

Students First:

Coordinating Resident and Mentor Roles to Support Student Learning and Develop Effective Teachers for High-Need Students in California, Massachusetts, and Tennessee

QUALITY OF PROJECT DESIGN

The Alder Graduate School of Education (Alder, formerly known as Aspire University) is pleased to submit an application for the Supporting Effective Educator Development Program, focused on **Absolute Priority 1: Supporting Effective Teachers [AP1]; Activity 1:** nontraditional teacher preparation pathways to serve in underserved Local Education Agencies (LEAs); **Activity 2:** evidence-based professional development activities which meet students' needs; and the **Competitive Preference Priority [CPP]:** promoting science, technology, engineering, or math (STEM) education, with a particular focus on computer science. Building on deep expertise and a strong track record in preparing and supporting teachers through the Alder Teacher Residency (ATR) and Boston Teacher Residency (BTR), Alder and its partner, Boston Plan for Excellence (BPE), will recruit, prepare, and support diverse cohorts of effective, long-term teachers to work in underserved urban LEAs in California, Massachusetts, and Tennessee, meeting urgent needs and serving as a model for the field of teacher education.

Exceptional approach to the priorities. While building on a base of Moderate Evidence, Alder and BPE propose to coordinate mentor and resident roles in order to solve a major challenge in the field of teacher preparation: the tension between the teacher candidate's need to practice classroom teaching, and the student's need for consistent, high quality teaching from experienced teachers. There is an unexamined risk in our field: the opportunity cost students pay when their experienced teacher steps aside while a teacher-in-training takes over:

Jose is learning quadratic functions. In one scenario, Jose has a great teacher who teaches the entire four-week unit. In another, Jose has a great teacher who teaches half the unit, while a resident teaches the other half. The resident gets practice teaching, but Jose loses two weeks of instruction from an expert teacher. Jose won't get another chance to learn quadratic functions. We propose a third scenario.

Through this project, **ATR and BTR will develop and codify a team-teaching, student-centered approach which strategically leverages multiple adults in the classroom to boost student and candidate learning simultaneously.** The project will build on existing evidence and focus on an innovative approach to STEM teacher preparation, including the launch of a computer science teacher residency, and will also include other high-need content areas for which partner LEAs are facing shortages. And, because research points to rigorous admissions and in-service support as necessary for the development of effective educators, we will include these program elements. Alder and BPE are well-positioned to address the tension described above. ATR and BTR integrate rigorous academic theory with comprehensive classroom practice via a year-long apprenticeship model. The model leverages a graduate-level curriculum and a close relationship with a trained mentor teacher to prepare teaching candidates, called "residents," for a successful career. Residents train in schools in underserved neighborhoods, and join a strong network of alumni in partner LEAs after graduating. In one year, residents complete the program with a Master's degree, teaching credential, and deep classroom experience.

Partners. This project builds on the partners' prior success. Together, ATR and BTR have prepared over 900 urban teachers in three states over 15 years. Graduates meet human capital needs in partner LEAs: 90% of graduates are hired by partner LEAs and 60% teach K-12 math or science. Data show (see Management Plan) that our graduates are more diverse, are more effective, and persist longer in teaching than comparable peers. ATR was founded at Aspire Public Schools in 2010. Today, it is operated by Alder and serves both charter and district school systems, with partnership agreements with Aspire Public Schools, KIPP Bay Area, KIPP LA,

Caliber Schools, Summit Public Schools, and Monterey Peninsula Unified School District. A record of success combined with high demand from school systems have led Alder to create ambitious growth plans and establish new partnerships. Alder plans to train 410 residents per year in California and Tennessee by 2023. Situated in the heart of Silicon Valley, Alder seeks to develop pipelines into STEM teaching by tapping the rich expertise and workforce needs locally.

For Boston Public Schools, BPE launched BTR in 2003, one of the first residency programs in the country, and co-founded the National Center for Teacher Residencies to help replicate its successful model nationally. BPE continues to lead the field. It recently developed "teaching hospital schools" called Teaching Academies in which it trains its residents, and a Networked Improvement Community for teachers to break down barriers to teacher improvement. Today, BTR is planning to launch the first computer science teacher residency program in the country.

Goals. Our long-term goal is to demonstrate that by using a team teaching approach, teacher preparation programs can increase student achievement for students in the high-need schools where candidates train. This project will develop 630 effective educators over three years through non-traditional pathways to teach high-need students in 19 underserved urban LEAs in California, Massachusetts, and Tennessee (SEED Performance Measure A). In partnership with schools, we will coordinate resident and mentor roles through a team teaching approach so that residents (a) increase teachers' capacity to personalize instruction, (b) contribute to student learning, and (c) learn how to teach effectively. The project will increase the effectiveness (Performance Measure B), diversity, and retention (Performance Measure C) of teachers in partner LEAs, all of which have been shown to increase student achievement (see below), and increase the pipeline of effective math, science, and computer science teachers in partner LEAs. In addition, this project will ensure a reasonable cost per participant and include an evaluation which meets WWC standards with reservations in order to ensure replicability of

and evidence from the model (Performance Measures D&E). See Management Plan for detail.

