TEMPLE AND STRING THEORY SCHOOLS TEACHER RESIDENCY PROGRAM
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A Proposal for the Teacher Quality Partnership Grant
of the
United States Department of Education
Office of Innovation and Improvement
CFDA: 84.FR.13019

SUBMITTED BY:

TEMPLE UNIVERSITY COLLEGE OF EDUCATION
AND
STRING THEORY SCHOOLS

May 20, 2019

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I.   Absolute Priority: TEMPLE AND STRING THEORY SCHOOLS TEACHER RESIDENCY

Research suggests that the alignment between the pedagogical practices of the mentor teacher and host school and the instructors of methods classes is a critical feature in pre-service teacher development, and, likely to contribute to both future use of such pedagogical practices, and, a greater sense of the value of the education as a whole (Anderson & Stillman, 2013). Drawing on these findings and experience Temple University's already successful residency model for the preparation of middle-grades math and science teachers CFDA 84.336S (2014-2019), we proposed a new collaboration between Temple Teacher Residency program and String Theory Schools (TTR+ST). This endeavor, which aims to meet both String Theory's and Philadelphia-area's need for highly-qualified teachers in STEM disciplines and at the secondary and middle school grade levels, will build the instructional and leadership capacity within String Theory Schools and the Philadelphia area with two intentional and connected strategies:

1) The preparation and support of 32 new math and science teachers over five years; and

2) The support and professional development of 20+ in-service teachers who will serve as mentors – to share these practices more broadly across the schools.

To this end, TTR+ST will recruit cohorts of undergraduate content majors in STEM through a fifth year, contiguous graduate residency program that will prepare them for STEM teaching and will culminate with a Master of Education (M.Ed.) and Teacher Certification in Middle Grades (4th–8th) or Secondary (7-12) STEM areas within 12-months. They will also have two years of post-induction support in addition to what their hiring schools and LEAs provide as they lead their own classrooms.

Significance of Temple Teacher Residency Program

Addressing Areas of High Need

In the most recent administration of the Pennsylvania System of Standardized Assessment, 80% of the School District of Philadelphia's scored at – or below – a *Basic* level in mathematics, and 64% did so in Science, far below the average percentages of the state. At the secondary level, 78% scored Basic or below in Algebra 1 and 71% did so in Biology. Relatedly, in 2017-18, only 62% of teachers in the School District of Philadelphia were in class for at least 95% of all instructional days. The 2009 National Assessment of Education Progress (NAEP) Trial Urban District Assessment paints a grim picture within science classrooms as well with reports that 4th graders in 14 of 17 participating districts in the study scored lower than the national average in science, with Philadelphia's students ranked fourth from the bottom. Similarly, 8th graders in 16 of the 17 participating districts scored lower than the national average in science, with Philadelphia's 8th graders ranked third from the bottom. We provide this data as a backdrop via which to situate the performance of the students of String Theory Schools; given that most students at String Theory Schools live within the city of Philadelphia.

The need for certified STEM teachers across grades 4-12 is particularly acute in the city of Philadelphia, especially candidates from minority populations. This is important because middle school students of all races and ethnicities perceive Black and Latino teachers more favorably than White teachers (Cherng & Halpin, 2016). Minority elementary students have been shown to have greater student achievement when taught by teachers of the same race (Dee, 2004; Egalite, Kisida, & Winters, 2015; Goldhaber & Hansen, 2010). Black teachers often have higher academic expectations for Black students than White teachers (Bates & Glick, 2013; Gershenson, Holt, & Papageorge, 2016; Grissom & Redding, 2016). Students who have teachers of the same race tend to have better attendance (i.e., less absences) and fewer suspensions than their peers with teachers from a different race/ethnicity. Given that the collective majority of

minority school-children currently make up a majority of Philadelphia's student population (School District of Philadelphia, 2016) and that student diversity is projected to increase over time (Kena et al., 2015), changing teacher demographics, especially of STEM teachers, is critical. TTR+ST will provide more, and more-qualified, STEM teachers to meet the needs of the LEA and other local schools, and to expand its support services so that these improvements will spread across the local education system.

Reports also indicate that many young teachers in urban districts leave after a few years of teaching (Goe, 2009; Ingersoll & May, 2012). Studies show that educating new STEM teachers (or any teachers) for urban settings must include strong preparation in content area and pedagogy. Even more important, however, is the need for preparation relative to the nature of the urban community and sustained mentoring throughout the early years in the profession (Ingersoll & Kralik, 2004; Ingersoll & Perda, 2009;). In the Philadelphia area, SDP has experienced significant problems with teachers from alternative providers; including attendance issues and persistence, especially as compared with students from Temple's programs. More, conversations with assistant principals at partner high schools suggested a discomfort at hiring some of the graduates into STEM teaching positions, even when the alternative was hiring a teacher with little or no training on an emergency certification.

As will be described in the narrative below, TTR+ST strives to address this need by recruiting diverse cohorts of undergraduate content majors in STEM through a fifth year, contiguous graduate residency program that will prepare them for STEM teaching and will culminate with a Master of Education (M.Ed.) and Teacher Certification in Middle Grades (4th–8th) or Secondary (7-12) STEM areas within 12-months.

Temple's Existing Teacher Residency

Large-scale research on residency programs suggests favorable outcomes on a number of factors, including diversifying the workforce in terms of residents' work history and graduation from more prestigious programs, increased hours of classroom-experience prior to graduation, increased hours of full-responsibility for the residency classroom, reports of a tighter integration between coursework and teaching experiences, and higher levels of support during supervised teaching experiences. In terms of post-graduation outcomes, teachers who complete residency programs are more likely to teach math and science and report feeling better prepared than teachers who did not complete a residency program. Finally, in terms of student outcomes, teachers who complete residency programs are as effective as other novice teachers, but by the time they are in their fourth or fifth year of teaching, they outperform similarly veteran teachers (Papay, West, Fullerton, & Kane, 2012).

In a white paper, "Why Clinical Experience and Mentoring Are Replacing Student Teaching on the Best Campuses," Fraser and Watson (2014) reviewed different approaches to teachers' clinical preparation. Among the characteristics of successful programs:

- They integrate course work with clinical time so novice teachers can make connections between practice and theory.

- They last one full school year so novice teachers can observe how master teachers set classroom expectations and handle seasonal distractions.

- The learning demonstrated by the students of the resident teachers measures the program's effectiveness.

- Novice teachers move gradually into the profession, learning from an experienced mentor before becoming a teacher of record and with the support of coaches and faculty in a high-touch environment.

Informed by this literature, in the Fall of 2014, the College of Education received a Teacher Quality Partnerships (TQP) grant from the U.S. Department of Education to fund a new teacher residency program to recruit and prepare a diverse cohort of teachers to become highly effective teachers specifically for students in Philadelphia's high-need schools. TTR consists of an accelerated one-year graduate certification program offered by the College of Education for middle-grades (grades 4-8) and secondary (7-12) mathematics and science teachers in collaboration with the School District of Philadelphia (SDP). Its mission statement reads:

> Temple Teacher Residency recruits diverse individuals with strong backgrounds in STEM subject matter knowledge and a commitment to teaching in high-need Philadelphia middle schools, engages them in intensive coursework, immersive clinical experiences in the classroom, and ongoing professional development to advance their knowledge and ability to provide academically rigorous, culturally responsive, and developmentally appropriate STEM education for all middle grades students. (TTR, 2014)

Since 2014, Temple's residency program has graduated 49 middle and secondary STEM teachers, 19 of whom identify as coming from an underrepresented background. Moreover, they complete their service requirements at a rate of approximately 85% (when pro-rated to the number of possible years of service they could accrue). The program has prepared these Residents for the unique challenges faced by 4-12 STEM teachers in an urban high needs district with the following successful practices:

Relationship Cultivation with Residency Placement Sites Temple University has cultivated

strong relationships with several schools within SDP. These schools are supportive of the teacher residency model and continually work to support the growth and development of the program's residents and mentors. This includes: involving residents in all of the responsibilities of teachers, providing constructive feedback, and supporting mentors as they assume the responsibilities of mentoring.

Ongoing Constructive Feedback A major strength of TTR is the program's emphasis on constructive feedback. Residents receive feedback daily from mentors, on several occasions (both formally and informally) each semester from university coaches and TTR staff, and meet in a weekly seminar led by a district math coach in order to reflect upon residency experiences and make connections to methods coursework.

Resident Placement The process to place residents in TTR host schools is very involved to ensure the resident-mentor pairs will work well. Every mentor and resident completes a survey and the results are shared so they can learn about one another before meeting. A "match" event is held at Temple, during which residents and mentors engage in several team-building activities and provide feedback about who they think they will work well with for the year. Time and thought are put into making the final matches before residents are placed in host schools.

Mentor Teacher Selection and Training The quality of the mentor teachers for TTR has generally been strong because of the relationships the program has with schools and principals and the process program staff engage in to observe and interview potential mentors. Mentors receive professional development during a summer institute that is focused on co-teaching, mentoring, giving feedback, communicating effectively, and building positive relationships. Additionally, throughout the year mentors meet via WebEx to collaboratively problem solve

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and share successes and challenges.

