TR@TC2
TEACHING RESIDENTS AT TEACHERS COLLEGE2

Teachers College, Columbia University (TC) is pleased to submit this proposal to the U.S. Office of Innovation and Improvement: Teacher Quality Partnership Grants Program in response to *Absolute Priority 2: Partnership Grants for the Establishment of Effective Teaching Residency Programs*; *Competitive Preference Priority 1: Promoting Science, Technology, Engineering, and Mathematics (STEM) Education*; and *Competitive Preference Priority 2: Implementing Internationally Benchmarked, College- and Career-Ready Elementary and Secondary Academic Standards.* We are requesting funding in the amount of $7,546,244 to support a teaching residency program over the five-year period beginning October, 2014.

Absolute Priority 2: Partnership Grants for the Establishment of Effective Teaching Residency Programs

We propose an 18-month graduate-level teaching residency program that will lead to New York State teacher certification and a Masters degree. ***TR@TC2*** (***Teaching Residents at Teachers College2***) will recruit academically talented, diverse individuals and transform them into exemplary, highly qualified teachers of Science—Biology and General Science (SCIB), English as a Second Language (ESL), Students with Disabilities (TSWD), and Science-Students with Disabilities (SCIB-TSWD, dual certification) who can capably meet the needs of children and youth attending schools in high-need, urban schools in New York City.

The goals for ***TR@TC2*** are to:

- Recruit, prepare, and graduate academically talented, diverse candidates from under-represented groups (including racial/ethnic minorities, women, and non-traditional students such as career changers) each year as highly qualified SCIB, ESL, TSWD and SCIB-TSWD teachers for high-need schools in New York City (NYC);

- Design and implement an 18-month teaching residency program with/for partnership schools that culminates in New York State (NYS) teacher certification and a Master of Arts degree;
- Collaborate with partners including NYC schools and educators, teacher education and Arts and Sciences faculty, to implement and continually improve the teaching residency program;
- Design and implement innovative curricula that deepen and enrich Teaching Residents' knowledge base in the STEM areas, develop their understanding of instructional design using Universal Design for Learning principles, and prepare them to effectively address the intersecting, complex, multiple needs presented by students in high-need schools;
- Support the professional development of teachers and leaders in partnership schools;
- Design and implement an enhanced two-year induction program to support the success and retention of program graduates in high need New York City schools;
- Engage faculty in continuous review of the residency program and the consideration of lessons that can be applied to other teacher education programs at TC;
- Conduct on-going research on the impact of teaching residency programs on teacher retention and student learning.

Competitive Preference Priority (CPP) 1: Promoting Science, Technology, Engineering, and Mathematics (STEM) Education

TR@TC2 will rest on four instructional "pillars" to ensure that every Teaching Resident (TR) acquires a foundational set of knowledge and skills that responds to the needs identified by our partner LEA and is therefore essential to their success as teachers for/in NYC schools. These four pillars are: STEM Literacy and Enrichment; Instructional Technology and Assistive Technology; Universal Design for Learning and Curriculum Development; and Co-Teaching and Co-Planning across Science, Special Education and English as a Second Language (Figure 1).

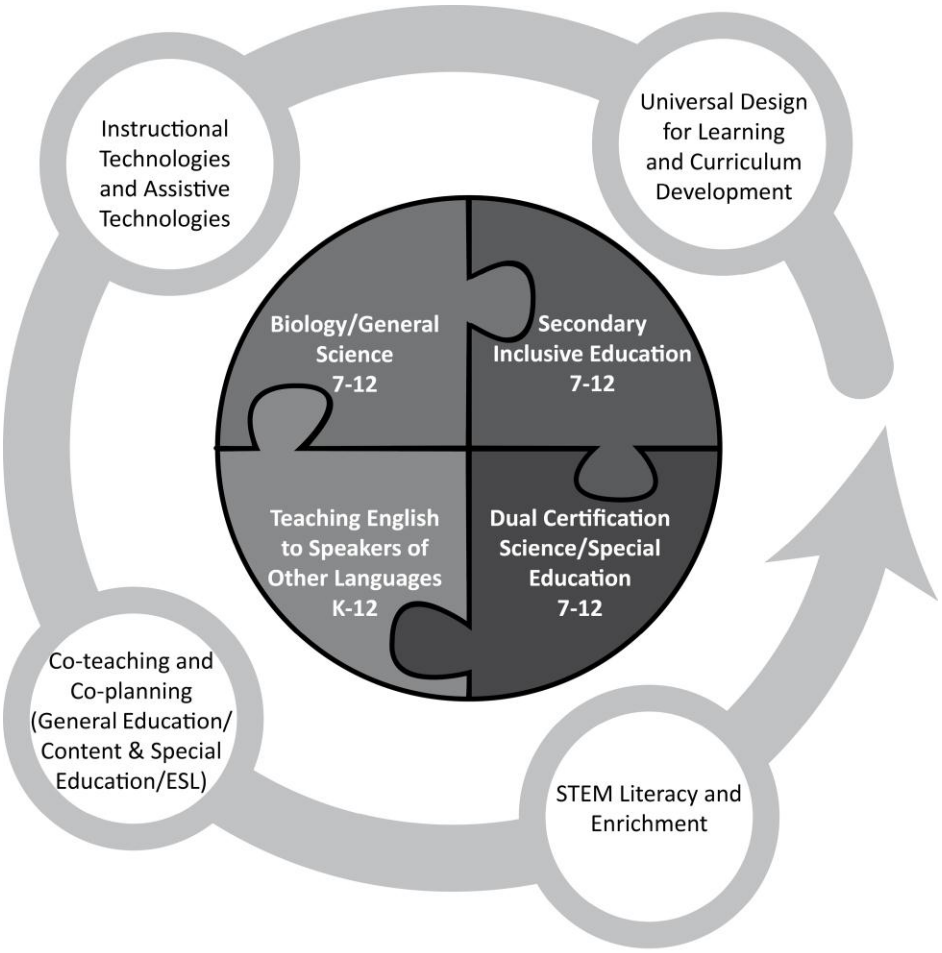

Figure 1: TR@TC 2 Four Instructional Pillars

Two of the four pillars directly address CPP1 and will guarantee the integration of high quality preparation and professional development in STEM subjects throughout the program, such that TRs as well as their Mentor Teachers (MenTs) will have multiple opportunities to enhance their STEM content knowledge and pedagogy. This will be accomplished through:

- A partnership with the Science Education Program at Teachers College of Columbia University. The program brings extensive experience in the recruitment and preparation of high quality Science educators for the same high need NYC classrooms for which TRs are preparing. Program faculty are equally expert in science and in education and offer courses in both STEM content and STEM pedagogy, enacting their stance that good science teaching

begins with strong subject matter understanding. In addition, program faculty are engaged in innovative projects around STEM instruction that directly align with ***TR@TC2*** goals. One example is the Harlem Schools Partnership for STEM Education, "a collaborative effort of Teachers College, and the Fu Foundation School of Engineering and Applied Science at Columbia University…[that]…increases teacher knowledge of STEM content and teaching practices, diversifies assessment of student learning, and ensures that English Language Learners are successful in STEM" (Harlem Schools Partnership, n.d.).

- Institutional collaborations that will give TRs and our school partners access to additional high quality and rigorous STEM courses, experiences and enrichment. Collaborators include Barnard College of Columbia University, a liberal arts institution that ranks among the best in the world. Of direct relevance to ***TR@TC2*** are the science and mathematics courses faculty collaborators at Barnard offer that integrate engineering design principles and use NYC as the context for developing deep and culturally relevant content knowledge. A second collaborator is the American Museum of Natural History (AMNH), well regarded for its excellent educational programming in STEM subjects. Through AMNH, ***TR@TC2*** will have access to a wealth of resources—both print and digital—for the exploration of STEM content, online seminars with scientists to explore data visualizations, workshops aligned to Common Core Standards, an online series of Science seminars, to name just a few. AMNH also has extensive experience working with NYC teachers and students, so the programming they provide is characteristically hands-on as well as minds-on, simultaneously emphasizing knowledge acquisition alongside classroom applications and pedagogy.
- Multiple field experiences and practica that will introduce TRs to many different models of STEM in action in NYC schools, help them to connect university learning with practice, and

engage them in critical analysis of and inquiry into science curriculum and instruction. These experiences will begin in students' first term and continue throughout the 18 months of the program. The vast network of schools to which TC is connected means that ***TR@TC2*** residents' exposure to schools in the LEA will extend far beyond the partnership schools.

- Collaboration with an instructional technology expert and with an assistive technology expert, both of whom will help to co-plan and co-teach the Intensive Summer Institute and Core Integrating Seminar described further on in the document.
- Capitalizing on STEM resources at Columbia University. These are numerous and include the Consortium for Policy Research in Education (CPRE) that has produced empirical and conceptual work on learning progressions in science and in mathematics; the Columbia Center for New Media Teaching and Learning's extensive library of digital portfolios and numerous digital tools that support classroom instruction and teacher learning such as VITAL (Video Interactions for Teaching and Learning) and Mediathread, an innovative platform for "multimedia annotation, editing, organization, and collaboration" (http://ccnmtl.columbia.edu); cutting edge research on mathematical thinking by TC faculty; the ongoing collaboration with the National Institute of Education in Singapore through which ***TR@TC2*** will connect with educators and researchers who are expert in Singapore Math for the purpose of professional development for TRs and partnership schools.

A second aspect of CPP1 is the recruitment of individuals traditionally under-represented in STEM. TC's first residency program was highly successful at recruiting people of color to teaching. Ranging from 25% to 50% of students per cohort, our numbers are significantly higher than current demographics for the profession where less than 20% of teachers are racial/ethnic minorities (Ahmad & Boser, 2014; Boser, 2011). ***TR@TC2*** will continue to employ the

recruitment strategies that have produced results. In addition, among faculty and key personnel from the partnership IHE and AMNH who will participate in the program, 9 are women (3 in science, 1 in math), 7 of 10 are people of color, 1 is in technology, two are directly engaged in the NYC special education reform effort. Thus, they all have direct and personal access to professional or social networks that will support recruitment efforts.