Absolute Priority 1: Supporting Effective Teachers [AP1]: Evidence base which meets Moderate Evidence standards. ATR and BTR program designs build upon core strategies developed by Teach for America (TFA) that have been shown to be effective at selecting and preparing teachers to positively impact student achievement in high-need schools. A WWC Intervention Report on TFA (2016) reviewed seven studies that met WWC design standards--three without reservations, and four with reservations--and concluded that, compared to teachers trained by other programs, TFA teachers were found to have positive effects on student achievement in math and potentially positive effects in science. Collectively, these studies examined the effectiveness of TFA-trained teachers in a variety of contexts and using a variety of assessments of student learning. In the domain of mathematics achievement, six studies that included 65,324 students in multiple states provide "strong evidence of a positive effect with no overriding contrary evidence" (IES, USDOE, WWC, 2016, p. 6), with an average effect size across these studies of .11 (Clark et al., 2013; Clark et al., 2015; Glazerman & Decker, 2006; Henry et al., 2014; Turner et al., 2012; Ware et al., 2011). WWC considers the extent of evidence from these studies to be medium to large. In the domain of science achievement, only one study (Xu & Taylor, 2011) was found to meet WWC standards, in this case with reservations. Analyzing data from 36,104 students, it found a positive, statistically significant impact of TFA teachers on science achievement, as measured by the North Carolina end-of-course science assessment (effect size: .19). See Appendices G and H for cited WWC Studies (WWC Intervention Report and Clark et al., 2013).

Like TFA, ATR and BTR work in schools with high-need students. We utilize three core TFA practices described by Clark et al. (2013) as the critical components in the TFA model: (1) selective admissions, (2) intensive pre-service training, and (3) placement and in-service support

during the first years of teaching. ATR and BTR enhance these practices in ways that (a) support student learning during the pre-service practicum, and, (b) increase teacher diversity and retention in high-need schools. These extensions are supported, in part, by early research suggesting that teacher residencies constitute a promising strategy for preparing and retaining effective teachers in high-need settings. Memphis Teacher Residency, founded in 2008 based on the BTR model, is routinely ranked by the Tennessee Higher Education Commission as one of the highest performing teacher preparation programs in that state on the basis of its graduates' impact on student achievement (as measured by value-added scores), teacher retention, and teacher diversity (Tennessee Higher Education Commission, 2017). In addition, a 2012 value-added study found early career Memphis Teacher Residency graduates to be more effective than other non-tenured teachers in Memphis, although the treatment group sample size was small (Garrison, 2012; Silva et al., 2014). An evaluation of an earlier model of BTR found that in their fourth and fifth years of teaching, graduates were more effective at raising student test scores in math than non-BTR teachers with comparable (or even greater) experience (Papay et al., 2012). Papay et al. (2012) also found substantially higher teacher retention and diversity rates of BTR graduates in Boston Public Schools. 75% of BTR graduates stayed five or more years, compared with 51% of non-BTR teachers who entered at same time.

Selective admissions. Like TFA, ATR and BTR have developed a robust recruitment and selection model which seeks and cultivates high-potential candidates. Following TFA's approach (Clark et al., 2013), ATR and BTR implement rigorous, multi-stage selection processes. Like TFA, ATR and BTR evaluate a range of competencies, skills, and dispositions beyond what traditional higher education programs typically focus on; we evaluate not only academic preparation, but also critical thinking skills, problem solving skills, perseverance, learning stance, communication skills, ability to work with diverse individuals, and commitment to

equitable education. Like TFA, we review college transcripts, resumes, essays, interviews, recommendation letters, and demonstration lessons. We enhance the process by providing feedback after the demonstration lesson and asking candidates to apply it as they teach the lesson again, in order to assess openness to and ability to utilize feedback. Our programs also require elementary and secondary STEM candidates to complete a math exam. ATR and BTR applicants must have a bachelor's degree with an undergraduate GPA of 3.0 or above, while TFA requires a 2.5 GPA. Average GPAs are similar: 3.2 (ATR), 3.5 (BTR), and 3.6 (TFA). We also require strong content knowledge, experience working with children, and a record of achievement. Like TFA, the ATR and BTR admissions processes lead to acceptance rates below 15%.