New School-University Partnership

The experiences and learning of the faculty, administration, school partners, and residents over the past 5 years serves as a foundation for the proposed TTR+ST program, as does the practices and models offered within the String Theory Network Schools. String Theory Schools was carefully selected as the partner in this project for their educational philosophy, structures and the needs of the student populations they serve. Philadelphia Performing Arts: A String Theory Charter School ("PPA") was awarded its initial K-8 charter in 2000, which opened with grades Kindergarten to fifth, 300 students at 2600 S. Broad St. Each year the school added a grade until it included grades Kindergarten through eighth by 2003, serving 450 students. In 2009, PPA was the only charter school in the city to be renewed without any recommendations. The expansion to add the high school began with 9th grade in 2013, adding a grade each year until PPA was a K-12 school in 2016, servicing a total of 2,525 students. With the addition of 9th grade, a third facility, 1600 Vine St., was acquired to house the middle and high schools. The Center City facility addition is ideal to pull from more neighborhoods and provide an inspiring landscape for students to learn in and outside the classroom. PPA is now the largest single charter school in Philadelphia.

At the same time PPA was expanding, in 2012 String Theory was awarded a K-8 Renaissance Charter School, now The Philadelphia Charter School for Arts and Sciences at H.R, Edmunds ("A&S"). String Theory Schools implemented its curriculum, school culture, and arts integration into a neighborhood school that was previously considered to be one of the most violent and poor-achieving schools in the city. The illuminating transformation of A&S is proof that the String Theory education model is effective. String Theory supports the school in

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continually fostering and enhancing relationships with and outreach to/from the community.

The educational philosophy universal throughout all String Theory Schools holds that every student is gifted and has specific intelligences that must be nurtured. Providing students of Philadelphia with equal opportunity for discovery and development of their innate potentials, through unique and rigorous curriculum blending academic and artistic excellence, that enables students to become the next generation of creative leaders. The schools focus on an integrated approach and constructivist model that emphasizes the visual and performing arts, S.T.E.M., world language, and collaboration along with a deeper understanding of academics.

Meaningful Learning, is one of the critical String Theory Schools Design Elements. The structures and resources that engage all students in relevant, rigorous, and accessible learning experiences affirm that priority. To do this, they synthesize a dynamic creative arts and sciences program, best-in-class curricular resources aligned to CCSS, NGSS and PA Core Standards for academic content and curricular priorities are founded on the following premises:

· <u>Student-Centered and Mastery-Based Learning</u> - Instruction happens in the context of flexible groups, and the practice students dedicate to each skill is determined by their own work towards mastery of standards, skills, and competencies.

· <u>Understanding By Design</u> - Lessons are logically inferred from the results sought, not from activities.

· <u>Teaching Students - Not Subjects</u> - Teachers invest in building positive relationships and analyze qualitative and quantitative data from inventories and formative assessments.
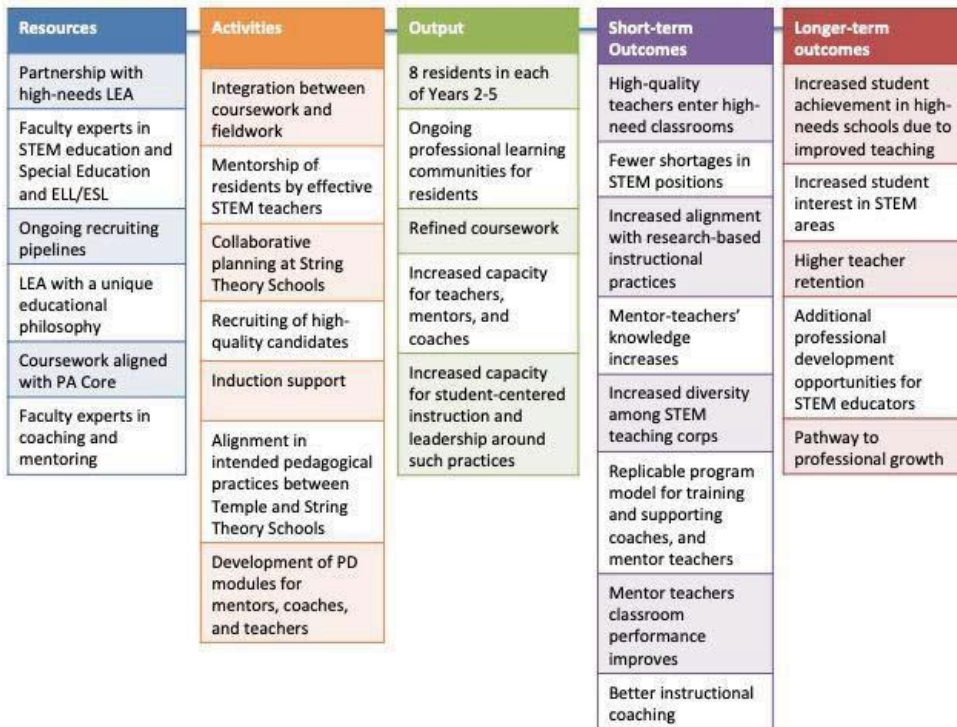
As String Theory's pedagogical model aligns with the student-centered methods that Temple's faculty promote, TTR+ST promises to serve as a demonstration project for programs

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across the College of Education, and will strengthen Temple's capacity to provide high-quality

teacher preparation

New Residency Partnership Design

Like the existing model, TTR+ST will feature a 12-month masters+certification program

for middle- and secondary-STEM teachers. Residents will spend more than 1000 hours in String

Theory Schools classrooms, paired with carefully chosen mentor teachers. They will both co-

plan and co-teach. More, we operate on a high-touch model during the residency year with

frequent coaching, check-ins with project faculty and staff, and the support of the mentor

teacher. During the residency year, residents will be supported with a generous living stipend of

$47,000, out of which they will need to pay a reduced tuition for Temple University. TTR+ST

will continue to support the residents post-graduation for 2 years drawing on the success of our

extant residency model and developing new means of doing so. We will do so via the bi-weekly

new teacher seminar, membership in professional math or science organizations, and summer

workshops. However, this model also aims to elevate the roles and responsibilities of the

university and school partners to attend to school structures and teacher leadership development

in the service of both our students and theirs. We illustrate, in Figure 1, below, the different

components and intended outcomes of the model.

Figure 1. Logic Model showing the features of TTR+ST and evaluation questions

Resources	Activities	Output	Short-term Outcomes	Longer-term outcomes
Partnership with high-needs LEA	Integration between coursework and fieldwork	8 residents in each of Years 2-5	High-quality teachers enter high-need classrooms	Increased student achievement in high-needs schools due to improved teaching
Faculty experts in STEM education and Special Education and ELL/ESL	Mentorship of residents by effective STEM teachers	Ongoing professional learning communities for residents	Fewer shortages in STEM positions	Increased student interest in STEM areas
Ongoing recruiting pipelines	Collaborative planning at String Theory Schools	Refined coursework	Increased alignment with research-based instructional practices	Higher teacher retention
LEA with a unique educational philosophy	Recruiting of high-quality candidates	Increased capacity for teachers, mentors, and coaches	Mentor-teachers' knowledge increases	Additional professional development opportunities for STEM educators
Coursework aligned with PA Core	Induction support	Increased capacity for student-centered instruction and leadership around such practices	Increased diversity among STEM teaching corps	Pathway to professional growth
Faculty experts in coaching and mentoring	Alignment in intended pedagogical practices between Temple and String Theory Schools		Replicable program model for training and supporting coaches, and mentor teachers	
	Development of PD modules for mentors, coaches, and teachers		Mentor teachers classroom performance improves	
			Better instructional coaching	

Specifically, Temple's TTR+ST program retains and builds on the following features identified by research as critical (Berry et al., 2008; Silva, et al., 2014):

1. Aggressively recruit talent with the demand needs of local districts in mind;

2. Residents are paid a stipend while learning to teach during a year-long program; and

3. Residents spend four days a week during the academic year working with expert K-12 teachers while also taking university-based coursework that "wraps around" their intense classroom experience.

As stated, since 2014, TQP funding has supported 10 middle-grades STEM teachers per year for both charter and district public schools, and in which all student support came from the grant. The grant offered students a $20,000 stipend in Year 1 and an $18,000 stipend in Year 2, but provided no other financial support. As a result, we lost a number of strong recruits, especially recruits from underrepresented backgrounds, to other, lower cost providers.

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In 2018-2019, we partnered with SDP who provide residents a living stipend of $38,611 and tuition support of $7500 in exchange for a 3-year commitment to teach in a district school.

