DATA SOURCES	
	Key stakeholder interviews . Other key stakeholders will be interviewed on a regular basis to understand the experiences and perspectives of those highly involved in the implementation and operation of the program. This could include interviews with program leaders, VCU faculty, district leaders, school-level administrators.	TF 1, 2, 3, 4

D.4. Valid and Reliable Performance Data on Relevant Outcomes.

Primary analyses for teacher and student outcomes. Treatment group propensity scores (on teacher and student outcomes) will be estimated for each year, based on the distribution of observed covariates between the treatment and comparison conditions (Michalopoulos et al., 2004). Dependent variables in these models will include teacher CK, PCK, instructional practices, and student achievement (i.e., proximal and distal math and science scores) outcomes. Teacher and student test scores will be *z*-transformed within grade to be put on a common scale (May et al., 2009; Somers et al., 2001). Using *HLM7* (Raudenbush et al., 2004), hierarchical linear models will be tested to investigate (a) RTR/NTC and non-RTR/NTC teachers' change in CK, PCK, and instructional practices over time (time of observation nested within teacher); (b) RTR and non-RTR students' change in achievement (time of observation nested within student); and (c) whether students' learning (level 1 outcomes) vary significantly by teacher condition, CK/PCK, and instructional practices (level 2 predictors). HLM accounts for hierarchically clustered structure of the data (e.g., students nested within teachers), by allowing for estimation of variance at different levels (Raudenbush & Bryk, 2002).

Intraclass correlations (ICCs) will first be calculated to determine the proportion of the total variance in the outcomes accounted for at each level. The random effects for the slope (rate of growth) for teacher and student outcomes will be estimated, and school-level effects will be fixed (due to small school *n*). To examine how student learning outcomes vary by teacher-level characteristics (e.g., treatment or comparison group, instructional practices) a series of 2-level models (student at level 1, teachers at level 2) will be tested. Covariates (e.g., %Free Reduced lunch, students' prior achievement) will be included in the models. The R^2 statistic (Snijder & Bosker, 1999) will be used to determine the amount of variance accounted for across levels in each model. Cohen's *d* (effect size) will be calculated (Spybrook et al., 2006).

Impacts on retention. Logistic regression will be used to estimate the log odds of retention in the teaching profession in each condition, as well as a difference between conditions in the probability of retention, 1, 2, 3, and 4 years after entry into the RTR/NTC program (outcomes: move, stay, leave) with the same covariates as above. Given the relatively small number of schools, fixed effects will be used in all impact analyses to indicate school membership. All impact analyses will be conducted per resident cohort and averaged across cohorts.

Additional analyses. In addition, to provide formative information to RTR/NTC and STEM PD and induction program staff, surveys and focus group interviews will be conducted with the student participants about their experiences in order to asessess fidelity, and refine and improve implementation. The focus group sessions will be based on a multiple-category design and guided by a semi-structured protocol (Krueger & Casey, 2009). All qualitative data will be imported into Atlas.ti for analysis.

References

Berry, B., Montgomery, D., & Snyder, J. (2008). Urban Teacher Residency Models and Institutes of Higher Education: Implications for Teacher Preparation. *Center for Teaching Quality*.

Brennan, R. L., & Prediger, D. J. (1981). Coefficient kappa: Some uses, misuses, and alternatives. *Educational and Psychological Measurement*, *41*(3), 687-699.

Carlisle, J. F., & Andrews, E. (1993). Monitoring learning-disabled students in mainstream science classes. *Annals of dyslexia*, *43*(1), 217.

Cook, T. D., Campbell, D. T., & Shadish, W. (2002). Experimental and quasi-experimental designs for generalized causal inference. Boston: Houghton Mifflin.

Cochran-Smith, M., Villegas, A. M., Abrams, L., Chavez-Moreno, L., Mills, T., & Stern, R. (2015). Critiquing teacher preparation research: An overview of the field, part II. *Journal of Teacher Education*, *66*(2), 109-121.

Danielson, C. (2013). *The Framework for Teaching Evaluation Instrument, 2013 Instructionally Focused Edition*. Princeton, NJ: The Danielson Group. Retrieved from http://www. danielsongroup. org/framework.

Darling-Hammond, L. (2003). Keeping good teachers: Why it matters, what leaders can do. *Educational leadership*, *60*(8), 6-13.

Darling-Hammond, L. (2008). A future worthy of teaching for America. *Phi Delta Kappan*, *89*(10), 730-736.