Partner LEAs provide hiring projections to guide our recruitment efforts, and STEM candidates and teachers of color are always a priority. In particular, there are rigorous empirical research findings that random assignment of students to a same-race teacher led to significantly increased math and reading achievement (Dee, 2004). While Clark et al. (2013) found that, "TFA teachers were less likely than comparison teachers to be from racial or ethnic minorities," ATR and BTR enhance the TFA model by consistently enrolling cohorts in which at least 50% of residents are people of color. This year, 71% of ATR residents and 50% of BTR residents are people of color. In addition to overall diversity goals, we aim to recruit people of color who have strong content knowledge in the STEM fields. To ensure that candidates reflect the school communities in which we serve, we recruit heavily from within LEA boundaries. We target local colleges, community-based organizations, staff in K-12 schools, pipeline partners such as City Year, EnCorps, and Breakthrough Collaborative, STEM professional and student associations, minority associations, and the general public via advertising geared towards career changers.

Intensive pre-service training. Following the TFA model, ATR and BTR candidates begin by participating in an intensive training program in July and August, which creates important

connections amongst the candidates and a support network for the entire year. The duration of the summer program is similar: about 250 hours for TFA (Clark et al., 2013), slightly more for ATR and BTR. Throughout the summer, as in the TFA approach, ATR and BTR faculty guide candidates through readings, analysis of teaching videos, assignments, teaching rehearsals, and a set of group activities as candidates learn "lesson planning, content delivery, classroom management, student assessment, literacy, and effective interactions with diverse constituents" (Clark et al., 2013). In addition, ATR and BTR address issues at the intersection of race, class, education, and democracy, and participate in any August meetings or professional development sessions organized by their school sites in preparation for the new school year.

Apprenticeship. The TFA pre-service practicum occurs during a summer school program for students. Each TFA candidate gets 20-40 hours of practice under the guidance of a mentor teacher (Clark et al., 2013). Then, candidates become teachers of record with in-service support. However, promising results from the Memphis Teacher Residency and BTR indicate that a full year of clinical pre-service training, such as within the residency model, may increase the retention of graduates while also increasing effectiveness (Tennessee Higher Education Commission, 2017; Papay et al., 2012; Silva et al., 2014). The additional hours of practice, reflection, coaching, and individualized attention from a highly supported mentor all contribute to a deeply enhanced approach.

The residency model provides a comprehensive, practice-based, content-focused model; we think carefully about what individuals and cohorts of teachers need to learn and when, and we make certain, through observed cycles of rehearsal, feedback, enactment, assessment, and reflection, that residents and graduates are effective. ATR's goal is to replicate best teaching practices from the most effective teachers in partner LEAs within teacher candidates. Residents serve in urban, high-need schools 4-5 days per week under the guidance of a mentor teacher in

their content area and with support from clinical faculty. Importantly, residents become part of the school community, participating in school meetings, professional development, and family conference nights. They gain an understanding of what school looks like from the first day through the last, and how students and teachers operate. They also become familiar with LEA-specific systems such as grading, attendance, and data analysis which eliminates the steep learning curve that many first year teachers face.

Targeted, effective feedback is critical to resident success, and is a cornerstone of our programs. Both mentor teachers and clinical faculty members observe residents and provide frequent, ongoing feedback. This is in contrast to traditional graduate programs and alternative route programs, of which just 43% and 23% respectively conduct five or more observation and feedback cycles with each candidate (Rickenbrode et al., 2018). Furthermore, programs ask residents to continually consider the research, rationale, and data behind their decisions about curriculum and instruction. Residents collect evidence of student learning, analyze patterns of student achievement, develop hypotheses to investigate, and refine instruction based on what they learn. The residency experience prepares new teachers to serve as effective teachers working to close the opportunity gap in high-need schools.

Mentor teachers. While the TFA candidate's first year in the classroom is as a teacher of record, the TFA model incorporates mentoring as a best practice, and most TFA candidates receive some level of mentoring during their first year. Embedded in mentors' classrooms, ATR and BTR are able to provide a more intensive mentoring experience. The quality of the clinical experience depends heavily on the selection of mentor teachers and the frequency and quality of feedback provided to the resident (Boyd et al., 2009a). We select mentor teachers based on strong content knowledge (with STEM a priority), effective teaching methods, ability to use data and provide feedback, a collaborative and transparent approach, and demonstrated student

achievement gains. ATR and BTR support mentor teachers through monthly seminars with their mentor professional learning community and regular observation and feedback sessions. Among other skills, we support mentors' ability to give feedback effectively. The mentor receives an annual stipend to coach and supervise the resident, and sets aside time each week to provide feedback and plan with the resident. In 2017, 94% of ATR mentor teachers reported that their own practice as an educator improved due to their participation in the program.