TTR+ST will incorporate these insights into the program design in two important ways. First, we are requesting significant funding for student living stipends. By reducing the financial constraints and demonstrating our appreciation of the value of their work in schools during the residency year, we believe we will be able to increase and diversify our applicant pool. Second, we've found strong recruiting success when our partner schools advertise the residency on their HR page to generate interest and referrals and we have engaged with organizations, such as Troops to Teachers and Fellowship of Black Male Educators to expand our outreach. Throughout this effort, we will emphasize that partnering with String Theory provides opportunities for our residents to practice the types of student-centered instruction that Temple's faculty promotes in their methods classes. That is, while Temple's program may be higher cost than an alternative provider, we argue that our experience, the TTR+ST partnership, and demonstrated success will make the Temple program attractive to future teachers from diverse backgrounds.

While listed above as a strength, we also recognize the selection and training of mentor teachers is an area for growth. TTR has faced challenges with some mentors' ability to effectively mentor; consequently, residents receive different levels of support based on the capacity of their mentor teacher to provide the support that is desired. A particular challenge that has arisen with some resident-mentor pairs is a mentor's inability to have difficult conversations with his/her resident. Additionally, some mentors struggle to effectively discuss and "unpack" their pedagogy in terms of explaining what they are doing and why they are doing it. The bulk of the training that is currently offered to TTR mentors and coaches is

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primarily offered at the Summer Institute, a week of programming in August that includes residents, mentors, and coaches.

In the TTR+ST model, the content, delivery method(s), and timing of mentor teacher training will be reworked to ensure not only that residency students receive high-quality field-based support, but that the benefits of residency programming is shared across the university-school partnership. We will use the planning year to develop a variety of professional development modules that will support potential mentor teachers (e.g., current String Theory teachers), coaches, and the residents post-graduation, in a variety of areas of practice. We will create new professional development to better support mentor teachers and coaches in their work with teacher-residents. We will develop structures so that Temple instructional faculty will be able to real-time make use of mentor teacher and coach reports in their classes. If they lead to changes in practice, we will adapt them to the needs of the rest of Temple's teacher preparation programs.

II. COMPETITIVE PREFERENCE PRIORITY:

The project will address the objectives of Competitive Preference Priority 1 (CPP1) in the following ways: continue to promote science, technology, engineering, and mathematics (STEM) education, partner with String Theory Schools to focus on improving STEM education, and a more targeted recruitment, and inclusion of underrepresented populations.

Promoting STEM Education

Graduates of TTR+ST program will have earned their Master of Education (M.Ed.), a teacher certification in either Middle-Grades (4th-8th) or Secondary (7-12) mathematics or science, and an optional certification in Special Education or ESL. They will also have two years

of post-induction support in addition to what their hiring schools and LEAs provide as they lead their own STEM classrooms.

To promote STEM education,, the proposed program, has developed a multi-faceted approach that supports STEM education across several contexts. TTR+ST will utilize a highly-targeted, discipline-specific curriculum and training approach. During the pre-residency summer and residency year, student coursework will examine literacy methods, proven instructional practices and strategies to support critical and creative thinking such as questioning techniques, adaptive classroom management, and inquiry- and design-based approaches to science teaching – broader skills that are essential to strong STEM instruction. Research suggests that such preservice placements are keys to developing teachers who are effective long-term urban educators (Whipp & Geronime, 2017). Thus, the curriculum will not only emphasize the use of hands-on learning experiences, but will be tightly integrated with the year-long clinical experience in the host-classroom through coursework that pushes the student to incorporate new knowledge and practices into the residency classroom. This immersive experience in a high-need subject within a String Theory high-need school will allow residents to work closely with their mentor-teacher and will acculturate them to the high demands of the middle-grades or secondary-grades math and science classroom while providing them ongoing support and feedback. We envision a reciprocal learning opportunity in these classrooms in which the residents will learn from the mentor teacher's experience while introducing the experienced teacher to cutting-edge classroom practices.

Partnership with String Theory Schools

Our partner, String Theory Schools, is a public charter school network that meets all of the criteria specified in the Federal Register and meets the definition of a high-needs LEA as

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61% of the students in the LEA were qualified for Free or Reduced Price Lunch during the 2018-19 school year. In accordance with CPP1 and to support residency graduates as they transition into the role of novice teachers, our partnership will implement an induction program that will offer ongoing training and professional development opportunities to potential mentor-teachers, current mentor-teachers, student-teaching coaches, and TTR graduates. Mentors will be supported through a training program that includes online professional development modules (developed during our initial planning year), a Summer Institute and ongoing cohort trainings.

To support residents post-graduation in their new positions with String Theory Schools, the induction program will last for the first two years of a teacher's employment. Graduates will participate in a bi-weekly new teacher seminar at Temple University focused on new teacher development and continuing to build a strong collegial community. For each of two summers they will participate in two-day workshops led by Temple staff and faculty to help prepare them for the school year. Temple will also provide each graduate with a membership to either the National Council for Teachers of Mathematics or the National Science Teachers Association.

Targeted Recruitment, and Inclusion of Underrepresented Populations.

In accordance with the note for CPP1, and to ensure that the TTR+ST produces teachers with content knowledge and the skills to transfer that knowledge to a classroom, we will admit only students with bachelor's degrees in fields related to mathematics, science, and engineering, and build instructional practices on top of their expertise (see Papay, et al., 2012 for evidence of the effectiveness of residency model programs)

Also, currently, the entire Philadelphia area has a need – not only for middle-grades and secondary STEM teachers – but for teachers who are more representative of the populations in their classroom. TTR+ST will address this by expanding Temple's and TTR's already-successful

diversity initiatives to target recruits who better reflect the populations they will teach. For the past four years, our average cohort has been approximately 39% composed of residents from underrepresented groups. Moreover, with String Theory Schools' human resources support, the Troops to Teachers funding and resources Temple is receiving through a sub-award agreement with Slippery Rock University to recruit veterans, and the more generous financial support package we will offer residents, we anticipate improving the rates at which we produce new teachers from underrepresented backgrounds.

Program Description

Building and implementing a new partnership and innovative model that meets multiple needs requires time, energy, and resources. Both Temple and String Theory are committed to providing these as match efforts to the funding to plan and implement this program over the next 5 years. During Year 1, the project partners will collaborate in the research, development, and design of the new program elements as well as the structures needed to implement in the following years. In the same year, pre-residency work will be initiated, including recruiting residents, mentors and coaches, enrolling participants in classes and trainings, and matching residents and mentors for their placements.

Cohort 1 residency will begin in Year 2, and as indicated in the timeline (Appendix C), the pre-residency work for Cohort 2 will begin that same year. In years 3-4, induction will be added to the implementation. In Year 5, the program will consist of residency and induction work only. Each area of implementation are detailed below.

Planning Year Activities (Year 1)

The first stage of this project consists of the development of new and revised professional development modules for training and supporting mentor teachers and coaches,

adaptation of existing courses for residents into online format, organization and

implementation of the recruitment of cohort 1 residents and mentor teachers, admissions,

securing placements, and development of pre-residency activities including the planning and

implementation of the resident-mentor match event and Summer Institute.

Program Development

To contextualize the program development goals of our planning year, we note some

challenges that our existing residency program has encountered. They are three-fold; a relative

paucity of high-quality mentor teaches and coaches, challenges related to the timing and load of

coursework and supervised teaching, and challenges relating to the interactions between the

instructional triad of mentor teachers, coaches, and instructional faculty.

String Theory Schools has already done some needs-analysis on their teaching staff, and

reports a need for better differentiation techniques as they reduce tracking and more consistent

integration of project-based learning across the curriculum. During the planning year, we will

further this exploration and, based on the findings, build a variety of online professional

development modules that include content, instructional techniques, communication, and,

focused observations of K-12 classrooms. Teachers who complete them will be eligible for PA

Act 48 credit, needed for ongoing professional education. Specifically:

- ██████████, a special education expert, will lead the development of two modules; one

  focused on differentiation in STEM subjects, and one that will support teachers in teaching

  students to take better notes, one of his areas of research expertise (c.f., Boyle & Weishaar,

  2014), and, which has shown significant impact on student academic performance.

- STEM content experts, ████████████████████████, will lead the creation of

  modules focused on problem-based-learning in STEM. In addition, each will lead the

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development of a module focused on a specific content area that students often struggle with

that will include teaching strategies and persistent areas of student difficulty (e.g., ██

██████ will focus on rational number).

● ███████████████ will lead the development of modules focused on three particular

areas: (1) focusing observations on high-leverage areas for instructional improvement, (2)

providing specific and actionable critique and advice, (3) the co-creation of action-plans and

next-steps, (4) co-planning and co-teaching models and distribution of responsibility.

Additionally, we will develop structures to facilitate communication throughout the

implementation phase of the project, including making mentor and coach feedback available to

TU instructional faculty in real-time, and, developing contingency plans for how to make use of

the feedback in relevant coursework. We will specify where, in each course calendar,

observations will take place, and, the foci of each observation, and which course(s) would be

best suited to supporting residents' developmental needs. Finally, we will work to transform our

hybrid version of Child and Adolescent Development into a fully online version to increase the

flexibility in scheduling, and, support residents in better balancing the workload.