Darling-Hammond, L. (2010). Recruiting and retaining teachers: Turning around the race to the bottom in high need schools. *Journal of Curriculum and Instruction, 4*(1), 16-32.

Darling-Hammond, L. (2011). *Recruiting and training teachers: What matters most and what government can do.* The Forum for Education and Democracy.

Dehejia, R. H., & Wahba, S. (1999). Causal effects in nonexperimental studies: Reevaluating the evaluation of training programs. Journal of the American statistical Association, 94(448), 1053-1062.

Deno, S. L. (2003). Developments in curriculum-based measurement. *The Journal of Special Education*, *37*(3), 184-192.

Espin, C. A., & Deno, S. L. (1993). Performance in reading from content area text as an indicator of achievement. *Remedial and Special Education*, *14*(6), 47-59.

Fishman, E. J., Borko, H., Osborne, J., Gomez, F., Rafanelli, S., Reigh, E., ... & Berson, E. (2017). A practice-based professional development program to support scientific argumentation from evidence in the elementary classroom. *Journal of science teacher education*, *28*(3), 222-249.

Fuchs, L. S. (2004). The past, present, and future of curriculum-based measurement research. *School psychology review*, *33*(2), 188.

Glazerman, S., Isenberg, E., Dolfin, S., Bleeker, M., Johnson, A., Grider, M., & Jacobus, M. (2010). *Impacts of comprehensive teacher induction: Final results from a randomized controlled study* (NCEE 2010-4027). Prepared by Mathematica Policy Research for the Institute of Education Sciences (IES). U.S. Department of Education. Washington, DC.

Haberman , M. (1995). Selecting 'star' teachers of children in poverty. *Phi Delta Kappan*, 76, 777-782.

Hestenes, D., Wells, M., & Swackhamer, G. (1992). Force concept inventory. *The physics teacher*, *30*(3), 141-158.

Hermann, A. (2010). The new teacher center induction survey: Measuring impact. *Reflections 7*(1), 10-11. New Teacher Center: Santa Cruz, CA.

Ho, D. E., Imai, K., King, G., & Stuart, E. A. (2007). Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political analysis*, *15*(3), 199-236.

Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal 38*(3), 499-534.

Ingersoll, R. M. (2004). *Why do high-poverty schools have difficulty staffing their classrooms with qualified teachers?*. Center for American Progress, Institute for America's Future.

Ingersoll, R. (2007). *Misdiagnosing the teacher quality problem* (CPRE Policy Brief No. RB-49). University of Pennsylvania, Consortium for Policy Research in Education. Retrieved from ERIC database. (ED498327)

Ingersoll, R., Smith, T., & Dunn, A. (2007, April). *Who gets quality induction*? Presented at the Annual meeting of the American Educational Research Association. Chicago, IL.

Jenkins, J. R., Deno, S. L., & Mirkin, P. K. (1979). Measuring pupil progress toward the least restrictive alternative. *Learning Disability Quarterly*, *2*(4), 81-91.

Johnson, S., & Birkeland, S. (2003). Pursuing a "sense of success": New teachers explain their career decisions. *American Educational Research Journal*, *40*(3), 581-617.

Krueger, R., & Casey, M. (2009). *Focus groups: A practical guide to applied science*. Sage.

Mason, J. (2017). *Qualitative researching*. Sage.

Michalopoulos, C., Bloom, H. S., & Hill, C. J. (2004). Can propensity-score methods match the findings from a random assignment evaluation of mandatory welfare-to-work programs?. *Review of Economics and Statistics*, 86(1), 156-179.

Minner, D., & DeLisi, J. (2012). Inquiring into Science Instruction Observation Protocol (ISIOP). *Education Development Center: Waltham, MA*.

Learning Policy Institute (2016). *Understanding Teacher Shortages: A State-by-State Analysis of the Factors Influencing Teacher Supply, Demand, and Equity*. [Data File]. Retrieved from https://learningpolicyinstitute.org/product/understanding-teacher-shortages-interactive

Kneebone, E. (2014). *The growth and spread of concentrated poverty, 2000 to 2008-2012.* The Brookings Institution.

Kneebone, E., & Berube, A. (2013). *Confronting suburban poverty in America*. Brookings Institution Press.

McDonald, J., Mohr, N., Dichter, A., & McDonald, E. (2007). *The Power of Protocols: An Educator's Guide to Better Practice.* Teachers College Press.