Exceptional Approach to API: Coordinating mentor and resident roles in a team teaching approach. Teacher education programs of all types seek to increase clinical preparation and lengthen the duration of the clinical experience. In fact, as a result of the strong promise of the residency model, 14 new residency programs are currently under development across the country, hosted by universities and nonprofits alike. These programs confront the need to strike a balance between giving candidates more opportunities to practice teaching with real students and giving students consistent, high quality instruction from experienced teachers. Research shows that, on average, experienced teachers are more effective than novice teachers (King, 2010; Kraft & Papay, 2014; Papay & Kraft, 2015). Unfortunately, student teaching - as it is traditionally implemented - can increase the time that K-12 students are exposed to novice teaching, which could have a detrimental effect on student learning.

Alder and BPE have designed an Exceptional Approach to solve this problem: a year-long pre-service clinical program which ensures residents have comprehensive clinical experiences without introducing negative effects on student learning. Typical student teaching is structured around turn-taking: the student teacher and the mentor alternate leading the class. In contrast, ATR and BTR use a coordinated team teaching model, in which our programs work closely with mentor teachers to ensure that the multiple adults in the classroom work together strategically to increase student learning in high-need schools. With clear, coordinated

roles and specific duties, residents have the potential to increase the amount of attention students receive from educators and to support the differentiation of instruction in STEM and other subjects in ways that may not be possible with a single educator. Over the training year, residents take on increasing responsibility as their role evolves along with their learning and they are ready to be successful. For example, residents move from supporting individual students to groups of students, from collecting data to analyzing data, and from co-planning parts of lessons to planning an entire unit with guidance from the mentor teacher. In parallel, the mentor teacher's role shifts, and together the mentor-resident team expands its teaching capacity significantly over the course of the year.

ATR and BTR will partner with mentors to clearly assign duties to residents which increase over the year and directly support student learning. This structure will not lead to off-time for mentors. On the contrary, strategically focusing on the roles of the two adults will increase the mentor teacher's capacity to personalize instruction for all students. The programs will support each teaching team to craft lesson plans which specify mentor and resident roles, so that both adults work together in service of student learning. Such plans will employ a number of formats, including: (1) each adult working with a group of students, (2) mentor (or resident) lead teaching while the other is working with a small group of students on a specific skill, collecting data on student engagement, conducting an oral assessment, or setting up for the next activity, and (3) both adults circulating the room while students are working on group projects.

To support this model, the practicum experience will be fully aligned with the resident learning trajectory. K-12 student learning needs will define what residents need to learn and when they need to learn it. Through authentic assignments for their courses, residents will learn their school's common instructional practices, assessments, student learning profiles, lesson planning, and approach to data analysis, so that they are well-equipped to be contributing

members of the adult team. ATR and BTR clinical faculty members teach courses and provide school-based coaching, enabling them to align the coursework and practicum experience with student learning needs. Faculty members model instructional practices and guide residents to develop, rehearse, and improve a lesson. After residents have implemented lessons in the classroom, faculty members support residents to analyze the outcomes and plan next steps. During their practicum and coursework, residents learn how to collect evidence of student learning through observations, assessments, and examinations of student work, and how to use these data to optimize instruction for their students. Critically, residents are held accountable for the quality of their instruction and the learning of their students in both ATR and BTR through high-stakes resident performance assessments called "gateways." Both mentors and faculty members conduct their work with residents around the gateway indicators, ensuring alignment of theory and practice and common expectations for effective teaching. This coherence improves the effectiveness of teacher preparation and makes team teaching possible.

Coursework. In addition to summer coursework, most TFA teachers take courses while they are in their first few years of teaching, in order to secure a Master's degree or other state teaching requirements (Clark et al., 2013). ATR and BTR provide a Master's degree during the residency year through a series of courses which the programs designed and degree-granting partners approved. Resident courses take place in the summer, as well as one day per week throughout the school year. In supportive cohorts of 20, residents take in-person, online, and hybrid courses over a 12-month period. The pacing and sequence align closely with school calendars and implement the gradual release model of teaching experiences. Courses cover topics such as content methods in math, science, or other content areas, classroom management, human development, inclusive practices, literacy, and data usage. In order to provide a strong foundation for teaching during the residency year, the coursework and residency experience are uniquely aligned to support

residents to make connections between what they are reading and learning in their courses and what they are practicing in the classrooms. Designed with students and their local curriculum in mind, courses connect to the specific instructional demands of residents' current contexts and inform and enrich residents' ability to support student learning during their residency year.

Job placement. Following TFA's practice, ATR and BTR assist residents in securing their first teaching positions in partner LEAs. This assistance is important since the fit between a teacher and their specific assignment can impact their success, job satisfaction, and potentially retention (Liu, 2004; Liu & Johnson, 2006). 60% of graduates secure positions in math, science, or elementary classrooms. Others teach English language arts (ELA), Humanities, or World Languages, based on LEA hiring needs. The residency year is described as a 'year-long interview' at their schools, where they receive priority hiring. Over 90% of our graduates secure teaching positions in partner LEAs. The vast majority of ATR residents are hired before they graduate. At this year's Boston Public Schools Candidate Demonstration Day, where candidates present a demonstration lesson to school leaders, BTR candidates outscored candidates from other priority teacher preparation programs by approximately 0.5 standard deviations.