Pre-Residency Activities (Years 1, 2, 3 and 4)

Resident Recruitment

In order to be admitted to any of the Masters + Certification programs at Temple

University, prospective students must have an earned bachelor's degree, an overall 3.0 or

higher GPA, and a passing score on the relevant Praxis exam. Secondary candidates are

required to have at least 30 semester hours of undergraduate coursework in their intended

subject area. Middle Grades candidates are required to have a diverse set of courses given that

they earn PA certification across a range of subjects, with sufficient coursework to be certified in either mathematics or science.

Temple will coordinate recruitment and selection with String Theory Schools. Temple and String Theory Schools each engage in extensive recruitment activities, including webpages specifically devoted to the residency program and targeted advertising on social media. In addition to the recruitment that String Theory Schools is doing in support of their teaching needs and advertising the residency program via their networks and human resources page, Temple will actively recruit students and support them in applying to the TTR+ST residency and the relevant Temple University Masters + Certification program.

The college actively recruits students via a partnership with two area HBCUs, Lincoln and Cheney Universities. Second, TTR+ST recruits internal to Temple, visiting classes in the College of Science and Technology and the College of Engineering as well as working with career and academic advisors in both colleges. We also advertise at clubs and fairs around campus. We note that our internal recruiting efforts have the potential to diversify the teaching workforce. Approximately 54% of the graduates of the College of Science and Technology and 48% of the College of Engineering are persons of color. TTR is an active member ally of The Fellowship – Black Male Educators for Social Justice (The Fellowship), a local organization focused on the recruitment, development, and retention of Black male educators in Philadelphia's public schools. We are currently collaborating with The Fellowship to conduct outreach to Black male students at Temple University to recruit black male teachers.

TTR also has a sub-award agreement with Slippery Rock University and Troops to Teachers in order to recruit veterans into the teaching field. Through collaboration with SRU and TTT we have created a strategic plan for the recruitment of veterans including:

participation in veteran job fairs, advertisement of our program through Recruit Military which has over a million veteran subscribers, outreach to local veteran organizations, targeted recruitment through social media, and collaboration with the Military and Veteran Service Center at Temple University.

Finally, TTR makes, and will continue to make, significant efforts to recruit from external populations, including those with experience in schools (e.g., paraprofessionals and substitute teachers), potential career-changers, and other relevant populations. For example, we will disseminate information via local STEM-focused organizations and initiatives (e.g., National Society of Black Engineers, Philadelphia Education Fund's STEM Initiatives, e.g., STEMcityPHL) to potentially interested candidates. We will continue to recruit externally via e-blasts, social media, flyers, posters, websites (e.g., TTR, Campus Philly, career centers, STEMcityPHL, other Temple-related websites), and word- of-mouth (we have recruited roommates and friends of residents).

Resident Admissions

There are three distinct processes that we will use for admissions to TTR+ST. First, during the planning year, String Theory Schools will develop an application for their system that helps them decide if the prospective resident can be successful given their unique educational, arts-infused, curriculum. Second, prospective residency candidates must apply to Temple University's Graduate School and College of Education in the relevant certification area. For admissions consideration, applicants must submit all required application materials, including an application form, statement of goals, passing praxis scores in the relevant areas, official transcripts from every college and university attended, two letters of reference, and a professional resume. Finally, TTR+ST will run an in-person admissions event, hosted at one of

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the String Theory Schools that includes both group- and individual-aspects, adapting TTR's extant process to reflect the needs of the TTR+ST collaboration. Before the event, candidates will be asked to provide written responses to prompts focused on the conditions of urban education. The in-person process includes an observation of STEM class meetings and a debrief in a whole-group setting. Each resident gives a teaching demonstration in their subject-area to the entire group (prospective residents and TTR+ST personnel) and writes an, in-the-moment, reflection as well as evaluates each of their colleagues' teaching. We do this in order to offer another way to assess their written skills, but, also to evaluate how well they will be able to offer specific feedback to colleagues as part of the cohort experience. Each resident is individually interviewed by at least one TTR+ST personnel, and we try to have one Temple-based and one String Theory-based interviewer.

Mentor Role, Selection, and Mentor+Resident Matching

TTR+ST mentors are experienced teachers working in String Theory schools who facilitate the growth of a resident's teaching practice. As a school-based teacher preparation program, the residency program relies heavily on the expert teachers-of-record to (a) onboard residents into the school community, (b) model effective classroom management and instructional practices, (c) support the resident in gradually assuming teaching and management responsibilities, as well as (d) mentor and evaluate residents on a daily basis (see Ronfeldt, Brockman, & Campbell, 2018 for the importance of such mentors). Mentors also participate in professional development sessions throughout the academic year to discuss and refine resident supports and to provide feedback to the residency program.

Selection Criteria and Process

Mentors will be nominated by their principals, and in order to qualify for our program must (a) be Pennsylvania certified to teach in the appropriate grades and subjects with content expertise (e.g, relevant coursework or external STEM workforce experience) and (b) have a minimum of three years teaching experience – with at least two years' experience teaching in the relevant grades, and (c) be recommended by ST personnel as an effective teacher who engages students in a variety of ways and is a strong collaborator with colleagues. To apply for a mentor position the teacher must send TTR staff (a) an up-to-date resume; (b) a Letter of Interest that addresses why they are interested in becoming a TTR+ST mentor, what they believe residents need to learn from this experience to be successful teachers, and why they would be an exemplary mentor to an aspiring STEM teacher; and (c) a form that provides basic information such as: years of teaching experience, area(s) of certification, grades taught, subjects taught, etc. If the submitted information is deemed satisfactory, the Program Coordinator will set up a time to observe and interview the mentor candidate (with at least one of the program faculty). An observation rubric based on Danielson's Framework for Teaching is used to assess the mentor candidate's teaching and a semi-structured interview protocol is used for the interview. As possible, we will use graduates from the Year 2 cohort as mentors for the Year 5 cohort of residents.

Resident and Mentor Matching—Classroom Placement

TTR practices mindful pairing of residents and mentors and recognizes the importance of matching mentor strengths with resident needs as well as ensuring personal compatibility. Given the unique philosophy and instructional model of String Theory Schools, we will be specially selecting potential residents based on their background and fit for the institution. In order to inform resident placement in mentor classroom, TTR+ST will host a "resident-mentor

match day" to gather useful information regarding individual personalities, work style, communication strategies, etc. Additionally, we will encourage all residents to meet with the principal at the four String Theory Schools in order to learn more about the culture of the school and any school-specific needs and expectations. Finally, we will ask all mentors, principals, and residents to produce a rank-ordered "match" list. TTR+ST program staff, including at least one String Theory staff member, will make mentor-resident assignments in order to balance needs and strengths as well as based on programmatic constraints.

Residency Activities (Years 2, 3, 4 and 5)

Program Structure

As noted earlier, the TTR+ST program is a one-year graduate program at Temple University's College of Education. All TTR+ST residents seeking teacher certification are graduate students for four terms: Summer II session, Fall semester, Spring semester, and Summer I session. During the 12-months, residents will complete 31 graduate-level semester hours of coursework, earn a master's degree and certification in their desired grade-band and STEM subject-area. Combining the number of hours spent within their residency school and within course-associated field experiences, residents will accrue well over 1000 hours of classroom-based experience. This proposal includes support for four years beginning in AY2020-21 and ending in AY2024-25, during each of which we will support a cohort of 8 residents.

Curriculum

The residency year begins with professional development including a one-day TTR+ST Orientation before courses start. The course and clinical schedule allows the students to complete a 12-month, 31-credit Master's + Certification program while spending Monday-

Thursday in 4-12 classrooms co-teaching. Residents begin coursework in Temple University's Summer II session with 2 courses, 3 courses during the Fall semester, 2 courses during the Spring semester, and 1 course during Summer I. In addition, during both Fall and Spring, residents take a 1.5 hour seminar led by a Philadelphia-based STEM curriculum specialist, and former middle-grades math teacher, focused-on and driven-by issues arising from their work in schools. The course sequence is structured in a way that supports residents in developing needed competencies while working in schools and drawing on school-based experience as a means to instantiate and ground the ideas in their coursework.

As an example of our continual process of reflection and revision of our programs, we note that in prior years residents claimed a need for additional training in classroom management. In fact, they needed it on Day 1 of their clinical experience, so we modified the curriculum so that residents take a classroom management course during Summer II, which includes in-school practicum hours during summer school. This course replaced the Technology for Teaching course in the curriculum. We have redesigned other courses to include all needed competencies about technology. All other coursework is as specified in the Temple Graduate Bulletin.

We also run a week-long TTR Summer Institute for residents, mentors, and coaches. Summer Institute topics are designed to prepare residents for work in classrooms, introductions to urban education, culturally responsive teaching, and special education. For TTR+ST we will also devote special sessions to the unique, arts-infused, student-centered curriculum of String Theory Schools. There is also significant time for residents and mentors to work together. That is, as part of their curriculum, during Summer Institutes, and other, ongoing PD, residents and mentor teachers will learn how to work with students with disabilities as well as students with

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limited English Proficiency. Moreover, one area that String Theory is purposefully working on with teachers is differentiation, and, we will be building a PD module to support residents and classroom teachers in doing so. Residents will also have an add-on option for SPED and TESOL certification.