Competitive Preference Priority (CPP) 2: Implementing Internationally Benchmarked, College- and Career-Ready Elementary and Secondary Academic Standards

In line with CPP2, the four pillars undergirding ***TR@TC2*** ensure that TRs are prepared to help their students meet internationally benchmarked standards for college and career readiness. The focus on STEM Literacy and Enrichment will build TRs' content knowledge base in subjects that are critical gatekeepers for college entry and future success. An aspect of STEM literacy will be exposure to the Common Core standards in mathematics as well as Next Generation Science Standards. The emphasis on Universal Design for Learning principles in curriculum development will equip TRs with the skills to use their content knowledge to 1) design and implement, high quality, rigorous and content-rich curriculum; 2) use formative, varied and authentic assessments to continuously gather evidence about students' understanding and progress in order to make instructional adjustments that address gaps and support their learning; 3) ensure multiple access points into the academic curriculum so that all learners can be supported to meet high standards; 4) differentiate instruction through adaptations and modifications designed to meet the needs of English language learners and students with disabilities. As the program draws on three teacher education programs and will bring subject teachers and teacher specialists together, TRs will be guided to develop curriculum collaboratively across content and specialization, working together as co-planners and co-teachers. The instructional technology/assistive technology pillar will

engage TRs in thinking about and experimenting with how new media, digital tools and a variety of hard and software can be used to support and extend curriculum, not supplant it. Not least of all, a practitioner in one of our partnership schools is an expert on school to college transitions. TRs will have privilege of learning from him about structures, strategies and supports that ensure students can smoothly transition from high school to higher education or employment.

Section I: Project Design

Building Upon A Solid Foundation

TR@TC2 benefits from the wealth of experience acquired from the successful implementation of the Teaching Residents at Teachers College, Columbia University Program (TR@TC), which was supported by a 2009 Teacher Quality Partnership Grant. Thus, our proposal presents an enhanced and re-imagined residency program that incorporates our best and current thinking, and directly meets critical needs demonstrated by our LEA, New York City. As the TC team wraps up the fourth TR@TC cohort, we can point to many achievements and milestones—as well as lessons learned —that directly support the goals outlined for ***TR@TC2*** and inform its design. We confidently feel that we have demonstrated the ability to develop and implement an innovative residency program that produces highly qualified and effective teachers in and for high needs school settings. In brief, the key successes on which we build ***TR@TC2*** include:

- Strong retention rates of Teaching Residents, 90% of whom are still teaching after three years in high needs, NYC classrooms.
- Robust recruitment of diverse persons to teaching—on average 42% of TRs across four cohorts are people of color, 52% have been non-traditional students, such as career changers.
- On-time graduation and certification of 80 highly qualified teachers of ESL (44) and TSWD (36) in direct response to critical shortage areas in NYC schools.

- High level of satisfaction with the program expressed by Teaching Residents—more than 80% of graduates across cohorts 2, 3 and 4 feel/felt prepared to teach in urban schools.
- High level of satisfaction with TR@TC graduates reported by 2012-13 and 2013-14 hiring principals; about 80% rated TR@TC graduates as better than graduates of other programs.
- Comprehensive and targeted professional development of NYC teachers—mentor teachers overwhelmingly attributed growth as reflective practitioners to their work with TRs.
- Successful implementation of innovative instructional practices such as education rounds, co-teaching and co-planning, integrating digital literacies and new media, etc.
- Individually responsive, tailored induction support provided to TRs according to the needs of their specific schools and students
- Inclusive induction practices such that new teachers who co-teach with our program graduates in hiring schools, have also benefited from our induction program/support.
- Education Rounds as a continuing professional practice among TR@TC alumni.

Recruitment and Selection

Our primary recruitment goal is unwavering—we aim always to attract the best candidates to ***TR@TC2*** and therefore to the teaching profession. We will look for candidates who possess the qualities that research has linked to student achievement, such as strong content preparation, high GPA's, attendance at quality undergraduate institutions, and commitment to service. Our experience supports these inputs as positive predictors for candidate success in the program and in the classroom. We will continue to seek out potential Teaching Residents who are more representative of the student populations in urban, high-need schools and who can serve as exemplary teachers and positive role models for minority children and youth. Our proven ability to attract diverse applicants to teaching has been the result of multi-pronged recruitment

strategies that have extended beyond marketing to include active outreach, community engagement, professional networking, personalized and responsive communication, and consistent follow-up of all inquiries. We will continue this comprehensive approach to recruitment, which has yielded positive results.

We have in place a rigorous, two-stage application process to identify and recruit candidates who demonstrate both strong content knowledge and a commitment to working in urban schools. The first stage involves completion of a standard application to TC, which allows both college/program admissions committees to determine if candidates meet core content knowledge requirements in their undergraduate and other formal schooling experiences and have performed to high academic standards. The second stage applies specifically to ***TR@TC2*** and entails a writing exercise consisting of several short essay questions and a two part interview process entailing: a) an individual interview by at least two program staff/faculty, and b) a group discussion with 3-5 other applicants (observed by program staff). The second part of the interview grew out of our experience with the first residency program. We learned that it afforded us the opportunity to observe how well applicants interacted with one another, how well they listened or dominated air time, their ability to support their views and develop reasonable and grounded arguments, and their leadership potential. This additional step in the selection process allows qualities and dispositions that are essential to good teaching to emerge, and provides insight into whether or how "walk" aligns with "talk."

Applicants who successfully meet these rigorous selection criteria will be:

- Enrolled in a degree-granting teacher certification program at TC, concurrent with the residency experience;
- Placed as a Teaching Resident in two partnership schools over a full school year;

- Engaged in graduate coursework, professional study, and educational activities that are closely connected to and informed by classroom practice, district curriculum and learning standards, and students' needs, thus comprising a synergistic blend of practice and theory;
- Eligible to receive a living stipend upon acceptance to the program;
- Supported by a partnership that brings together urban schools and practitioners, university departments and faculty, and a cultural community partner;
- Mentored, guided and supported by Mentor Teachers and Residency Supervisors during the residency, and an Induction Mentor during the first two years of practice, all of whom have been carefully selected and rigorously trained;
- Required to commit to at least three years of service as a teacher in a high-need school—preferably in NYC—upon completion of the program and the attainment of certification;
- Supported and guided during the first two years of their teaching career through an induction program supported by ***TR@TC2*** and designed to meet the needs, enhance the skills, ensure the success, and increase the retention of new teachers in high-need schools.

Table 1 shows the anticipated recruitment schedule for four cohorts of Teaching Residents. In reviewing the table, it is important to keep in mind that each cohort will actually receive ***TR@TC2*** services for three+ years. We also feel that it is best to begin with a smaller cohort, given the tight turnaround time available for planning and recruitment between October 2014 and January 2015. A smaller cohort will also allow us to pilot the program modifications and enhancements outlined as well as enable us to extend the planning period somewhat. This planning period, informed by practice, ensures smooth operations during years 2-5 for ***TR@TC2***.

Table 1: Recruitment Schedule for *TR@TC2*

	10/2014--1/2015	1/2015—6/2016	1/2016—6/2017	1/2017—6/2018	1/2018—6/2019
	Planning & Recruitment				
Cohort A		15			
Cohort B			25		
Cohort C				25	
Cohort D					25

The Eligible Partnership

The eligible partnership for ***TR@TC2*** comprises a high-need LEA, a consortium of high-need schools served by the LEA, a partner institution of higher education (IHE), programs of education within the IHE, plus a department of Arts and Sciences within the partner institution.

The New York City Department of Education (NYCDOE) is the **high-need LEA** for the partnership. The NYCDOE operates the largest school system in the U.S., serving 1.1 million students in approximately 1,800 schools taught by 75,000 teachers (http//:schools.nyc.gov). About 85% of NYC public school students are racial/ethnic minorities, with Latino students accounting for just over 40% of the total (NYCIBO, 2013). Poverty rates in NYC are high such that in 2009-10, 78.2% of K-8 students in NYC received free or reduced price lunch, a likely under-estimation of the actual poverty rate "because there is a tendency among students at the junior and senior high school levels not to apply" for this support (Council on Children and Families, 2014). Immigrants make up a steadily rising proportion of the school population, and speak 160 languages in NYC schools (Office of English Language Learners, 2013). A recent report (NYCIBO, 2012) revealed that 49% of non-ELLs achieved the score of "proficient" or higher on the English Language Assessment test, 62% on the math test, compared to ELLs at 12% and 35% respectively. ELLs also evidence lower graduation rates and earn Regents diplomas at less than half the rate of non-ELL students. Even more concerning are data that

indicate that upon graduation, only 14% of ELLs are considered college and career ready in both math and English compared to 32% of non-ELLs. NYCDOE figures show that more than 5,000 teachers were hired for the 2013-14 academic year and the district is actively recruiting STEM teachers with a goal to attract and train more than 100,000 STEM teachers in the next decade. The percentage of students taught by teachers who meet federal definitions of highly qualified is lower in high poverty middle and secondary schools, and in subjects including STEM and languages other than English, as well as special education, particularly for grades 5-12 (NYS Board of Regents, 2008) (See Appendix A.1 for LEA eligibility data and Appendix G.2 for NYCDOE partnership letter).