In-service support. Through formal induction programs as well as through community building, we will provide the professional support required to improve and sustain cohorts of effective teachers within partner LEAs. ATR and BTR provide a variety of induction services to graduates during their first two years of teaching (and sometimes more) which are similar to the TFA model, including individual and group mentoring, observations and feedback, and a strong peer network (Clark et al., 2013). Research by Smith and Ingersoll (2004) found that beginning teachers who were provided with multiple induction supports were less likely to move to other schools or to leave teaching altogether after their first year. All our induction activities are guided by research on how adults learn and how teachers improve including: collaboration,

observation of modeling, practice, feedback, support to apply new learning, the ability to see progress and success, deep inquiry into specific and highly-relevant questions or problems, and teaching others. These elements help teachers to learn new skills, remember the content and apply it to various contexts, and be motivated to improve (Hargreaves & Fullan, 2012).

ATR partners with LEAs such as KIPP and Aspire Public Schools to provide context-relevant and individualized induction services. BTR provides induction services through its Early Career Teacher Network. In-service supports include a summer institute to prepare for new teaching jobs, individual and group coaching cycles, an annual teacher learning symposium, significant peer support, STEM Learning Sites where teachers observe and reflect on a hosting teacher's problem of practice, and an online repository of tools and resources developed in teacher classrooms and curated by clinical faculty for a broader audience (BTRgrad.org). Finally, BTR's Networked Improvement Community of 25 talented BTR graduates serve as coaches for early career graduates with the goal of breaking down barriers to improvement and building in teachers the adaptive expertise needed to help all students reach ambitious learning goals. ATR and BTR graduates work in schools and LEAs with other alumni, where they support each other to achieve better outcomes for students, take leadership roles, and form a critical mass of like-minded professionals committed to dramatically better outcomes for students.

Competitive Preference: Promoting science, technology, engineering, or math (STEM) education, with a particular focus on computer science [CPP]. About 60% of new ATR and BTR teachers will be well-prepared to teach math, science, or computer science, either at the elementary or secondary level. The workforce needs STEM-strong students, and partner LEAs need STEM-strong teachers (See "Design appropriate to needs of population"). While recruiting great STEM teachers is challenging, we have built the capacity to attract talented and diverse STEM candidates and train them in ways that align with LEA needs. For example, ATR recruits

volunteers from EnCorps, a STEM career changer nonprofit which places employees from STEM industries in STEM classrooms for six months. We require strong STEM content knowledge upon entry into our programs, and we augment it with additional content support alongside pedagogical training. Our clinical faculty model strong pedagogy as they teach a content lesson to small groups of residents, allowing residents to experience the content as a learner. Because we understand that students create knowledge by making sense of the world around them, we train residents to engage their students through inquiry. Residents learn to support students to analyze a problem from multiple perspectives, reflect on and refine approaches, think critically and creatively about real world problems, engage in academic discourse, and work collaboratively. This approach is highly engaging for students in STEM courses and critical for developing workplace-relevant skills, even at the elementary school level.

In Boston, BPE has an unprecedented opportunity to develop BTR as a model for career-oriented STEM teacher learning. BTR trains secondary residents in the Dearborn STEM Academy, a grade 6-12 public school which is moving into a state-of-the-art STEM education facility in September, and works with industry partners to reimagine what school might look like in order to prepare students for STEM careers. In preparing new STEM teachers, BTR incorporates the knowledge and skills required by employers, rather than just academic standards. In working with mentor teachers, BTR residents will experience a new kind of STEM teaching that is career-focused, collaborative, and connected to the real world.

The Dearborn is unique in that every student takes a computer science course in every grade level every year, as well as a middle and high school engineering class. With two full time computer science teachers, an engineering teacher, and an established curriculum, the school is ideal for training new teachers in computer science. **The new BTR computer science pathway will establish a model to inform computer science teacher preparation broadly.** BTR will

design a set of experiences for computer science residents which fits within the existing BTR structure, meets the urgent need for quality computer science teachers in Boston, and supports student learning at the Dearborn through coordinated team teaching.

Sufficient quality, intensity, and duration to lead to improvements in practice. The greatest strength of residencies is the strong integration of theory and practice. With a team teaching approach over a full year, this project is likely to narrow the theory-practice gap further and lead to improvements in both teacher practice and student learning in high-need schools.