During the residency year residents spend 30 weeks in a mentor teacher's classroom in a String Theory school. During that time, they have an intensive immersion in urban student-centered, arts-infused STEM teaching through a collaborative co-teaching and one-on-one mentorship experiences with an expert teacher. We have developed a gradual-release model, and Monthly Learning Calendar, that asks the resident to assume more classroom responsibilities over time, while under the guidance of their mentor teacher and coach, and, in conjunction with increasing knowledge developed via coursework. The calendar provides guidance to the resident's and mentor's foci for development and includes the timing of formal observations by the coaches and mentors. For example, in November, the residents should be learning about questioning strategies, while assuming more co-planning responsibilities although often drawing on the mentor teacher's materials. We describe co-teaching strategies to use, and, note that we expect who is 'lead' and who is 'second' in the classroom to start to shift, so that the resident is sometimes the lead.

Learning rotations are targeted visits to other teachers' and residents' classrooms to gain experience with other groups of students and school settings. Moreover, we note that as part of the planning year, we will be developing a structured way for Temple instructional faculty to make real-time use of the mentor teacher and coach feedback as part of the residents' graduate coursework. Detailed descriptions of the roles and responsibilities of residents, mentors, and coaches for TTR are described in the Fall Practicum Handbook (Appendix A) and

Student Teaching Handbook (Appendix B). As with mentors, coaches are selected based on their experience in education, ability to provide critical support, and knowledge of effective pedagogical practices. They make at least 9 formal observations of residents per year, 5 in the Fall and 4 in the Spring semester as well as hold pre- and post-observation conferences and write formal reports to the program. In addition, program faculty and staff check in with coaches, mentor teachers, and residents approximately weekly. Faculty and staff do additional formal and informal observations of and meetings with residents and mentors as appropriate.

Role of the Mentor

The role of the school-based TTR+ST mentor is to support and guide the resident in the classroom and in the school. The role of the mentor for *any* student teacher is described in Temple's Student Teacher Handbook (Appendix B). We also expect mentors to collaborate with the resident regarding curriculum, instruction, assessment, and classroom management. Mentors always actively model best practices in instruction and co-plan and co-teach with the resident through a gradual release curriculum. Mentors participate in ongoing professional development related to mentoring, co-teaching, coaching, Common Core, STEM pedagogy, and more. They play multiple roles including co-teacher, coach, advocate, collaborator, facilitator, learner, and assessor. Mentors also provide feedback to TTR staff regarding resident progress, the mentor-resident relationship, and program development.

Mentor Professional Development

In the interest of supporting residents, mentor teachers are supported through a training program that includes a Summer Institute and ongoing mentor cohort trainings. Moreover, as described above, the planning year includes the development of a number of new PD modules for mentor teachers that include content, collaboration and communication, and, targeted

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observations. During the academic year TTR+ST will support mentors to ensure they are equipped with the knowledge and skills to (a) model effective classroom practices and provide the resident with practical guidance on how to apply theory into classroom practices; (b) use informal and formal data to facilitate resident learning; and (c) release instructional and classroom management responsibilities gradually to residents so residents gain experience and confidence in leading all aspects of a professional teachers' job. Throughout the school year, mentors convene five times, under the leadership of ▮▮▮▮▮▮▮ and Program Coordinator, to reflect on residents' growth and progress, troubleshoot any challenges that arise in their mentorship role, and share strategies to facilitate resident learning. Mentor meetings focus on strategies to support various facets of residents' learning (e.g., practical daily lesson planning, productive observation and debriefing) and their own instruction. We will also have mentor meetings specific to the TTR+ST partnership given the unique nature of the school.

Classroom Teaching Experience in the Residency Year

TTR has developed and implemented a model for the year-long classroom teaching experience that TTR+ST will adopt. Residents will spend 30 or more weeks in a highly accomplished mentor teacher's classroom. During that time, they will have an intensive immersion in urban 4-12 teaching through a collaborative co-teaching and one-on-one mentorship experiences with an expert teacher, ongoing professional development, and integrated graduate- level coursework. The design is one that relies on a gradual assumption of responsibility through a progressive co-teaching model. Residents work side by side with school-based mentors teaching in String Theory Schools' classrooms from Monday through Thursday. On Fridays, residents visit other classrooms to explore instructional practices and classroom management strategies as well as to hone their abilities to be excellent teachers of

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science and mathematics. The rigorous curriculum integrates clinical school-based teaching experiences with coursework, enabling residents to apply their expanding knowledge and new practices directly into classrooms while they are simultaneously provided ongoing feedback and support from mentors, professors, and TTR+ST program staff. We suggest that the TTR+ST collaboration will be valuable for our *other* STEM-pre-service teachers as well as it will provide a real model of student-centered STEM instruction with the same population of students. We will ask all TTR students, especially those working in SDP schools, to do one of their observation-rotations in String Theory Schools, as well as suggest it of coaches and mentor teachers.

Gradual Release

During the residency year, residents are expected to take more and more ownership of the lead teacher role while under the guidance of the mentor. Classroom management and instructional responsibilities are gradually released over time. In each subsequent month, residents take on more responsibility such that by the time they are in their second semester of residency, residents assume 75% of the classroom instructional and management responsibilities. Mentors can make minor modifications to the responsibilities as needed based on the resident's specific development.

More details about the gradual release approach that TTR+ST will use can be found in the handbooks (Appendices A and B). To ensure that all residents meet Temple's College of Education's Standards for Skillful Teaching and focus on all four domains of the Danielson Framework for Teaching (Danielson, 2014), TTR residents and mentors use a Monthly Learning Calendar (see Appendix A) as a supplement to the gradual release schedule to guide the residents' and mentors' foci and work throughout the residency year.

Retention Efforts

The current project addresses challenges around teacher retention in a number of ways. First, we draw on a cohort model, which supports persistence during the residency year and beyond. As in our existing program, TTR+ST aims to create a cohesive professional learning community of residents who teach, study, reflect with, and rely on each other during the graduate program and beyond. All residents begin the residency program at the same time and take the same course scope and sequence (appropriate to their certification area) throughout the year. Research suggests potential values for a cohort model include strong socialization effects—including peer-support both in terms of professional competencies and related to program-completion (Bullough, Clark, Wentworth, & Hansen, 2001; Mather & Hanley, 1999). Moreover, effects of cohorts also include improved higher-order thinking, (Beachboard, Beachboard, & Adkison, 2011) and development of a vision of education and teaching and a community responsibility (Bullough et al., 2001). To facilitate the development of a cohort, we offer a dedicated section of each of most courses for TTR, which also allows increased use of school placements in discussions and assignments. In addition, we use a variety of social media platforms and services to promote communal support and resource sharing, beginning before the Summer Institute, and lasting throughout the participants' teaching career. For example, we use Google's Team Drive to pool and organize resources developed during the residency year with the notion that they will continue to add and share resources throughout their teaching careers, and, after graduation, we create a 'super'-drive that pools resources across cohorts. Moreover, the modules developed during the planning year can be part of the post-induction support for TTR+ST cohorts as they work through them together.

Financial Support

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As noted, there is an extant TTR residency that partners with the School District of Philadelphia. For those residents, SDP pays a salary of $38,611 and provides benefits as well as contributes $7500 towards residents' tuition at Temple University. We have had strong recruiting success, and a diverse pool of residents, with this level of financial support, even though we are competing against lower-cost, alternative providers. When we developed TTR, we provided less financial support and struggled in our recruiting.Thus, we have chosen to support each TTR+ST resident with a living stipend of $47,000 during the residency year. This number was chosen because it results in an after-tax financial value that is the same as would be offered via the SDP residency.

We note that Temple University's College of Education is investing in TTR+ST's mission to diversify the teacher pipeline. Temple's College of Education is committed to providing a tuition discount of $5400 per resident. Second, the Benjamin Banneker Award, serves as both a retention incentive and a means of recruiting persons of color. Awardees receive $500, and, are publicized on the College of Education webpage and other media as a means to further recruiting efforts.

Induction Activities (Years 3, 4 and 5)

New Teacher Supports (2 Years)

Preservice teacher education is, in itself, an insufficient preparation for high-quality teaching (c.f., Borko, 2004). High-quality teacher preparation programs require a sustainable approach to new teacher support. TTR has developed a 2-year post-graduation plan to support residents as they transition to their roles as Teacher of Record. TTR+ST will build upon our existing model of induction support and add additional support structures. To support residency graduates as they transition into the role of novice teachers, TTR will offer

ongoing training and professional development opportunities to TTR graduates for the first two years of employment. In addition, participation in their school's induction program during year 1 will be mandatory for all TTR+ST graduates

From its inception, the main goals of our program have been to prepare high-quality math and science teachers and to support them at the beginning of their careers so they will become career teachers. In this next iteration of our program, we will strengthen induction support by implementing a new teacher seminar for our graduates, which will be led by the Project Coordinator and will meet bi-weekly for the duration of two school years. The reason for the seminar is twofold – to capitalize on the strong community that will have been built during the residency year as teachers often feel isolated in the first years of teaching and to focus on the new teachers' development. The bi-weekly meetings will be a time for the cohort of new teachers to build a collegial teacher community, reflect on their teaching practice, problem solve challenges they are encountering as new teachers, and to continue to learn new instructional and pedagogical techniques. Through these seminar meetings, the Project Coordinator will also be able to assess whether additional support and/or coaching is necessary for any of the new teachers.