The NYC schools in the **consortium of high-need schools** within the LEA serve grades 6-12 and all show that 45% or more of their students qualify for free and/or reduced lunch rates. Besides meeting eligibility criteria, these schools were invited to participate as partners because they have each demonstrated their capacity to support and achieve results with NYC children and youth who face many risk factors and typically must overcome numerous challenges and barriers in order to progress academically. All of the schools have track records as strong partners who are committed to the preparation of high quality teachers; all but one of them hosted residents for TC's first teaching residency and understand fully the intensity and demands of residency programs, and the time commitment entailed in mentoring and developing novice teachers. These schools have also shown themselves to be thoughtful collaborators who are willing to engage in the planning and decision-making required by any innovative endeavor. Appendix A.2 lists the partnership schools along with the percentage of their students who qualify for free and/or reduced lunch rates. We anticipate adding more schools during the project using the same eligibility criteria (See Appendix G.3 for partnership agreement school letters).

Teachers College, Columbia University (TC) will serve as **the partner IHE** and also the fiscal manager of the grant. The College is the oldest and largest graduate school of education in the United States and has been preparing teachers and educational leaders since 1887. Its 5,000+ graduate students study for a broad range of careers, centered in two complementary areas of education: first, policy-making and school reform and second, in preparing educators who not only serve students directly but also coordinate the educational, psychological, behavioral, technological, and health initiatives to remove barriers to learning at all ages.

More than 300 TC student teachers are placed in NYC schools every semester, which translates into ongoing relationships with hundreds of NYC public schools. TC is also a leader in research on urban education through the Institute for Urban and Minority Education, the National Center for Restructuring Education, Schools & Teaching, and the Campaign for Educational Equity. The university is also home to the Teachers College Inclusive Classrooms Project and the Teachers College Reading and Writing Project. Together, both projects work in hundreds of NYC schools, providing professional development and curriculum support.

TR@TC2 will have the full support of the **Office of Teacher Education** (OTE), which operates at the nexus of the university and the public schools. OTE works closely with eight academic departments at the College to facilitate and support teacher education at TC and serves as the primary liaison between TC and both the NYC Department of Education and the NYS Department of Education. It is a central point of access and information for faculty, students and staff involved in the hundreds of student teaching placements made every year, and provides professional development and resources to faculty, students and teachers. OTE has also been instrumental in supporting faculty and students during the recent rollout of edTPA, the new performance assessment for initial teacher certification adopted by NYS. OTE is uniquely

qualified to assist students and faculty in the program, plus will also be able to engage a diverse range of faculty at TC to work with principals, mentors, and TRs in the partnership schools.

The ***SCIB, ESL and TSWD*** **programs of education within the partner IHE** will be directly involved in ***TR@TC2***. The programs in Teaching English to Speakers of Other Languages (TESOL/ESL), and the Secondary Inclusive Education (SIE/TSWD) represent established relationships; both have expressed great enthusiasm for continuing as partners given their past experience with the residency program and the caliber of candidates they were able to recruit and support. The program in Science Education (Biology/General Science, grades 7-12) is a new partner whose faculty have fortuitously been exploring dual certification in science and special education given their commitment to preparing science educators ready to instruct all learners who will naturally evidence a range of academic needs and abilities. Linking science education with the teaching of ELLs and students with disabilities through ***TR@TC2*** will result in a powerful synergy that will benefit all the residents and, in turn, all their students.

The **arts and sciences partner** working with ***TR@TC2*** is ***Columbia University's Barnard College***. Barnard has distinguished itself as a liberal arts college dedicated to the success of women. Her 2,400+ undergraduate students study to become leaders in nearly 50 academic majors and 40,000+ alumnae have gone on to become world leaders in literature, science, commerce, law, and the arts. Biology is among the most popular majors and so we anticipate that Barnard will also be a feeder institution for ***TR@TC2***.

Barnard is a member of the Consortium for Excellence in Teacher Education, an association of selective, private liberal arts colleges and universities in the Northeast with teacher education programs. The Barnard program in Urban Teaching combines courses and faculty from various departments to prepare students for NYS teacher certification. The program offers

students the option to study education and another related discipline jointly. The model results in strong pedagogical content knowledge merged with subject area expertise. (See Appendix G.1 and G.4 for partnership letters from Columbia and Barnard).

The American Museum of Natural History (AMNH) will support ***TR@TC2*** as a ***cultural community partner***. AMNH has a long and positive relationship with TC and with NYC schools. The educational programming offered by the museum is highly regarded and well utilized by teachers and students throughout the partner LEA. The focus of these educational activities is the enhancement of Science content and pedagogy through authentic, hands- and minds-on interaction with the museum and with scientists. Professional development courses are typically co-taught by a science expert with a pedagogical expert; on-line modules are similarly designed by such specialist teams. While AMNH covers all areas of science, it is especially expert in the earth sciences—yet another area of critical shortage in NYC—and thus will further enrich both ***TR@TC2*** and its school partners. (See Appendix G.5 for the partnership letter from AMNH.)

Needs Assessment of the High-Need LEA and the Partnership Schools

According to the NYCDOE website (http//:school.nyc.gov), the shortage areas for which "district public schools in NYC may hire external teachers (teachers not currently employed by the NYCDOE)" include science, special education and English as a second language. Moreover, there is also a serious need for "teachers willing to work in our high-need schools…High need schools often have high percentages of students with special needs, including English language learners (ELLs) and special education students" many of which are "in low income neighborhoods, including central Brooklyn and the Bronx." Additionally, special education/ TSWD and ESL teachers represent particular shortages facing NYC schools given the 183,831

students who require special education services and the more than 158,180 who are designated as English Language Learners (NYCIBO, 2013).

Special Education, English as a Second Language and Science. In 2010, a Special Education Reform was launched by the NYCDOE "with the intent to increase integration into general education curricula when possible" and "close the significant achievement gap by providing students with disabilities increased access to and participation in the general education curriculum" (Fund for Public Advocacy, 2012). To support the reform, the Office of Special Education and the Office of English Language Learners were combined to "accelerat[e] and [sustain] achievement, both for ELLs and for students with disabilities" (Fund for Public Advocacy, 2012). These changes are illustrative of the intersection between general education, special education and the education of English language learners—the policy/practice direction being taken by the NYC schools, the partner LEA for this proposal. This systemic initiative has heightened the need for highly qualified special educators with strong content knowledge.

In contrast to this reality, too many special education teachers have limited or no training in science, (Cawley, 1994; Donovan & Cross, 2003; Hammrich, Price, & Slesaransky-Poe, 2001; Vannest et al., 2009), or mathematics (Desimone & Parmar, 2006; Maccini & Gagnon, 2006; Pugach, 2005), and nearly 60% rely on textbook for instruction versus inquiry approaches. Similarly ESL teacher preparation focuses more on language acquisition, pedagogy, and cultural perspectives than on content knowledge in core subjects (DelliCarpini, Gulla, & Smith, 2012). This leaves English language learners to fall behind academically, highlighting the need to integrate English language development with science, and other content areas (Lee, 2005; Nordmeyer, 2008; Stoddart, Pinal, Latzke, & Canaday, 2002).

In terms of general education teachers, particularly those who teach science at the secondary level, data indicate that in 2012-2013, 47% of NYS students with disabilities and 39% of students classified as Limited English Proficient passed the Living Environment Regents with a score of 65 or above, as compared with 81% of general education students (NYSED, 2014b). In NYC, almost 60% of students with disabilities are in general education classes for 80% or more of the school day (NYSED, 2014a), and more ELLs are being placed in mainstream classrooms (Nordmeyer, 2008). Moreover, beginning in middle school, ELLs with disabilities, long-term ELLs (those still requiring services after six years), SIFE students (Students with Interrupted Formal Education), or students with a combination thereof begin to make up a larger share of ELLs who need specialized attention. Indeed, SIFE "are two times as likely to be enrolled in grades 9 to 12 than they are to be in grades 3 to 8" (Office of ELLs, 2013, p. 8).

In a recent interview, the immediate-past NYC Deputy Chancellor characterized the shortage of science, special education and ESL teachers as "severe." In 2012-2013, 1,313 special education teachers were hired (UFT, 2013); in 2013-2014, 20% of all NYCDOE teacher hires were in special education. A recent report (Asian American Legal Defense and Education Fund, 2008) shows only one ESL teacher is available for every 116 ELLs, and one bilingual teacher for every 88 ELLs in NYC. NYC offers a number of incentives to encourage practicing teachers to undergo additional preparation in science, special education and ESL for the purpose of converting their current certifications to meet these critical needs (Teach NYC, nd). Clearly, the context and needs of NYDOE schools support the preparation of teachers able to competently work across dis/ability, language and content/STEM boundaries.

Description of the Teacher Residency Program

The proposed program will begin each year in January and run for 18-months through May/June, followed by a two-year induction program. Teaching Residents (TRs) will be engaged in: university coursework required by their specific certification area; an Intensive Summer Institute (ISI); two residency experiences over the full school year anchored by an ongoing Core Integrating Seminar (CIS); school visits and observations; and other professional development activities. Post graduation and into their first two years of teaching, Teaching Residents will continue their development and learning with support provided by ***TR@TC2*** Induction Mentors as well as a range of induction activities and professional development.

As stated earlier, ***TR@TC2*** will rest on four instructional "pillars" designed to ensure TRs' acquisition of a foundational knowledge/skill base that responds to the needs identified by our partner LEA. These four pillars will be integrated throughout the program so that by program completion, all TRs, regardless of certification area, will develop basic competencies in: STEM Literacy and Enrichment; Instructional Technology and Assistive Technology; Universal Design for Learning and Curriculum Development; and Co-Teaching and Co-Planning across Science, Special Education and English as a Second Language. A description of the program chronology follows, highlighting key activities, courses and experiences over the 18 months. Figure 2 lays out a roadmap for ***TR@TC2***, from program start through induction.