Raising the bar to entry to the profession. ATR and BTR residents must demonstrate the ability to teach effectively in order to graduate and enter the teaching profession. We have analyzed the key practices and outcomes of great teachers, created action-oriented and normed rubrics for planning, teaching, and assessing, tied all coursework and coaching to the rubrics, and established high-stakes gateway assessments to measure resident effectiveness. Gateway rubrics include measurements of planning, teaching, family engagement, learning environment, data usage, and more. The programs are designed to ensure that every graduate meets standards for effectiveness; if a resident fails to demonstrate competence, s/he does not continue in the program. In order to graduate, residents must also pass their state's pre-service performance assessment, their state's licensure exams, Master's oral examinations, and all graduate courses. ATR alum Vitalis Obidi reported, "ATR really ensures teachers are ready to serve a classroom and community of historically underserved students. What I really appreciated was the amount of support I got from my director, mentor, fellow teachers, and my cohort."

Coordinating mentor and resident roles. The coordination of mentor and resident roles will be embedded in our programs such that it becomes deep-rooted enough to lead to improvements in practice. ATR and BTR will deepen partnerships between schools, mentor teachers, and our programs to create a system in which student and resident learning are mutually

beneficial, taking advantage of an enormous opportunity to advance student learning through the strategic use of multiple adults in the classroom. Over the year, residents will increasingly help teachers with planning, teaching, and assessing, thus expanding staff capacity to ensure every lesson is of high quality and meets the needs of every student. Our clinical faculty will guide mentor-resident teams to adopt this approach, providing tools, templates, feedback, and support.

Early evidence of success. BPE has begun to pilot the team teaching approach with encouraging early results. On mentor-resident teaching teams that are rated the highest in terms of collaborative practices, we are seeing that they consistently post higher student growth and achievement than other teams at the schools. For example, 64% of second graders were reading at grade level in June 2017 on UChicago's STEP assessment, compared with 40% of all students in the school. The teachers and residents on such teams are highly successful at grouping students strategically, focusing on student learning, and using clear lesson plans which maximize the strategic use of all adults to personalize instruction for each student. The proposed project will scale the approach of the most effective teams to residency classrooms across three states.

Feedback from students and mentor teachers on the team teaching approach in Boston is positive so far. On a 2017 survey, 85% of 200 students (grades 6-12) agreed that, "Having residents in class helps us learn more." 75% of mentor teachers reported on a survey that "Having a resident in my classroom supports student learning." BTR graduates trained with the team teaching approach are rated highly by principals: 100% of graduates who were trained in Teaching Academies in 2015-16 were rated as Proficient on the MA educator evaluation in their first year as a teacher of record. The following quotes from mentors demonstrate the impact residents can have when teacher preparation programs put students first: (1) "Having two dedicated adults in the room has a huge impact. Co-planned lessons are generally better than any lesson that either of us would have planned alone." (2) "Residents were able to productively

contribute to learning right away." (3) "My resident asking questions about how to support specific struggling students pushes me to be more intentional about this."

With this project, BTR will improve, expand, and codify the team teaching approach and support Alder to scale the innovation across ATR. Increased capacity for differentiation will enable deeper impact on student learning in residency classrooms while also preparing more effective, student-centered teachers. See Evidence Base and Competitive Preference for more detail on quality, intensity, and duration.

Collaboration of appropriate partners for maximizing project effectiveness. The proposed project depends heavily on partners. Alder is growing in scale from 115 residents in 2018-19 to 285 residents in 2020-21 based on its pipeline of partnerships with K-12 school systems. BPE will play an R&D role for the project. In an iterative fashion, BPE will develop, pilot, study, and share the team teaching approach, helping Alder to adopt promising practices and helpful tools. BPE will open up both student and residency classrooms as learning sites for Alder and its partners. While Alder pursues degree-granting status, it partners with University of the Pacific and Relay Graduate School of Education, and BTR partners with the University of Massachusetts-Boston to award Master's degrees to residents.

Our closest partners will be the LEAs, schools, and mentor teachers with which we train residents and place graduates: Aspire Public Schools, Boston Public Schools, Caliber Schools, KIPP Bay Area, KIPP LA, Monterey Peninsula Unified School District, and Summit Public Schools. Our partner LEAs have signed agreements and made financial commitments to operate ATR in their schools, and we plan to add ten additional LEAs over the next three years. LEAs provide hiring projections, assist with recruitment, hire and support graduates, guide expectations for teacher effectiveness, and provide data. Our work exists to support their human capital needs, so close collaboration with LEAs is critical to the effectiveness of the project.

For recruitment, we collaborate with several partners, including City Year, Breakthrough Collaborative, EnCorps, Students for Education Reform, local colleges and universities, and programs that support first-generation college students such as the Education Opportunity Program and the Puente Project. In addition, Alder and BPE participate in regional and national networks devoted to improving teacher effectiveness. We will collaborate with thought partners nationwide to share our learning, seek support with challenges, and learn from best practices in the field. See Dissemination for named networks and thought partners.