The initial induction support will begin the summer before graduates start their teaching job. They will participate in a two-day workshop led by Temple staff and faculty focused on helping them prepare for their first year of teaching. These workshops will occur in August as graduates will know where they will be teaching and they can use the workshop time to prepare for that specific context i.e. 8th grade math at X school. With their own classrooms and students in mind, workshops will focus on areas such as: setting up a successful classroom environment, establishing routines, building relationships with students, etc. In year 2, new

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teachers will again participate in a two-day workshop during the summer. This second set of workshops will build on their experiences and will focus on cultural competence.

To further support the news teachers, TTR will pay the fee for each new teacher to become a member of a relevant national professional teacher organization. The membership affords the beginning teacher access to content-based teaching and professional development resources, grant opportunities, and professional networking. Being part of an external network of teachers has been shown to be a salient factor of effective induction as measured by teacher retention (Smith & Ingersoll, 2004).

We also provide highlights of the types of induction support that String Theory Schools provides to their new teachers. In the first year of induction, STS asks inductees to:

- Attend professional development sessions that are specifically targeted for teachers in their first year in the school.

- Attend bi-monthly induction meetings with the building principal or designee to discuss topics specific to the building.

- Meet regularly with his/her mentor to discuss topics specific to the needs of the inductee.

Inductee evaluation will be completed by a certified administrator using the Danielson Model. During the first year of the induction program, the inductee will be observed at least twice in accordance with the PPA School Supervision Plan.

Post-Residency Service Obligation

In accordance with UTRU guidelines and the Absolute Priority, TTR+ST graduates must commit to serve within a high-need school within the String Theory School network for a

minimum of three years, in exchange for an accelerated hiring process and a comprehensive induction program spanning the first two years of their teaching experience. Residents will be set up for successful hiring through the intensive residency design that targets the needs of our partnering schools. TTR+ST graduates will be highly-effective teachers who better represent the communities they will teach in, and who are experts in high-need content areas (science and/or math in middle- or secondary-grades). Additionally, String Theory Schools has committed to prioritized hiring for residency graduates, where they will have increased visibility in the candidate pool. With the planned expansion of the network to acquire or manage additional schools in the Philadelphia region over the next several years, we anticipate adequate opportunities for our graduates to secure positions within a String Theory School.

TTR Requirements and Repayment Conditions

Students will receive a one-year stipend, paid in monthly installments that begin in the summer preceding the residency year. Upon award, residents must sign a Memorandum of Understanding/Master Promissory note which demonstrates their agreement to satisfactorily complete: 1) the program of study for which the TQP funds are awarded under the TTR+ST; 2) the PDE requirements for being awarded an Instructional I certificate; and 3) three years of service as a mathematics or science teacher. Verification of full-time employment in teaching will be required. Proof of this commitment, accomplished by providing to the eligible partnership a certificate, from the chief administrative officer of the LEA in which the resident is employed, of the employment is required at the beginning of, and upon completion of, each year or partial year of service.

If a resident does not meet these requirements, their stipend will convert to a loan which he/she must repay in full to Temple University. The terms and conditions of this agreement will

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include: 1) A commitment to repay the loan within ten years from the date the resident failed to meet Program requirements; 2) A grace period for repayment of the loan, which will not commence so long as the applicant remains in compliance with all eligibility requirements; 3) An interest rate, assessed daily at the rate of 5% per annum, that will begin accruing on the principal amount of the stipend funds, unless in period of deferment (in which case no interest will accrue); 4) Prepayment opportunities, at the resident's discretion and without penalty; and 5) Forbearance for residents facing economic hardship, illness, and/or or military service. Required repayment will be pro rata based on the amount of service completed in an eligible LEA.

C. MANAGEMENT PLAN

Program Timeline

See Appendix C for additional detail. Year 1 will be a planning year in which TTR+ST will hire a Project Coordinator, refine one of our graduate courses in teacher preparation, develop a variety of PD modules, and, structures that support real-time use of mentor and coach feedback in Temple coursework. By Year 2, TTR+ST will reach capacity (8 residents) and will maintain it during the final four years of the grant while incorporating support and resource structures to ensure the sustainability of the program past the award period. TTR+ST will operate as a strand of Temple's existing, highly successful, residency program. All residents will be supported for 2 years post-graduation during their induction facet, by the program, and their hiring institution.

Responsibilities and Management Structure

The design and implementation of this project, as well as the responsibility for achieving its goals, will be shared by key staff across the College of Education, College of Science and Technology, and String Theory Schools. The sections below highlight key responsibilities and discuss the strategies and personnel assigned to them.

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Expertise of Temple Project Staff

████████████████████████ has approximately 20 years' experience teaching in secondary and university classrooms, in both mathematics and mathematics education. He has taught mathematics and mathematics methods classes and has served as a coach for student teachers. While at the University of Maryland he collaborated with faculty from the College of Education, the Department of Mathematics and a local school district to create a new Master of Education program for in- service middle school teachers. He also has significant experience delivering professional development for middle and secondary in-service teachers for around mathematics content and pedagogy.

████████████████ has over 15 years' experience working in middle and university classrooms. She started as a middle school teacher where she learned the importance of high-quality teachers who stay at their schools. For the past ten years, she has focused on teacher preparation and retention. She has worked with pre-service teachers at various universities teaching both undergraduate and graduate students and coaching student teachers. In her current role with TTR she has worked extensively to support and develop resident and mentor teachers, including creating new program components to better support the growth and leadership of new and veteran teachers.

████████████████ has approximately 20 years' experience teaching in secondary and university classrooms, in both science (physics, chemistry, astronomy) and science education. She teaches both science methods courses and regularly serves as a Coach for student teachers in the TUteach program. She has conducted extensive professional development for inservice teachers, including foci on content knowledge improvement and teacher leadership—for

example, she was PI of a three-year program called the Nevada Mathematics and Science

Leadership Cadre while at a previous institution.

███████████████ is Associate Dean of Teacher Education in Temple's College of

Education. Before taking this position in early 2019, Dr. Sniad had been a College of Education

at Temple faculty member in TESOL since 2011, and was on faculty at Rowan University for

two years prior. She specializes in Teaching English as a Second language, diversity in

education, and discourse analysis. In addition to university teaching, she has held positions

directing a college access program in Camden, NJ, teaching English as a second language in the

US and abroad, and leading a national training program for out-of-school education. She is the

recipient of multiple college- and university-wide teaching awards. She is PI on a 5-year, $2.7

million Department of Education grant to improve the experiences and outcomes for English

Language learners in Philadelphia middle and high school. She has a B.A. and M.A. in

Linguistics from the University of Florida, and Ph.D. in Educational Linguistics from the

University of Pennsylvania.

███████████████ is an Associate Professor in the Department of Teaching and

Learning at Temple University. She received her Ph.D. from the University of Maryland in 2006.

Kristie has taught both middle and high school mathematics, and she has conducted professional

development for mathematics teachers at the elementary, middle, and high school levels. Her

research has focused on the development of mathematical knowledge, especially related to

fractions and algebra. She has explored mathematical thinking across a range of groups, from

struggling learners to experts, in order to understand misconceptions as well as productive and

flexible ways of problem solving.

Management Structure and Responsibilities

We note that management needs include recruitment, selection, residency year support, residency site and mentor selection, ongoing professional development, fiscal management, scholar compliance, and program oversight.

███████████████████████ will maintain primary leadership and oversight of the TTR+ST project, ensuring that all planned activities are carried out. He will be responsible for *fiscal management*, collaborate with ███████████████ in the direction and interpretation of assessment and evaluation. With █████████ and String Theory personnel, he will carry out *recruitment and selection activities*. With █████████, he will coordinate with String Theory Schools for resident and mentor site selection as well as resident-mentor matching. He will co-develop and lead the Summer Institute for the residency year.

██████████████ will have a variety of responsibilities that change significantly over the life of the grant. Prior to the grant as well as during Year 1, with ████████████████, she will coordinate the hiring of a Project Coordinator. During the residency year, █████████ will make frequent checks with faculty teaching courses as well as mentor teachers, coaches, and the residents to proactively identify possible issues with compliance and, with other project faculty and staff, develop remediation plans to help scholars stay in compliance. █████████ will work closely with the senior advisory group, Temple faculty and staff, school leaders and teachers from String Theory Schools, to ensure effective collaboration and use of research-based principles and best-practices. She will also convene quarterly check-ins with stakeholders to review program and participant progress. Due to her experience with TTR she will assist with design and implementation of the Year 1 and 2 Summer Institute as well as ongoing professional development for mentor teachers and induction support for graduates.