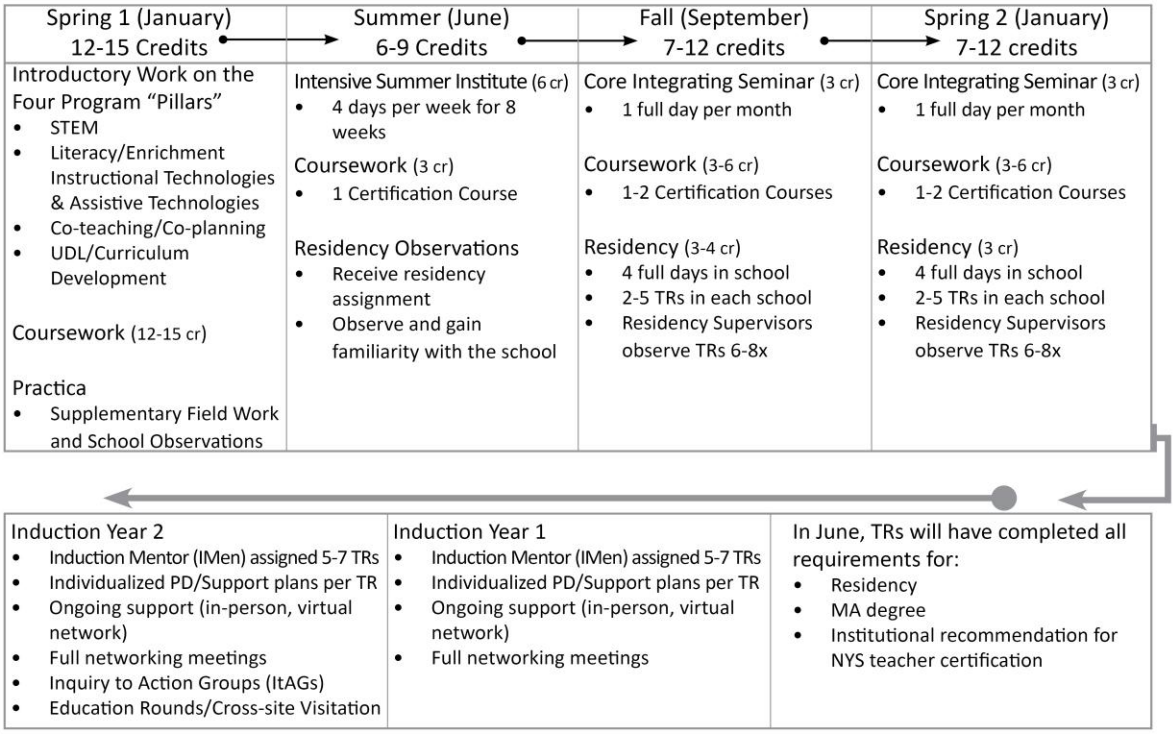

Figure 2: Teaching Residents at Teachers College 2 Program Timeline

Spring 1: January—An Introduction to the Field. The initial semester of ***TR@TC2*** is designed to introduce TRs to: 1) the field of education and to New York City schools; 2) the four pillars so they can immediately begin the process of acquiring essential knowledge. TRs will also begin fulfilling requirements for their certification area and degree program, with the expectation that they will take a full load of 4-5 courses. These courses will be accompanied by practica to support theory-practice connections; practica will be supplemented by classroom observations in partnership schools to begin TRs' immersion in the partner LEA for the purpose of gaining rich and varied perspectives of the district. Towards the close of the term, TRs will receive their first school assignment so that they can familiarize themselves with the context in which they will be residents through observations, and meetings with the principal and their Mentor Teacher.

Introduction to the four pillars will occur through a menu of experiences that will consist of a mix of required options, forced choices, and free choices. A requirement would definitely be for all TRs to attend a workshop on assistive technologies offered by the Teachers College Inclusive Classrooms Project; a forced choice could be to select from and participate in one of the many STEM professional development activities offered by our partner AMNH to NYC middle or secondary teachers and their students; free choices will have TRs choosing from among a wide variety of relevant activities, such as interviewing a TR@TC graduate and her/his co-teacher, about effective co-teaching and co-planning, or reviewing and evaluating STEM curriculum materials developed from a Universal Design for Learning framework, or perhaps exploring the use of digital tools in STEM in classrooms serving ELLs. In this way, the initial semester of ***TR@TC2*** establishes learning to teach as an integrated process where field and university, theory and practice are blended, connected and mutually informing.

Intensive Summer Institute: June and July—Building the Foundation*.** TRs will participate in the Intensive Summer Institute (ISI) four days a week for eight weeks. ISI will be led and taught by the ***TR@TC2 Lecturer, but will involve the participation of other TC faculty, Mentor Teachers, principals, and other members of the partnership. ISI will focus on providing TRs with a solid foundation and toolkit for their entry into schools and will integrate the 4 pillars along with 1) knowledge of students from high-need communities who demonstrate "multiple vulnerabilities" (Rong & Preissle, 2009) such as poverty, learning needs, limited English proficiency, health issues, and so on; 2) cognitive development and learning theory; 3) basic literacy assessments and strategies; 4) multi-level instruction and interactive pedagogies; 5) classroom management; 6) district and state standards (such as Common Core standards) and regulations. TRs may simultaneously enroll in one course required by their certification area.

MenTs will be experienced teachers from the partnership schools who have been nominated by the principal, and have undergone a rigorous selection process that includes an application, an observation of their classroom practice and an interview. The application process has been designed to ensure that prospective MenTs' classroom practice aligns with program goals and with coursework, and to assess their ability to work with diverse learners, gather evidence about student learning using multiple measures, and use these data to inform instruction in order to improve learning outcomes for their students.

All MenTs will receive extensive training and professional development. This support will be informed by Mentoring Standards developed by the first residency program, which will ensure substantive and quality training. MenTs receive three days of orientation and training prior to the start of the school year, and participate in monthly training/support sessions during the year. In addition, MenTs and TRs come together for a full-day retreat each semester for targeted professional development around co-teaching/planning (fall) and assessing students' work (spring). The program also provides on-site support for MenTs as needed. Teachers who are experienced residency program mentors have been and will continue to be recruited as co-trainers and mentors of MenTs; they will also serve on the selection committee.

Fall—The Theory-Practice Nexus. TRs are in their first of two school assignments four full days a week. This is a major change from our first residency endeavor that kept TRs in one primary placement for the majority of the school year. Arguably, the strength of year-long residencies is that they offer teachers-in-preparation the opportunity to develop knowledge of one setting deeply and continuously over time, and to participate in every aspect of one classroom: instructional activities, routines, assessments, etc. While residencies clearly offer the possibility of in-depth learning, they are often less able to offer breadth. To address this, we

required TRs in our first residency to complete observation assignments in other partnership schools so as to become familiar with different settings, grade levels, and content pedagogies. This arrangement also enabled residents to meet NYS certification requirements for observation and experience in more than one grade level. While these assignments unquestionably yielded positive results, the take-away from our first residency experience is that breadth must always be accompanied by depth, that the learning/insights TRs gained from alternate placements were so valuable that full immersion in two placements was the only sensible decision for ***TR@TC2***.

TRs will begin the residency at the same time that their MenT begins the year—before the students have returned to school. While this period before schools officially open is brief, typically two or three days, it is a crucial planning and set-up time, and TRs will have the opportunity to observe and assist their MenT with preparations for the school year. Each TR will be in a partnership school with at least one other TR from the same cohort. The purpose is to create a natural buddy system that will foster sharing and collaboration with peers. Every effort will be made to assign TRs to schools in groups of two to five. Because we found this to be a challenge during our first residency program given our focus on two serious shortage areas where a school might only have one ESL or TSWD teacher, we have selected partner schools that will be able to accommodate a group of TRs. Each TR will also work with a Residency Supervisor during the residency year. Residency Supervisors will serve as a crucial intellectual bridge between the residency placements and the university, and will work closely with MenTs and TC faculty. In their role, they will need to balance guidance and instructional support to TRs, with critique and evaluation of their practice. Thus, their perspective will be that of a critical friend and expert whose aim is to observe, dialogue and reflect with the TRs, offering specific feedback and suggesting solutions or alternative strategies to teaching dilemmas in order to

encourage continuous improvement on the part of TRs. Residency Supervisors will visit and observe TRs in their school placement 6-8 times over the term. Like MenTs, Residency Supervisors will undergo a rigorous application process and be carefully vetted by the Office of Teacher Education. Through our first experience with Residency Supervisors, we have fine-tuned the training we provide them as well as strengthened and expanded the ongoing communication and professional development they need to be maximally effective in their roles.

The Intensive Summer Institute extends into the academic year but is transformed into an integrating experience, connective tissue that will provide conceptual coherence throughout the residency experience. The Core Integrating Seminar (CIS) is designed to support TRs in developing their classroom practice, and building crucial research-to-practice and theory-to-practice connections. The four pillars will run thematically through CIS—TRs will work on applying and enacting the foundational knowledge base they began to build during the summer. As the nexus for theory and practice, CIS will emphasize student learning and achievement, with an emphasis on research-based large-effect practices such as grouping and student teaming (Bennett et al., 2005; Kulik & Kulik, 1992; Slavin, 1996), formative assessment (Black & Wiliam, 1998; Young, 2007; Perie, Marion, & Gong, 2007), and planning and instructional design that attends to variations in student learning, fosters deep student engagement and offers students challenging tasks (Corcoran & Silander, 2009). As a multi-faceted experience, CIS will bring together different faculty according to their expertise. Co-planning and co-teaching among these experts will be key since CIS aims to prepare TRs to attend to and connect many variables simultaneously as they consider learners' multi-level and differentiated needs in relation to standards and goals. To guard against fragmentation, the ***TR@TC2*** Lecturer will continue as lead instructor for CIS and attend closely to communication, curriculum planning, and coherence.

CIS will meet once a month for a full day and affords residents space for reflection and critical analysis of their practice. This change results from our past experience which taught us that a weekly seminar session did not allow TRs some necessary breathing room given the constant need to juggle residency and academic demands. In addition, a full day further supports integration as well as in-depth focused work. During the fall, TRs will enroll in up to two additional courses according to the requirements of the degree and certification area.