National Commission on Teaching and America's Future. (2007). The *Cost of Teacher Turnover Study and Cost Calculator.* Retrieved from https://nctaf.org/teacher-turnover-cost-calculator/the-cost-of-teacher-turnover-study-and-cost-calculator/

National Commission on Teaching and America's Future. (2016). *What Matters Now: A New Compact for Teaching & Learning.* Retrieved from https://nctaf.org/research/what-matters-now/

National Comission on Teaching and America's Future. (2018). *Teacher Turnover Cost Calculator.* Retrieved from https://nctaf.org/teacher-turnover-cost-calculator/

Papay, J. P., Bacher-Hicks, A., Page, L. C., & Marinell, W. H. (2017). The challenge of teacher retention in urban schools: Evidence of variation from a cross-site analysis. *Educational Researcher*, *46*(8), 434-448.

Piburn, M., & Sawada, D. (2000). Reformed Teaching Observation Protocol (RTOP) Reference Manual. Technical Report.

Raudenbush, S. W. (2004). *HLM 6: Hierarchical linear and nonlinear modeling*. Scientific Software International.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Sage.

Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, 50(1), 4-36.

Smith, T., & Ingersoll, R. (2004). What are the effects of induction and mentoring on beginning teacher turnover? *American Educational Research Journal*, 41(3), 681-714.

Snijders, T., & Bosker, R. (1999). Multilevel modeling: An introduction to basic and advanced multilevel modeling.

Spybrook, J., Raudenbush, S. W., Liu, X., Congdon, R., & Martínez, A. (2006). Optimal design for longitudinal and multilevel research: Documentation for the "Optimal Design" software. *Ann Arbor: University of Michigan School of Education, Hierarchical Models Project*.

Stanulis, R. & Floden, R. (2009). Intensive mentoring as a way to help beginning teachers develop balanced instruction. *Journal of Teacher Education*, 60(2), 112-122.

Stockard, J., & Lehman, M. B. (2004). Influences on the satisfaction and retention of 1st-year teachers: The importance of effective school management. *Educational Administration Quarterly*, 40(5), 742-771.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). A coming crisis in teaching? Teacher supply, demand, and shortages in the US. *Learning Policy Institute. Retrieved from https://learningpolicyinstitute. org/product/coming-crisis-teaching*.

Thurber, R. S., Shinn, M. R., & Smolkowski, K. (2002). What is measured in mathematics tests? Construct validity of curriculum-based mathematics measures. *School Psychology Review, 31*(4), 498.

U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. (2012). *Schools and Staffing Survey, Public Teachers Data File 2011-2012.* [Data file]. Retrieved from https://nces.ed.gov/surveys/sass/tables_list.asp

U.S. Department of Education, Institute of Education Sciences, What Works Clearing House (2017). Retrieved from https://ies.ed.gov/ncee/wwc/ReviewedStudies#/FWWFilterId:2,RatingId:2,OnlyStudiesWithPositiveEffects:false,SetNumber:1

U.S. News & World Report. (2018). *Best colleges rankings.* Retrieved from https://www.usnews.com/best-colleges

U.S. News & World Report. (2017). *2017 Best Graduate Schools.* https://www.usnews.com/info/blogs/press-room/articles/2016-03-16/us-news-releases-the-2017-best-graduate-schools

Villar, A. (2004). *Measuring the benefits and costs of mentor-based induction: A value-added assessment of new teacher effectiveness linked to student achievement*. Paper presented at the annual American Educational Research Association.Virginia Department of Education. (2017). *Report from the Task Force on Diversifying Virginia's Educator Pipeline.* Richmond, VA.

Virginia Department of Education, Division of Teacher Education and Licensure. (2016). *The Shortage of Qualified Teachers in the Commonwealth of Virginia and Recommended Strategies for Addressing the Shortage.* Richmond, VA.

Virginia General Assembly, Joint Legislative Audit and Review Commission. (2014). *Low performing schools in urban high poverty communities* (Report No. 454). Retrieved from: http://jlarc.virginia.gov/reports/Rpt454.pdf

Wang, J., Odell, S., & Schwille, S. (2008). Effects of teacher induction on beginning teachers' teaching: A critical review of the literature. *Journal of Teacher Education*, 59(2), 132-152.

Yin, R. K. (2017). Case study research and applications: Design and methods. Sage publications.

Young, V. M., Schmidt, R., Wang, H., Cassidy, L., & Laguarda, K. (2017, December). A comprehensive model of teacher induction: Implementation and impact on teachers and students. Evaluation of the New Teacher Center's i3 Validation grant, final report. Prepared for the New Teacher Center. Menlo Park, CA: SRI International.