███████████████ will be responsible for *monitoring and compliance reporting* as well as serving as a point of administrative contact between Temple and String Theory Schools. If a resident falls out of compliance, a process will be initiated by ████████, in conjunction with PI Fukawa-Connelly, to ensure the scholar will no longer receive support from the program and that all past support will convert to loans that the student will be required to pay back. Dr. Snaid, as Associate Dean, will have supervisory authority over the Project Coordinator, setting goals and priorities for the work in conjunction with the PI. ████████, in collaboration with ████████ ████████████ will be the point of contact for the external assessment team. She will liaise with the director of the *assessment and evaluation* efforts. All data, including any evaluations of teachers by mentors, coaches or other project staff, as well as all evaluations will be sent to ████████ in order to ensure that data is centralized and organized.

████████████, Assistant Professor of Science Education, will primarily serve as an academic advisor, mentor, and coach for residents and will lead development of PD modules focused on problem based instruction in secondary science. More, she will support the assessment team in evaluating the resident's and graduate's science-specific competencies. Dr. Bailey will also provide direction and support for the induction seminar residents.

████████████, Associate Professor of Mathematics Education, will lead development of select PD modules focused on rational numbers and tasks with possibilities for differentiation in middle grades mathematics. In subsequent years, she will support the assessment team in evaluating the resident's and graduate's math-specific competencies for middle grades. She will also serve as an academic advisor, mentor, and coach for residents.

Program Design/Faculty Mentors

As described, TTR+ST is a collaborative effort of Temple University and String Theory Schools. Program design – particularly the design of professional development, refinement of courses, and the integrated clinical experience – will be led by ████████ and a team of faculty in mathematics, science, and teacher preparation with additional input from representatives of String Theory Schools who will speak specifically about their curriculum and training needs. Among the faculty in this group, who will serve in design roles, on candidate selection committees, and as course instructors and faculty mentors are**:** ████████████ (special education instruction and inclusive teaching practices for teaching students with learning disabilities), ████████████ (math education, including teacher preparation in mathematics and learning in the middle grades), and ████████████ (secondary science education). These faculty have extensive experience in K12 teacher preparation and will lead graduate-level courses in which they make weekly visits to the host-classrooms – an approach that will further integrate coursework and clinical experience, as well as lead the design of PD modules during Year 1. ████████████████ will be leading the work to transition Child and Adolescent Development to a fully online course. ████████████, Associate Professor of Biology, will lead PD with the residents to help them adopt scientific approaches in the development of inquiry-based curricula. She will also help with the recruitment of students from within the College of Science and Technology. Finally, she will provide ongoing guidance and support regarding challenging pedagogical practices, and insight into scientifically accessible problems. Dr. ████████████, Assistant Professor of Instruction of Mathematics, will lead PD with the residents to help them adopt scientific approaches in the development of inquiry-based mathematics PD focused on using PBI in mathematics and around new content such as transformational geometry. She will also help with the recruitment of students from within the

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College of Science and Technology. Finally, she will provide ongoing guidance and support regarding challenging pedagogical practices, and insight into mathematically challenging problems that have differentiation possibilities.

██████████, the Director of School and Community Partnerships at Temple University, will serve in an advisory role to track resident performance during the induction period. ███████ has worked closely with partnering schools and charters in Temple's teacher-placement programs to ensure new teachers are successfully leading classrooms and acculturating to their new environment. A newly appointed Program Coordinator will work with the current TTR+ST faculty and staff to support the day-to-day operations of these efforts, while providing leadership and oversight to TTR. The Program Coordinator will assist the daily operations of the program to assure the timely completion of all tasks, events, and deliverables.

Resident Support / Mentor-Teacher Support

The Program Coordinator will be responsible for the day-to-day work of ensuring residents and mentor-teachers engage in a productive classroom experience. The Coordinator will be supported in this role by █████████████, who will advise the Program Coordinator on strategies for identifying and supporting residents, including intervention efforts and improvement plans. ███████ works closely with Pre-K-12 schools and organizations in Philadelphia to place and support pre-service teachers. Ongoing support and training for mentor-teachers will be provided by the Program Coordinator, ████████, and faculty, who will work closely with them during the Summer Institute, and collaborate with them over the course of the clinical experience. The Program Coordinator will also host quarterly meetings for the mentors to discuss practices for improving the clinical experience.

Technical Support/Web Development

██████████, the Director on Information and Instructional Technology, will provide

ongoing technical assistance and support for TTR. In Year 1, she will work with faculty to

develop the TTR+ST PD modules and will support their upkeep and maintenance in the

following years. Additionally, she will offer technical oversight and coordination for the

TTR+ST, particularly in the areas of data management and tracking.

Progress Monitoring and Evaluation

The ongoing and frequent evaluation of the residency program is necessary for its

flexibility, growth, and sustainability. The PI, CoPI ████████, Program Coordinator, and

supporting staff are responsible for ensuring that the program meets its regular milestones. ██

████████ will also assess the success of the program through: 1) Faculty feedback from

coursework; 2) Resident feedback at the end of each course and throughout the residency and

induction; 3) Evaluations, completed by the mentor-teachers, of residents' performance in the

host-classroom; 4) Feedback from principals in partnering schools and charters; and 5) Principal

evaluations of novice-teacher performance and growth during their first two years, as well as

surveys of hiring principals. TTR+ST will also incorporate external evaluation procedures that

incorporates an array of measures to determine the quality, efficacy, and impact of a program as

described below. The Center for Assessment, Evaluation, and Policy Analysis will carry out the

external evaluation.

D. PROJECT EVALUATION PLAN

The TTR+ST evaluation plan includes both formative and summative analyses using

mixed (qualitative and quantitative) methods in order to measure the specific program goals and

objectives described in the Program Design, as well as to gauge the outcomes required by GPRA

and the outcomes described in 20 U.S.C. 1022c(a) so as to participate in national evaluation of

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the TQP program as required by the US Department of Education. The assessment will be co-designed with the Center for Assessment, Evaluation, and Education Policy Analysis (i.e., the Center) at Temple University, an independent, stand-alone research and evaluation body within the College of Education.

   Year 1. As staff develops the materials for the residents, PD modules, and recruiting and selection procedures, Center evaluators will use detailed understanding of these and other evolving program elements toward refining details of the five-year evaluation plan.

   Initial needs assessment. In the first 3 months of the project, Center staff will work with project staff to develop a series of questions for interviews with TTR mentor teachers and coaches, TTR graduates, and ST teachers likely to serve as mentors. Questions will target the most effective aspects of TTR concerning its pre-service preparation, induction supports for new teachers, and PD for mentor teachers. We will also explore areas for improvement and discuss strategies that TTR+ST might use. Project staff will conduct and audiotape the interviews, which Center staff will transcribe and code using qualitative methods. Center staff will summarize the findings and share with ███████████████████████████████.

   Planning resident learning assessments. In the next 6 months of Year 1, Center staff will assist program staff in fleshing out detailed measures of performance and improvement, including observation tools. Further, the Center will establish a plan for division of labor around data collection and analysis, coordinating with ████████████ to ensure that data are rapidly collected from instructors, entered into datasets by Center personnel, and checked for accuracy.

End-of-year focus group. In the final 3 months of Year 1, Center staff will interview coaches and mentor teachers on the feasibility and quality of the materials that the Project staff have created throughout the year. As in the initial needs assessment, Center and Project staff will

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collaborate to create interview questions. Center staff will conduct the interviews, audio-record data, and then later transcribe and code. Center staff will report results to Project staff to support additional adjustments to materials.

Year 2. As the residency begins, the Center will collect from project staff a variety of pieces of evidence of residents' learning that are part of the program itself.

Initial resident characteristics. Center and Project staff will work together to develop a brief battery of initial interview questions for residents regarding their knowledge and dispositions around urban schools, STEM methods, special education strategies, and dual language learner strategies. Center staff will interview residents, audiotape, transcribe, code, and share data with the Project staff. The Center will also disseminate a demographic survey to residents and collect and store the data.

Resident skill development. While working in high-need classrooms with their mentor, residents will be frequently observed by their mentor, coach, and TTR+ST faculty and staff. Formal evaluation tools used by faculty, mentors, and coaches are based upon (1) Charlotte Danielson's Framework for Teaching (Danielson, 2014), and (2) Temple's Standards for Skillful Teaching (Temple University, 2013). During the planning year, we will adapt these for use in TTR+ST, given the unique context of String Theory Schools. Measures include:

1. *Informal Feedback* given by the mentors or coaches and recorded in journals by residents.

2. *Intermediate Performance Assessment (IPA)* completed by residents during the fall semester to gauge the extent to which residents know and can teach their content. The IPA is evaluated by Temple faculty.

3. *Teaching Observation Reports (TOR)* completed each term by the coach, multiple times.

4. *Mentor Feedback Form* completed three times during the fall semester by the mentor.

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5. *PDE 430s*, a state-developed observation form, completed once at mid-point and once at end-point of the spring semester by the coach.

6. *Mid-Semester Evaluation for Student Teacher* completed once, in spring, by the mentor.