Spring. Spring mirrors the fall in that TRs will continue in their school-based residencies but will be assigned to a second partnership school, with the expectation that each resident will complete a middle school placement as well as a high school residency. Again, TRs may enroll in up to two additional courses according to degree and certification requirements. CIS will continue with the same overarching focus on student learning undergirded by the four instructional pillars. The spring term will also be the time when TRs complete all certification assessments, including the performance assessment edTPA, along with certification exams required by NY State, and begin the process of securing a full-time teaching position in NYC.

The Induction Program

The Program will work with ***TR@TC2*** alumni into their second year as teachers of record, using a variety of structures and activities, both electronic and in-person, designed to further their learning and development. Induction will also concentrate on helping TRs to incorporate into their curricula large-effect practices shown by research to positively impact student achievement (Corcoran & Silander, 2009; Hattie, 2009), to move from ad hoc or inconsistent applications of evidence-based practices to deliberate, integrated and consistent implementation.

During both induction years, TRs will each be assigned an Induction Mentor (IMen) who will provide assistance and guidance according to needs. Induction Mentors will also undergo a

rigorous application and will be carefully selected for this important responsibility. TC's prior experience implementing a residency program means that we now have a cadre of seasoned Induction Mentors on which to draw. We have learned to truly adhere to our own goal (stated earlier), i.e., to "provide assistance and guidance according to needs" and allow TRs to take the lead in terms of the induction supports they need rather than assuming that we can anticipate how to best assist them. We subscribe to a model of induction that is individualized, context-specific, and professionally responsive. Thus, while the program is driven by clear and common goals and structures, for example that IMens will help TRs develop their effectiveness as teachers through coaching, technical assistance and resource identification, there is no longer an expectation that the way in which these goals are enacted will be similar across TRs. Indeed, we have seen IMens provide a rich and varied range of supports which have included co-teaching and co-planning, arranging inter-school visits (often of more senior TR graduates), demonstration lessons and modeling, guided observations, review of lessons and curriculum, and so on. Sometimes the support has helped a TR strengthen practice, other times support has enabled TRs to extend practice and try something new, bolstered by the IMen "safety net." This individualized approach notwithstanding, all IMens have and will work closely with our Induction Coordinator who oversees the induction program, maintains face-to-face and online contact with all TRs, meets regularly with IMens for feedback, guidance, and training/professional development purposes, and keeps everyone focused on the same goals.

The Induction Coordinator (along with Induction Mentors) also works with hiring school administrators, establishing strong communication channels in order to make certain that ***TR@TC2*** does not work at cross purposes to the school and principal, but rather reinforces the goals and mission of each setting in which TRs are employed. It is important that the induction

program is welcomed as a trusted collaborator with the common goal of retaining quality teachers and enhancing their teaching effectiveness. One way in which the induction program has been supportive to hiring schools is by opening up group induction activities to other new teachers at the school (including partnership schools), especially those who are co-teaching with program alumni. We have seen non-TRs benefit from these opportunities and so the ***TR@TC2*** induction program will continue to sponsor full group networking events to support professional learning communities, peer exchange and enhancement of teaching practice.

The basic structure of the Induction program will remain consistent over both years. However, the Continuing Induction year will differ from the Initial year in two possible ways. First will be the introduction of Education Rounds more formally, building upon inter-visitations in the first year, to more structured learning communities in the second year, taking into account TR needs and readiness. The second will be the initiation of Inquiry to Action Groups (ItAGS) where induction residents can be supported to engage collectively in classroom-based research on issues of instruction and learning that emerge as critical concerns. We began ItAGs this past year in response to TRs' self-identified questions of practice and their motivation to examine their own teaching and address areas of common concern. We are excited to have the opportunity to further develop this promising practice. (The Logic Model in Appendix H.1 provides a conceptual map of the key components, strategies, activities, and outcomes of ***TR@TC***.)

The Distinguishing Features of TR@TC2

Research on exemplary teacher preparation programs tells us that "it is within the substance of teacher education programs and not only in their structural characteristics that clues about program effectiveness are to be found" (Darling-Hammond, 2006; Zeichner & Conklin, 2009, p. 275); even programs that are similarly configured may produce very different outcomes.

The design of ***TR@TC2*** emphasizes student achievement and growth, quality teaching experiences, and rich learning opportunities. Several key features distinguish the Program:

The four "pillars"—a common knowledge base that blends STEM content and specific instructional skills. The choice of the four pillars undergirding ***TR@TC2*** is a deliberate response to our LEA needs, gaps in teacher knowledge and pedagogy, students with special needs including language diversities, and the general press towards inclusive schooling, particularly in NYC. Data on current teachers especially informed our decision, i.e., that: a) general education teachers report lacking needed skills to effectively instruct students with disabilities; b) between 82% and 99% of secondary special education teachers are not highly qualified in the academic content areas that they teach (Higher Education Consortium for Special Education, n.d.); c) ELL programs may not provide the specialized literacy or academic language supports necessary for struggling learners (NYCIBO, 2012).

These data indicate that special education and ESL teachers need stronger preparation in content, at the same time that there is a dire need to enrich secondary educators' repertoire of skills and strategies to effectively accelerate the achievement of diverse ELL groups and students with disabilities. The four pillars will not only ensure that all TRs have both essential STEM content knowledge and pedagogical knowledge to reach the diverse spectrum of learners, they will acquire the skills they need to 1) develop accessible curriculum undergirded by Universal Design for Learning principles; 2) appropriately support curriculum with a variety of instructional technologies, including assistive technologies; and 3) work effectively as co-teachers. Studies have shown that co-teaching increases teacher retention, supports professional development and learning, improves both special and general education teachers' ability to support student learning, and increases inclusive practices such as differentiation (Dove &

Honigsfeld, 2010; Friend, et al., 2010; Honigsfeld & Dove, 2008; Scruggs, Mastropieri, & McDuffie, 2007). Co-teaching has also been shown to be highly beneficial to students—both with and without disabilities—in terms of academic performance, attendance, social behavior, student satisfaction and higher level thinking (Honigsfeld & Dove, 2008; Rea, McLaughlin & Walther-Thomas; 2002; Wilson & Michaels, 2006; Scruggs, Mastropieri, & McDuffie, 2007).

A core curriculum focusing on learners' multiple and integrated needs. The challenges faced by youngsters in high-need areas are not neatly compartmentalized, but are integrally linked and mutually exacerbating. In essence, the whole child is much more than the sum of the parts. A child who is a poor, immigrant, English language learner with academic challenges requires a teacher who does not see each of these needs as isolated, but recognizes that she must attend to the child's *multiple* needs *simultaneously* and take a developmental, holistic perspective on the child's progress. ***TR@TC2*** will offer an integrated curriculum that addresses, the multiple issues and needs that learners embody and bring to the classroom. TRs will examine issues relating to language, culture, socio-economic circumstances, immigration, context or environment, and education, not in isolation but in tandem. The curriculum is integrally different from others based on similar topics because it emphasizes how *the interaction and intersection* of these issues in the lives of children impacts their learning and achievement. This integrated curriculum was successfully developed and implemented with residents in our first program. It is further enhanced and strengthened in ***TR@TC2*** by the four pillars.

The use of empirically-based practices with large effects on achievement. To efficiently use the time we have with TRs, and to prepare them to accelerate learning and close achievement gaps, we will continue to emphasize those practices that have been found to consistently have large effects on achievement. The success of the graduates of our first residency program

illustrates that these key practices remain essential to effective teaching. Still, we will remain open to learning by staying abreast of the research literature for new developments that demonstrate similarly powerful effects so we can incorporate them into the program. The knowledge base about learning and teaching is growing rapidly so the program must keep up. As a research-intensive university, TC demonstrates an exceptional capability for and commitment to research on teaching and learning. Thus, we expect to add to the knowledge base on the impact of teaching residency programs by engaging in scientifically valid studies of our own program and the impact of these high leverage practices on student learning.

A deliberate focus on middle school learners. The problem of unqualified teachers is particularly acute at the middle school level where teachers are much less likely than their high school counterparts to be highly qualified (Stullich, Eisner, & McCrary, 2007). Research on achievement among middle school students indicates that the public schools are failing large numbers of these students. For instance, in New York City, studies show that in 2005-2006, a majority of eighth graders could not read up to standards, a problem particularly acute in high-poverty schools where only 22% of eighth graders met the New York State ELA standards (New York City Coalition for Educational Justice, 2007). Teachers also rarely report feeling prepared to work with middle grade students even while research shows that urban middle school teachers must be both skilled and sensitive in order to respond to the unique needs of these students from diverse racial/ethnic and cultural backgrounds (National Middle School Association, 2003).

In response, ISI and CIS will deliberately differentiate between middle and high school students. In addition, TRs will complete a middle school residency. The middle grades are a critical bridge between elementary and high school, and it is therefore imperative that TRs

understand middle school learners' development and socio-emotional needs so as to design meaningful curriculum that will build capacity and motivate them to meet rigorous standards.

Education Rounds and Communities of Practice. Education Rounds is seen as a promising innovation in teacher preparation, teacher practice, and educational leadership, and is gaining popularity across the world (City, Elmore, Fiarman & Tietel, 2009; Del Prete, 2013; Elmore, 2007; Fullan, 2009; Marzano, 2011; Roberts, 2012; Watts & Levine, 2010). ***TR@TC2***, will use Education Rounds to engage TRS in collectively examining mutually identified instructional issues for purposes of understanding and improving them (Elmore, 2007). The concept builds from medical rounds in which experienced physicians, residents, and medical students review real-life medical cases, in order to enhance the diagnostic and treatment skills of the medical students (City, Elmore, Fiarman & Tietel, 2009; Roegman & Riehl, 2012). Education Rounds have been implemented as a model for improving teaching practice at the school- and district-level for more than a decade (City et al., 2009). Recently, scholars have suggested that rounds have the power to "redefine the teaching profession" (Fullan, 2009) and that they "are one of the most valuable tools that a school or district can use to enhance teachers' pedagogical skills and develop a culture of collaboration" (Marzano, 2011, p. 80). Education Rounds has enabled TRs to inquire into their teaching practice and build professional learning communities, beginning during the residency and extending into their first years of teaching.