Focused on those with the greatest needs. Both residents and graduates will work in high-need schools as defined by the concentration of high-need students. High-need students are those who are English language learners (ELLs) and/or eligible for free or reduced-price meals (FRPM). While we intend to add 10 new partner LEAs which serve high-need students, current partner LEAs together serve 96,544 students. 77% are FRPM eligible and 28% are ELLs. 76% of students in partner LEAs are African American or Latino. Our schools draw students from the major public school districts in the following cities: Boston, Compton, East Palo Alto, Los Angeles, Memphis, Modesto, Monterey, Oakland, Redwood City, Richmond, Sacramento, San

Table 1. Demographics in Partner LEAs				
LEA	Number of Students	Latino+ African American	ELL	FRPM
Aspire CA	14,995	84%	25%	82%
Aspire TN	1,467	99%	2%	77%
Caliber	1,285	83%	25%	76%
KIPP CA (Bay Area & LA)	12,147	89%	24%	86%
Monterey	10,685	63%	28%	62%
Summit	3,300	53%	11%	43%
Boston	52,665	73%	32%	78%
Total	96,544	76%	28%	77%

Francisco, San Jose, Stockton, and Vallejo. Statistically, many of our students are more likely to drop out of high school than graduate from college. Schools in Aspire, Caliber, Monterey, and Boston post lower proficiency rates on state tests than state averages, pointing to

achievement gaps. For example, the portion of students testing proficient or advanced in Aspire CA schools is seven percentage points below the state average in ELA and five points below in math. Boston is about 18 percentage points below the state average in both math and ELA. Despite serving concentrations of English learners and low-income students from sending districts, KIPP and Summit have been successful in closing the achievement gap between students from sending districts and state averages (as demonstrated by portion of students testing proficient or above on state tests). However, there are still large achievement gaps between the students in all partner LEAs and other LEAs which educate more affluent students. For example, in ELA the portion of students testing proficient or advanced in KIPP schools in California is about fourteen percentage points above the state average, but still 21 points below Manhattan Beach Unified School District, a district where just 4% of students receive free and reduced price meals (CA Department of Education, 2017; MA Department of Education, 2017; TN Department of Education, 2016). For our students to be successful, we must close these deep and persistent achievement gaps by increasing effective teaching for students with significant needs.

Design of the proposed project is appropriate to, and will successfully address, the needs of the target population. Partner LEAs will provide annual hiring forecasts to ATR and BTR to ensure we are recruiting and training teachers in the most urgently needed areas, which are currently math, science, computer science, elementary, and ELA, as well as teachers of color. This project will meet five human capital needs: (1) teacher pipeline programs which add value to the high-need schools where residents train; (2) more great teachers committed to long-term teaching; (3) effective STEM teachers, including computer science; (4) teachers from underrepresented backgrounds; and (5) teachers who are responsive to student needs.

Teacher pipeline programs which add value to high-need schools. Many students in partner LEAs are reading and doing math behind grade level. They need access to the best

possible instruction in order to improve their chances of graduating on time with a strong educational foundation. Students don't have time to waste, and they have a myriad of learning needs. While residency programs bring instructional expertise and additional classroom support to these schools, there is untapped potential to leverage these resources to more deeply to benefit students. ATR and BTR have always held ourselves accountable for the effectiveness of graduates. In this project, we propose to add accountability for effectiveness of residents.

More great teachers committed to long-term teaching. Partner LEAs need to hire about 1650 new teachers annually. Through this project, we will prepare 630 new teachers for partner LEAs over three years. Research demonstrates that effective teachers can significantly improve student learning outcomes (McCaffrey et al., 2003; Rivkin et al., 2000). When teacher candidates have opportunities to learn and practice what teachers actually do, they become more effective teachers and produce more student achievement gains than teacher candidates whose preparation was not grounded in the classroom (Boyd et al., 2009b). Inadequate teacher preparation programs are underpreparing teachers for our most vulnerable students, which negatively impacts student outcomes and teacher retention. The 2014 Tennessee Higher Education Commission's Report Card on the Effectiveness of Teacher Training Programs, which did not evaluate ATR, found that only two of 44 programs prepared teachers who performed as well or better than veteran teachers; one of the two programs was Memphis Teacher Residency. While a 2013 National Council on Teacher Quality (Greenberg & Walsh) report found that 93% of teacher preparation programs failed to ensure a high-quality student teaching experience, the 2018 NCTQ Teacher Prep Review ranked ATR (listed as Aspire University) and BTR both at the 97th percentile for quality among all secondary programs, excluding undergraduate programs (Rickenbrode et al., 2018). Our programs are aligned with what new teachers need to know and be able to do in classrooms to be successful. We do not ask doctors to perform surgery alone

after learning about surgery in a classroom. We expect doctors to undergo years of supervised and supported practice-based training. We must treat the teaching profession with as much respect. This project will ensure every graduate meets our high standards for effectiveness.