7. *Summary Performance Assessment (SPA)* completed by residents during the spring semester to gauge the extent to which students demonstrate understanding of Temple's six teaching standards. The SPA is evaluated by Temple faculty.

8. *Portfolio* completed by residents during spring semester and is comprised of representative lesson plans, a student case study, and assessment results. Temple faculty evaluate the portfolio.

9. *Co-teaching observation* The Program Coordinator will visit host classrooms and assess the productivity of the mentor-resident collaboration according to a TTR-specific rubric that will be modified for TTR+ST. This rubric examines mentors' and residents' co-teaching abilities, the quality of the feedback the mentor is providing to the resident, and the observable impact the clinical experience is having on the resident's instruction.

Data reduction and analysis. Tools 2-8 above all highlight common features of instructional quality, including lesson organization, content instruction, student engagement, and classroom organization/management. Each of these tools also has an evaluation rubric with numerical ratings. Center staff will aggregate residents' numerical data so that they have one score on each of these dimensions for each measure. We can then examine change in ratings over the year, using both qualitative and non-parametric techniques. Tools 1 and 9 feature narrative reports and will provide explanatory context for the ratings.

End-of-year Resident Characteristics. Center staff will record which Residents complete the year-long program and which do not. For completers, we will re-administer the interview

questions. Center staff will also interview Residents about their perceptions of the residency, with a focus on the most helpful features and areas for improvement.

Data reduction and analysis. Center staff will transcribe and code interview responses, summarizing them to share with Project staff and support improvements to the Residency.

Resident Certification. To collect information relevant to the annual GPRA requirements, we will first collect information on residents' scores on certification exams (all of which should be taken by the end of the residency year). These exams target content in STEM, special education, and English language learning; Residents will report their score on each exam that they take. Second, we will document, with our College's licensure office, which Residents complete the formal application for an Instructional I certificate.

Data reduction and analysis. Center staff will calculate the percentages of residents who (a) undertook each program-relevant certification exam, as well as (b) passed each exam, (c) ultimately obtained the applicable certificate. Finally, we will use demographic data from the beginning of the year to determine whether, in fact, the residency is resulting in a more diverse teaching force than the state and city averages.

Resident employment as instructor of record. Center staff will collect and share information via survey on graduates' employment status (school, position, assigned courses). We will follow up every 2 months with each graduate who has not yet found a teaching position to ensure data accuracy.

Partner school leader feedback. Center staff will work with project staff to craft interview questions for ST leaders regarding how prepared they have found residents to be, as well as how the TTR+ST program could be improved in the future. Center staff will transcribe, analyze, and report the data to Project staff.

Year 3 represents the second year of residency, so the same pattern of data collection and analysis regarding initial resident characteristics, resident skill development, end-of-year resident characteristics, resident certification, and end-of-year partner school leader feedback will be repeated from Year 2. We will also collect data on whether any Residents who left the program before completing in prior years returned to complete this year. In addition, Year 3 marks the beginning of the two-year induction period for the first cohort of residents who have become teachers of record. Evaluation efforts related to induction programming include the following:

Observations of instructional quality. In October, February, and May, Center staff will visit the classrooms of former residents who are now teachers of reference, videotaping each teacher's classroom for one full day. We will use a project-designed measure (developed with Project staff) to explore core domains of instructional quality: lesson organization, content instruction, student engagement, and classroom organization/ management. We will also explore the use of a standardized tool such as the Classroom Assessment Scoring System as an additional tool.

Data reduction and analysis. Because the sample size will be small in Year 3 (n=8 maximum), we will plot each former resident's instructional quality on all four dimensions of quality at all three time points to descriptive understand the rate and shape of change.

Nature of induction supports. Induction personnel will audiotape their meetings with their teachers. Center staff will transcribe, code, and summarize the meeting content to understand what new teachers need help on and how induction personnel meet these needs.

Data reduction and analysis. Taking a qualitative approach, for each teacher, we can overlay the nature of the supports they receive over the year with change in the quality of their instruction to understand potential relations between induction input and instructional output.

New teacher feedback. In spring, Center staff, with Project staff, will craft interview questions for TTR+ST graduates who have just completed their first year as teachers of record. Questions will focus on how TTR+ST prepared them for the field, what other programmatic features might have been helpful, and how induction supports helpful and could be approved. Center staff will transcribe, code, analyze, and summarize data.

New teacher principal feedback. In spring, Center staff will work with Project staff to craft interview questions for principals of the schools in which former residents are completing their first years as teachers of records. Interviews will focus on what these new teachers did well and where they required special support. We will probe in particular for comparisons between TTR+ST graduates and other new teachers who received master's degrees and certification, so as to draw some comparisons about the quality of the TTR+ST programming. Center staff will transcribe, analyze, and report the data to Project staff.

Employment success. Beginning in spring, Center staff will survey former Residents on employment status for fall, tracking how many will be newly hired as teachers of record and how many will be rehired in the same position for another year. We will document the data for GPRA.

Year 4 will include the same evaluation processes for residents (described in Year 2) and first-year teachers (Year 3). We will also use the same induction-related strategies to understand the experiences of teachers for whom Year 4 was their second year as the teacher of record. In particular, as required by GPRA, we will carefully track TTR+ST completion, instances of persistence/re-enrollment after dropout, and employment status and retention.

Year 5 will include the same evaluation processes for residents (described in Year 2) and first-year teachers (Year 3). We will also use the same induction-related strategies to understand the experiences of teachers for whom Year 5 was their second year as the teacher of record.

Summative questions. After data collection concludes in Year 5, Center staff will aggregate

data across multiple years to ask a series of questions.

1. Completion. To what extent does TTR+ST result in new STEM teachers? Specifically,

what percentage of students pass certification exams and become certified upon completing the

program? What percent obtain employment at STEM teachers within two years of graduation?

What percent remain after each year of induction? Certification information will be used to

answer this question. Further, District-wide data on teacher retention are available, allowing us to

compare TTR+ST to the larger community.

2. Diversity. To what extent do new STEM teachers from TTR+ST represent diverse ethnic

and cultural backgrounds, at each of the time points noted above (graduation, one year after, and

two years after)? Demographic and certification information will be used to answer this question.

3. Improvement in residency. To what degree do TTR+ST residents improve on instructional

knowledge and skills over the residency? Instructional quality data from the teacher skill

development measures will answer this question, with *t*-tests comparing pre- and post-test data.

4. Residency features and skill development. Regressing year-end skill (either in each domain

of instructional quality or in one aggregated score) on start-of-year quality, co-teaching skills,

and a variety of demographic covariates will elucidate what aspects of the TTR+ST

programming best explained learning, and for which residents (e.g., initial skill, demographics).

5. Improvement throughout induction. To what degree do TTR+ST residents improve their

instructional knowledge and skills over the first and second years of induction? Data from the

classroom instructional quality measures will be used to answer this question, with *t*-tests

comparing pre- to post-test data in each of the first and second years and pre-test data from the

beginning of the first induction year to post-test data from the end of the second induction year.

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6. Induction features and skill development. Regressing year-end skill (either in each domain of instructional quality or in one aggregated score) on start-of-year quality, induction supports, and a variety of demographic covariates will elucidate what aspects of the TTR+ST induction programming best explained skill development, and for which residents. Analyses would be conducted separately for the first and second years of induction.

7. Student outcomes. To what degree do students of TTR+ST graduates demonstrate stronger STEM outcomes than those of other new teachers? Do TTR+ST advantages grow with graduates' years of teaching experience? We will work with the School District of Philadelphia and our ST partner to access available GPA and STEM test scores. Analyses will employ multilevel regression, with TTR+ST as the criterion variable, and teacher/child covariates.

8. Cost per program completer. Center staff will use budget data and the number of completers throughout the program to ascertain cost per program completer.

Evaluation summary: This wide net of observation, communication, and feedback will support residents' skill development, allow TTR+ST to steadily improve program design and implementation, and afford conclusions about features of program effectiveness.

Center for Assessment, Evaluation, and Education Policy Analysis

Within Temple's College of Education, the Center serves as a hub for collaborative research around teacher education, urban community development, and community behavioral and mental health. Led by ███████████████, ███████████████, and ███████████████, affiliated faculty members apply cutting-edge methods and techniques, translating research into practice and helping urban schools and communities engender positive social change for the children and families they serve. Our expertise includes comprehensive needs assessments in urban communities, rigorous observational and intervention studies in schools and other learning

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settings, analysis of student academic and social-emotional outcomes, examination of teacher professional development and personal well-being, and large-scale secondary data analysis with regional, national, and international datasets.

The Center includes a team of trained graduate students who can support both quantitative and qualitative research, as well as work space for these students and their faculty mentors with computers, printers, and other key technology. Secure spaces and computers are dedicated to analysis of privacy-protected data. In addition, the Center includes a suite of software programs for statistics (SPSS, Mplus), qualitative analysis (Nvivo), and observational coding (Noldus). Finally, all projects managed by the Center receive pre- and post-award budget and hiring support from the College.

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