Section II: Evaluation

The Consortium for Policy Research in Education (CPRE) will conduct the evaluation of ***TR@TC2***, which will be both summative and formative. The summative evaluation contains a descriptive analysis, an impact evaluation, and an analysis of changes in classroom practice over time. The formative analysis will inform the design and implementation of the program.

I. Summative evaluation overview

This evaluation includes a descriptive analysis of educational and employment outcomes (section A) and an impact evaluation (section B) comparing the performance of Teaching Residents to a matched sample of students in traditional certification programs at TC. In particular, we ask if participating in the residency program (versus a regular Science or ESL certification program) improves outcomes in education, employment, and teacher practice. Finally, we focus on the Teaching Residents only and ask how much change in teacher practice occurs over time and if these rates of change differ from those in traditional certification programs.

A. Descriptive analysis of program outcomes

The descriptive analysis of program outcomes will be conducted according to the reporting requirements outlined in the RFA. Thus, the evaluation will generate descriptive data on both short-term and long-term outcomes, which include:

1) Educational outcomes: program persistence and completion/graduation rates; scores and pass rates on relevant state teacher certification exams; the percentage of participants who attain initial certification (within two years of beginning the program); and the percentage of teachers trained on integrating technology into classroom practice.

2) Employment outcomes: one-, three-, and four year rates of retention in high-needs settings in the partner LEA, and the percentage of highly qualified teachers who are: a) hired by the high-need LEA overall, b) members of underrepresented groups, c) teaching high-need academic subjects (Science in this case), d) teaching in high-need areas (e.g., special education, or ESL programs), and e) teaching in high-need/high-poverty middle or secondary schools.

3) Teacher practice outcomes: the percentage of teachers employing evidence-based practices over time (measured through coded classroom observations and interviews); student

learning outcomes such as average student scores (and pass rates) in Science on NYS tests and the Regents examinations, as well as ELA scores on Regents exams (for ESL teachers).

Also, we plan to compare these descriptive statistics of ***TR@TC2*** to those of traditional teacher preparation programs in Science and ESL at TC, which may be suggestive of between-program differences. These differences will be evaluated more formally by an impact evaluation comparing ***TR@TC2*** participants to a group of similar non-participants, as detailed below.

B. Impact evaluation of teacher residency program

The second component of the summative evaluation will address impact: what outcomes would have been observed for program participants in the absence of the residency program. In the absence of random assignment of individuals to the treatment group (the residency program) and a control group (a traditional teacher education program), we will employ quasi-experimental methods, namely, "propensity score matching" techniques to match program participants to students in traditional Science education and ESL programs at Teachers College.

Research questions. The central research questions in this evaluation ask: Compared to students in a traditional certification program, what is the impact of the teaching residency program on the educational, employment, teacher practice, and student learning outcomes identified in section A (descriptive analysis). In particular, we ask:

1- Related to educational outcomes: Do Teaching Residents have higher program persistence and graduation rates than students in traditional Science and ESL certification programs? Do these participants also have higher NYS certification exam pass rates and overall scores?

2- Related to employment outcomes: Do Teaching Residents have higher *long-term* (more than three years post-graduation) retention rates than those in traditional programs? And are these teachers more likely to continue to work (long-term) in high-needs academic subjects, high-

needs locations, or high-needs areas (e.g., special education or ESL). [Note: While, the examination of *short-term* retention outcomes (less than 3 years post-graduation) makes up part of the descriptive analysis (above) these outcomes are not used in the impact evaluation, as teacher residents are in fact *required* to teach in the LEA for the first three years after completion of the program, thus any short-term comparison might be misleading].

3- Related to teacher practice: Do Teaching Residents show more use of or faster growth over time in their use of evidence-based instructional practice than those who enroll in more traditional certifications programs? And how do teachers' instructional practices differ between these two groups (in both cases, based on coded classroom observations)?

4- Related to student learning: Does participation in the teaching residency program have an impact on student learning (as measured by student performance on state Science and English language examinations)?

Comparison group program differences: It is necessary to consider the main characteristics of the "control" or regular program against which we are comparing the teaching residency program. In general, students entering the residency program are older and have more work experience than students entering traditional certification programs. In addition, students in the traditional certification program receive much less clinical experience and on-site mentoring than students in the residency program. Specifically, while students in the teaching residency program work in local schools throughout their enrollment in the program, teachers in regular Science certification programs complete only 14 weeks of student teaching. The ***TR@TC2*** residents also receive more intensive on-site mentoring (6-8 supervision visits per term), an integrated seminar that connects theory to practice, and experiences/training in co-

planning. In addition, the residents will participate in a two-year induction program after program completion and receive continuous supports during the crucial years of teaching. Another difference between the programs is that ***TR@TC2*** enhances the STEM content and pedagogical content knowledge of the Teaching Residents by collaborating with Barnard College and the American Museum of Natural History (which provides online seminars and workshops).

Impact evaluation methodology: Propensity score matching techniques will be used to "balance" the program participants with a group of program nonparticipants who are similar in the aggregate, assuming that the number of program participants and nonparticipants is relatively large[1], the control group is larger than the treatment group, and applicants' background characteristics are related to the probability of selection into the program. Thus we will construct a comparison group as similar as possible to the "treatment" group on measured characteristics. Since the groups are equivalent at the outset of the program, the true program impacts can be estimated by comparing the outcomes observed for the treatment and comparison groups.

In order to employ this methodology, the evaluation staff will gather data on the population of program applicants and on students admitted to the regular Science education Masters-level program at Teachers College, including their undergraduate degrees and GPA's, undergraduate college selectivity, age, prior professional and work experience, gender, and racial/ethnic background, among other background variables.

It is possible that applicants to the teaching residency may differ in unobservable ways from the students in the traditional certification courses at TC—in particular, their level of commitment to service. While many traditional Teachers College students do in fact enter degree programs to serve students in high-needs areas/locations, we recognize that the ***TR@TC2***

[1] The proposed cohort size of 25 teachers should be sufficiently large to conduct a propensity score matching exercise.

program places a special emphasis on enrolling students who are interested in such work. In order to better match ***TR@TC2*** participants to traditional students, we will administer a survey to these traditional students, employing similar admissions questions asked of ***TR@TC2*** applicants. Measuring their interest in serving high-needs students will provide us with additional matching criteria with which to calculate each student's propensity score. The goal of this exercise is to be able to match Teaching Residents with regular Science education students in such as way that the only difference between these two groups is program participation itself.

After matching on the propensity score, it is important to check for sufficient "overlap" across participant and non-participant groups at each level of the propensity score, as well as for statistical balance on observable variables between these two groups. Poor overlap can be improved by statistical techniques such as "matching with replacement" (i.e. using particular non-participants as matches more than once); there is also the option of combining cohorts to increase the sample size for the treatment and comparison groups. In order to improve the precision of the results, a regression adjusted model using these matched pairs is employed to estimate β_1, the average impact of participating in ***TR@TC2*** on the outcome of interest:

$$Y_i = \beta_0 + \beta_1 Teacher\ Residency_i + \boldsymbol{X}_i\phi + c_i$$

$$c_i \sim N(0, v_i)$$

where Y_i is the outcome of interest for individual i (e.g., score on licensure exam or employment retention); "Teacher Residency" is a dummy variable that is equal to 1 if a student participated in ***TR@TC2*** and equal to 0 otherwise; $\boldsymbol{X}_i$ represents a vector of student-specific background variables (including those upon which the propensity score was based), and ε_i represents the error term, which is assumed to be normally distributed with variance v_i and mean 0.[2]

[2] This error term ε_i may be clustered at the classroom level if participants are divided into separate learning groups.

C. Analysis of teacher development over time & heterogeneous effects

This portion of the evaluation limits the sample to only the teachers in the ***TR@TC2*** residency program (without the control group) and explores the evolution of teacher practice in the full sample. Research questions explored in this section include:

1- Relating to overall teacher development: Do teachers improve their teaching practice (through the use of evidence-based pedagogies) over the entire period of the residency program (this includes their 18 months at Teachers College, their 2-year induction program, and in the two years post-induction)? Further, is there a large degree of variation in the take-up of these practices? Or are there certain practices in which all residents become proficient, while others evidence lower take-up? And does this take-up relate to teacher placement/student population?

2- Relating to heterogeneous effects: Are there heterogeneous effects with regard to teacher practice development rates? That is, do development rates in teacher practice depend upon the background of the teachers themselves? For example, is there a correlation between teacher gender, age, experience, or race and uptake of high-impact pedagogical practices? Or are teachers from a certain ethnic backgrounds or from certain locations more likely to be able to manage classroom discussion or encourage student participation?

In order to evaluate these questions, classroom observations of teachers will be conducted (and coded) 10-15 times per year (described in more detail below). Further, regression analysis (correlational analysis) and multi-level modeling will be employed to better examine individual-level and sub-group-level correlations, as well as in-group variation. [Note: this analysis is strictly correlational (not causal) in nature].

D. Data sources for evaluation

The residency program has an individual tracking system in place to monitor the progress of

program participants and comparison group members over time (both during the 18 months years spent at Teachers College, the first two years of the "induction program" during which participants are employed (and mentored) in schools, and one to two years beyond this). This tracking system will allow us to ascertain the percentage of program completers and comparison group members who persist in their respective programs, graduate from their programs, and who are retained in teaching within the New York City Department of Education or other high-need LEA's one year, three years, and four years after initial employment. Moreover, we will be able to discern whether completers are teaching high-needs academic subjects (Science in this case), high-needs areas (special education or English language programs), or in schools that are judged to be high-need on the basis of factors such as the percentage of students eligible for free or reduced-price lunch and the percentage of teachers teaching out of license.

Furthermore, data on teacher knowledge of content and pedagogical practices will come from items on the participant surveys about their perceived preparedness for teaching Science/ ESL and the participants' scores on the New York State Teacher Certification Examinations (NYSTCE), as these scores can be reported to the candidate's home institution. Further, shifts in teacher practice will be assessed using classroom observations, conducted 10-15 times each year of Teaching Residents by trained supervisors and research staff and several times per year for students in the regular teaching certification program (by the same observers). These observations will be based on the updated version of the Danielson framework for teaching for classroom observations (2011), teacher use of high-impact practices drawn from recent reviews of research on instruction (Corcoran & Silander, 2009; Hattie, 2012), and teacher use of preferred (and inclusionary) instructional methods for teaching ESL and special education. These coded observations will be used to assess teacher use of selected evidence-based instructional

pedagogies over time; these pedagogies will be drawn from recent reviews of research on instruction. Data will be coded by CPRE staff who have expertise in the use of this observational protocol and analyzed using ATLAS.ti.

Finally, data on student learning will be collected both from NYS Science exams (8th grade), as well as from the NYS Regents exam (grades 10-12) in both Science and English Language (the test used will depend on the subject(s) the teacher is teaching).

II. Formative Evaluation

The purpose of the proposed formative evaluation is to inform the design and implementation of the ***TR@TC2*** program. Interviews with Residency Supervisors, Mentors teachers and residency students and Induction Mentors will be coded by CPRE staff with expertise in the use of interview protocol, and analyzed using ATLAS.ti. Interview One will be conducted at the conclusion of the Intensive Summer Institute, Interview Two at the end of the residency year, and the third interview will conducted following the first year of the induction program.

The interview protocols will ask Supervisors and mentor teachers about their perceptions of the quality of the training of residents and their performance over the entire 18 months. The teaching residents will be asked which elements of the program have been most valuable, and which elements might benefit from revision. They will also asked the extent to which they feel prepared for their residency sites, their emerging identities as teachers, and they will be asked to evaluate communication and knowledge exchanges between supervisors, mentor teachers and residency students. In the second interview, residency students will be asked about their experiences in the residency, their classroom assignments, feedback from supervisors and mentors, the ongoing integrating seminar, and the contributions of partners such as Barnard and the American Museum of National History including technology integrated experiences.

Interview Three at the end of the first year of teaching will emphasize the quality of the induction experience. This final interview will also ask participants to reflect on all the elements of the residency program, their timing and sequencing, and their strengths and weaknesses.

Section III: Management Plan

To ensure that the objectives of the proposed project are achieved on time and within budget, we have made careful decisions about personnel needs, feedback mechanisms and milestones that will provide a structure for ongoing communication and assessment, the scope and sequence of activities, and the marshaling of resources in addition to the funds requested.

Project Personnel.

A project team will assume major responsibility for the implementation and management of the project. This team will include both full- and part-time personnel, as well as several current TC staff. All but one will have a percentage of their time allocated to the project for the duration of the grant.

The PI for the project will be [redacted] who will assume the [redacted] is a well-known teacher education scholar, who began her career teaching K-12 in general and special education. She has extensive experience in teacher preparation, both as a professor and as an administrator, and has conceptualized and successfully implemented several funded, multi-year projects, aimed at improving and diversifying the teaching force, including TR@TC, TC's first residency program supported by a 2009 TQP grant. [redacted] as she did with TC's first residency effort.

A full-time Project Manager—to be hired—will be responsible for bringing the project from conceptualization to implementation. The Project Manager will be the glue between the

various partners and components of the project, taking responsibility for creating the structures needed for monitoring, coordinating and overseeing the activities that will support ongoing communication between partners, both as a whole and as constituent or task groups. As such, the Project Manager will convene and facilitate all meetings, oversee the program on a daily basis, and ensure smooth program operations.

A full-time ***TR@TC2*** Lecturer—to be hired—will design, coordinate, and teach the Intensive Summer Institute and the Core Integrating Seminar, in collaboration with faculty and other key partners. The ***TR@TC2*** Lecturer will serve as the conceptual bridge between requirements of the teacher certification programs, the residency placements, and between university- and school-based educators in the partnership. Thus, the ***TR@TC2*** Lecturer should be an expert practitioner with extensive experience in urban, high-need schools, knowledge of state academic standards and a deep understanding of teaching children and adults. This person will also be expected to possess a doctoral degree—or have doctoral preparation—to ensure a solid understanding of theory and research that can inform instruction and support high achievement for students, as well as demonstrate the capacity to engage in empirical inquiry.

A full time Partnerships Coordinator—to be hired—will be responsible for the recruitment and selection of residency schools, and will maintain communication and strong relationships with and across these schools. This person will take the lead in the recruitment, selection, training, professional development and support of all the Mentor Teachers and Residency Supervisors and will utilize program documentation and data to inform this work. Selection criteria for this position include a keen understanding of NYC or urban public schools, deep knowledge of teaching youth in urban environments, and the ability and experience to support teachers in all phases of their development as practitioners and mentors.

[redacted]

TR@TC. This position oversees the recruitment, selection, training and PD of Induction Mentors and professional development for Teaching Residents. [redacted] is an experienced teacher who has served as both a [redacted]. Unsurprisingly, she has done an exceptional job with the induction component of the project and has taken the program in creative and very productive directions.[redacted]

The project team will also include: 1)[redacted] ***TR@TC2*** to assist in the recruitment and selection of full time program staff as well as support TRs through the new edTPA state certification requirement; 3) [redacted] ensure that TRs understand and meet all certification requirements, and provide guidance in registering the new dual certification program of biology and special education with NY state; 4) [redacted] for the duration of the project to weave ***TR@TC2*** into the CAEP accreditation process for Teachers College; 5)[redacted] Additionally, OTE has also allocated secretarial support to the project.

OTE has been awarded two Teacher Education Fellows, advanced doctoral students in teacher education, who will be assigned full-time to the project. Both Fellows will have a solid understanding of teacher preparation research, issues and practice. The project will also employ a

part-time Program Administrator responsible for logistical details for all meetings and activities, maintaining program data bases, electronic networks, supervising clerical and graduate student assistants, and ensuring the Program interfaces smoothly with administrative offices across TC.

[redacted], is not a member of the project team but has assumed responsibility for the project evaluation, and designed the evaluation plan described in this narrative. [redacted] is an expert researcher with over 40 years of experience in designing and conducting empirical studies of school and student performance, achievement and school persistence, and urban school reform. He has conducted dozens of large-scale evaluations, many of which have focused on urban school districts so he well understands the contexts in which TRs will be teaching and learning.

[redacted], will work with [redacted] on the project evaluation. She has extensive experience in executing qualitative and quantitative studies on mathematical teaching, students' thinking, professional development, and quality instruction. Neither [redacted] are engaged with any program at TC, and will not be involved in ***TR@TC2*** daily operations; neither has any substantive role in the program beyond the evaluation. Thus, they can conduct the evaluation as objective, but informed, experts.

Ongoing Communication and Feedback Mechanisms

The complexity of the Program requires multiple structures designed to support continuous communication, mutual problem-solving, and timely feedback for the purpose of program refinement and improvement. These structures will be built into ***TR@TC2*** from the start so that they are systematic and integral to the Program, and immediately initiate program routines and regularities. The most important structure will be regular meetings in order to carve out defined and planned-for space for partnership members to come together.

First, the project team will meet weekly to ensure the smooth functioning of all program components, address both instructional and administrative concerns, and make sure that team members are all on the same page in terms of issues, changes, policies, and finances. Second, a Steering Committee will assume responsibility for program policy and general oversight. This Committee will meet twice a year, will be representative of partnership members (school-community- and university-based), and will include Project team staff. A TR graduate and an induction mentor will be added to the committee after the first program year. Next, the Teacher Education Policy Committee at TC, which meets twice each month, will also be engaged in assessing program progress with particular attention to TRs' experience, curriculum and instruction in the program and to lessons applicable for other teacher education programs at TC and beyond. Finally, the program will host an annual retreat for all partnership members—Administrators, Mentor Teachers, TRs, Residency Supervisors, TC faculty, Induction Mentors, project team members, Barnard personnel, AMNH personnel and NYCDOE representatives. During the retreat, participants will a) reflect on the year and evaluate all aspects of the program; b) attend professional development and re-tooling workshops; c) engage in collective analysis and solution of problems raised by participants or the evaluation; and d) participate in collective program planning according to needs identified by the evaluation and by partnership schools. Meaningful improvement cannot occur in the absence of assessment, and the retreat will provide a deliberate structure that fosters self-examination and a careful analysis of accomplishments against needs for the purpose of moving both the program and the teachers forward. The retreat will also provide an opportunity to examine program progress in relation to the annual milestones we set for each cohort: recruitment, program completion, graduation and certification,

and completion of two induction years/retention in the profession. (See appendix H.2 for Project Management Timeline.)

Valuable Partners

Research tells us that quality teachers have the greatest impact on student learning. Essential to a quality teacher residency program that produces excellent teachers is the caliber of the faculty with whom TRs will study. TRs will have the privilege of learning from faculty at Teachers College who are well-known for their expert teaching, their scholarly productivity, and their work in urban settings. Some of these faculty members include:

- [redacted], known for her work in disability studies and inclusive education, has extensive experience relevant to this project, including her work with NYC public schools and the Teachers College Inclusive Classrooms Project. She is intimately familiar with special education in NYC schools, and has worked closely with teachers and principals as a staff developer and researcher.
- [redacted] comes to the project as a disability studies teacher and researcher with experience in the middle grades. Her scholarly interests focus on inclusive schooling and she has particular expertise in assistive technology.
- [redacted] is an ESL expert whose research focuses on issues related to teaching English language learners at the K-12 level, including the role of language in learning the content areas and teacher preparation for ELLs.
- [redacted], is a science teacher educator who brings expertise in culturally responsive science teaching and curriculum; science teaching as achievement, access, empowerment, opportunity; and urban and multicultural teaching.

Beyond Teachers College faculty, TRs will also have the privilege of learning from leading educators who have committed to the ***TR@TC2*** partnership. Some key people include:

- [redacted] She is an experienced teacher in both K-12 and higher education and currently directs the AMNH teacher residency/certification program. She has expertise in multiple areas including science education, and is the principal architect of the exceptional science education programs AMNH offers to NYC teachers and schools.
- [redacted] Her work focuses on the preparation of teachers in science for urban environments, specifically NYC.
- [redacted] with many years of experience in curriculum and staff development with teachers. He will continue as a collaborator with ***TR@TC2.***

Section IV: Significance

Affecting System Change and Improvement

TR@TC2 promises to build upon and extend the accomplishments of TC's first residency program, TR@TC. Given the track record we have established and our achievement of program goals, we feel confident that ***TR@TC2*** will continue to make a significant impact on teacher preparation and teaching quality for NYC by:

Increasing the recruitment of high quality teachers for high-need schools. The Program will maintain a sharp focus on the single biggest influence on student learning—the quality of teachers. As demonstrated by its first residency, TC has been successful at bringing fresh talent and energy to the consortium of high-need, high poverty schools in NYC. Surveys of hiring administrators (several of whom were from partnership schools) showed that at the end of TRs' first year of teaching (2012-2013 and 2013- 2014), 79% and 100% respectively rated TRs'

ability to make a difference in student learning as good or excellent; 84% and 100% would hire a TR if given the opportunity. Administrators whose schools hosted residents during that period expressed equally positive views about TRs—100% and 75% respectively rated TRs' ability to make a difference in student learning as good or excellent; the same percentage would hire a TR if they had the opportunity. These data are all the more noteworthy given common knowledge of the challenges teachers face in their first year in the classroom, resulting in high attrition rates, particularly among those teaching in high need, urban schools (Ingersoll, 2004; Pallas, & Buckley, 2012). Sample comments from administrators are illustrative:

- The teachers that are the residents who have finished the program are extremely prepared and highly qualified for taking on the challenge of teaching in an urban area. (2011-2012)
- [The TR I hired] is an outstanding teacher. His strongest suit is his ability to relate to students in such a nurturing yet professional matter. This makes him the perfect teacher for an urban school. He is also well prepared and uses effective teaching strategies in his daily teaching. His preparation at TC has contributed to his ability to excel during his first year of teaching in areas where many new teachers struggle. We are very fortunate to have him. (2012-2013)
- We love the TR@TC Program because it truly prepares its candidates for success in the classroom by providing them with a mentor and valuable classroom experiences (2013-2014)

Increasing the retention of high quality and experienced teachers in high-need schools through quality induction support. The retention rates of Teaching Residents are a clear indicator of the quality induction we have been able to deliver. While TR@TC has only one cohort of residents that could possibly have taught three years, 90% were still teaching at the close of their third year, with all indications that they plan to continue; the retention rate across all three graduating cohorts is equally strong at 95%. This contrasts sharply with data that show that up to a third of new teachers have left the field by year three (Ingersoll, 2003) and that high-poverty, urban public schools turn over, on average, a fifth of their teachers annually (Ingersoll,

2004), a turnover rate higher than all other types of schools (Ingersoll, 2011; Simon & Johnson, 2013). Retaining quality teachers in the classroom is a clear priority for high-need schools and induction programs can be critical to retaining new teachers in these schools (Humphrey et al, 2000; Ingersoll & Strong, 2012; Simon & Johnson, 2013; Smith & Ingersoll, 2004). The ***TR@TC2*** induction program will continue to be informed by research that indicates that induction that focus directly on teachers' classroom responsibilities and realities have the greatest impact on teacher retention (Dove & Honigsfeld, 2010; Fletcher, Strong, & Villar, 2008; Smith & Finch, 2010; Smith & Ingersoll, 2004). The program also has the benefit of proven strategies gained from TC's first residency experience to ensure TRs possess the critical competencies needed to handle the challenges of urban classrooms and thrive as teachers.

Broadening and deepening the knowledge base for research and practice in urban classrooms. Urban high-need classrooms boast a rich diversity of students who vary in their racial, ethnic, linguistic, developmental, and academic abilities. Empirical evidence of the impact of residency programs on academic outcomes for diverse students remains nascent. ***TR@TC2*** is essential in connecting the pedagogical expertise of faculty at TC with the invaluable knowledge of classroom practitioners. Program faculty from three TC departments, Barnard College and AMNH will actively work with MenTs across discipline and grade-level boundaries to examine, evaluate and apply insights afforded by TRs' experiences in the field. Such collaborative inquiry will inform teaching and research on ELLs, subject matter knowledge, pedagogical content knowledge, language acquisition, differentiated teaching and learning, among others. ***TR@TC2*** also provides a valuable opportunity to learn from a successful residency program, i.e., to apply prior knowledge and experience from TC's first residency experience in order to scale up and replicate best practices and proven strategies. In so doing, ***TR@TC2*** will enrich the knowledge

base for research and teaching undertaken at the College and enhance TC's contribution to the national discourse and policy-making on educating urban youngsters to meet high standards.

Informing and building local capacity. Successful university-school partnerships can change the life course for students in high poverty communities and at the same time strengthen the mission and reputation of the university (Rodin 2007). ***TR@TC2*** will continue to support Mentor Teacher learning and growth through high-quality professional development, leadership opportunities, and professional learning communities. Participating schools will benefit from access to university resources and from working with school- and university-based educators to shape teacher preparation. They will participate in research and learn from evaluations, which will expose them to cutting edge thinking and new ideas. Of particular interest will be data the program will collect on the intersection of STEM, ESL and special education in teacher preparation and its impact on student learning. These data will be particularly meaningful and relevant to NYC principals given the system-wide special education reform underway with its focus on inclusive classrooms and full access to the academic curriculum for all.

Improving outcomes for diverse learners through an integrated approach to instruction. Large proportions of the NYC student population receive special education services and are designated ELL and/or learning disabled (Thomas & Collier, 2002). NYC is immersed in special education reform that aims to educate ELLs and students with disabilities "to the same level as their non-disabled peers" in least restrictive environments and to increase graduation rates and the number of students who earn regular high school diplomas (Fund for Public Advocacy, 2012). General education teachers will be working increasingly in inclusive classrooms and co-teaching/planning with their special education and ESL teacher colleagues, but few teachers feel prepared to adequately meet these multiple needs (Darling-Hammond,

2002; DeSimone & Parmar 2006). ***TR@TC2*** steps up to these needs head-on through a program of comprehensive and customized support for Science, ESL and TSWD teachers. The integrated curriculum will build teachers' confidence—TRs as well as their mentors—in teaching content, applying specialist knowledge, collaborating with peers, and responding flexibly to complex and diverse needs.

Student achievement. The causes of achievement gaps between advantaged and disadvantaged students are numerous and complex, but within schools, teachers impact the learning of students more than any other factor including, facilities, curricula, class sizes, funding etc. (Chetty, Friedman & Rockoff, 2013; Goldhaber & Anthony, 2007; Hattie 2003). However, students from the most disadvantaged backgrounds are often taught by the least qualified teachers as measured by years of experience, certification level, and performance on standardized tests of general and teacher knowledge (Clotfelter, Ladd, & Vigdor, 2006; Corcoran, 2007; Darling-Hammond, 2000; Lankford, Loeb, & Wyckoff, 2002; Stullich et. al, 2007). Following the trajectory of its predecessor residency program, ***TR@TC2*** will bring certified, experienced, knowledgeable teachers to schools where the achievement gaps are especially pronounced. High quality teachers can make a significant impact on student achievement in just a single school year (Chetty, Friedman & Rockoff, 2013; Hanushek, 1992; Kane, Rockoff, & Staiger, 2007). Furthermore, ***TR@TC2*** graduates will reach ESL and students with disabilities who are especially at risk of under-achieving because teachers are usually ill prepared to incorporate them into the general education classroom.

Teacher achievement. Some student teaching requirements for university-based programs are as short as seven weeks; most are rarely longer than a college semester. New entrants to the field are subsequently overwhelmed and feel unprepared for urban classroom

realities. In contrast, ***TR@TC2*** residents will have embedded time in classrooms four days a week and familiarity with several different schools, affording them a deep and well-rounded experience. They will learn from veteran teachers, and be members of close-knit cohorts that will help them study, teach and reflect. In addition, MenTs will become skilled teacher educators whose work complements the Residents' coursework and builds local capacity.

Saving money. Researchers calculate that taxpayers pay between 25% and 200% of the annual salary and benefits of a teacher who leaves. The cost of attrition of first-year teachers in NYC alone is about $21 million, or $13,200 per teacher lost (UFT, 2013). The 95% retention rate of TC's first residency program equals savings of over one million at the end of graduates' first year—savings that have only increased as the majority of TRs have remained in teaching for three, two and one years thus far. ***TR@TC2*** will prepare another 90 highly qualified teachers for its LEA. Extrapolating from the track record of our first program, ***TR@TC2*** will save a minimum of well over million dollars at the end of teaching (induction) year one alone.

Ultimately, this project will produce 90 high quality teachers and so much more. The significance and potential impact of ***TR@TC2*** must be considered in the context of TC's positive history with designing and implanting a teaching residency program, the high quality teachers we have already prepared who are currently—and competently—serving in high need NYC schools, and the college's capacity, capability and mission to research and further advance new knowledge about innovative approaches to teacher preparation. ***TR@TC2*** is designed to be generative in nature, so as to qualitatively impact and reshape what we know about preparing quality teachers and about achieving excellent outcomes for students who have been underserved and left to lag behind, but who absolutely need and deserve more.

(See Appendix J for proposal narrative bibliography.)