A 2016 Learning Policy Institute study showed that approximately 75% of California districts experienced a shortage of qualified teachers in the 2016-17 school year, and that attrition rates among teachers accounts for as much as 95% of the shortage. The problem is exacerbated in districts serving the highest need populations, with four times the portion of uncertified teachers in high-minority schools (Podolsky & Sutchter, 2016) and 50-75% of teachers leaving urban districts within five years (Papay et al., 2017). This turnover negatively impacts student achievement (Ronfeldt & Wyckoff, 2013). ATR and BTR recruit candidates who are committed to long-term teaching, and prepare and support them to be able to do so. Our programs post retention rates higher than average: ATR's three-year rate is 72% (compared with 49% for non-ATR teachers) and BTR's rate is 80% (compared with 63% for non-BTR teachers). As our graduates gain experience and improve their skills, they will stay in high-need schools, increasing the benefit to students over time and reducing teacher turnover in partner LEAs.

Effective STEM teachers, including computer science [CPP]. Partner LEAs need to hire 250 new secondary STEM teachers and 700 STEM-strong elementary teachers annually. Among other districts, Boston is eager to provide computer science classes to all students, but faces a major human capital challenge. States report more shortages in STEM teachers than in teachers of other subjects (Cross, 2016). Only 72% of public school classroom teachers are certified in the STEM fields in which they are teaching (NCES, 2008). Through this project, ATR and BTR will prepare 370 effective K-12 STEM teachers (half of which will teach grades 6-12), and develop and implement the country's first computer science teacher residency program.

Technology jobs are the top source of all new wages in the U.S. and make up almost 60% of

projected new jobs in STEM fields. The development of computer science courses, curricula, and tools, which already outpaces teaching capacity, will continue to evolve, driven by industry's investment in their future workforce. We need a parallel investment in teachers. There is a gap in knowledge about how to effectively prepare computer science teachers, and few programs prepare computer science teachers at all. According to code.org, universities in Massachusetts did not graduate a single new teacher prepared to teach computer science in 2016 (*Support K-12 Computer Science Education in Massachusetts*, n.d.). As cities and states across the nation ramp up efforts to offer computer science courses to ALL students, there is an urgent need for effective teacher preparation for computer science teachers.

Teachers from underrepresented backgrounds. Teacher diversity is essential in our schools, as teachers who do not reflect the diversity of their students can negatively impact student performance (Villegas & Irvine, 2010). Nationwide, 80% of the teacher workforce is white (Dixon, 2017). 76% of students in our partner LEAs are African American and/or Latino. ATR is one of the most diverse teacher preparation programs in the country, with 71% of residents identifying as people of color, and BTR is one of the most diverse teacher preparation programs in Massachusetts, with 50% of residents identifying as people of color (Rochelau, 2017). This project will prepare 315 new teachers of color, with strong representation of African-American and Latino candidates.

Teachers who are responsive to student needs. Our students come to partner LEAs with significant academic and non-academic needs. Residents learn to identify and respond to student needs by upholding the following core principles: (1) Know all students as individuals and learners; (2) Measure the success of teaching through student learning; and (3) Enter into collaborative relationships with families and communities. For example, 28% of our students are learning English; they need teachers of all subjects to plan their lessons with language objectives

and to provide multiple access points to the content. Therefore, ATR and BTR residents learn to incorporate these elements into their practice. Furthermore, our residency programs are managed by local directors, who adapt the residency experience to the local context in order to boost resident capacity to effectively teach local students.

SIGNIFICANCE

Importance or magnitude of impact on improvements in teaching and student achievement. The most important outcome of this project will be a research-based model for teacher preparation which develops effective teachers without subjecting students in candidate training schools to the risk of a decrease in quality teaching. **Our long-term goal is to demonstrate that by introducing a team teaching approach, teacher preparation programs can increase student achievement for students in the high-need schools where candidates train.** By developing structures and tools for these roles, and designing and codifying a team teaching approach, we can disseminate a model which has the promise to, if implemented well, improve student learning outcomes in K-12 schools nationwide. About 260,000 teachers leave the profession each year (Goldring et al., 2014). If 200,000 classrooms nationwide host teacher candidates and serve an average of 40 students (20 elementary, 60 secondary), then eight million students stand to benefit from this project annually.

This project will develop 630 effective educators over three years through non-traditional pathways to teach high-need students in 19 underserved LEAs in California, Massachusetts, and Tennessee. Together, these teachers will serve approximately 25,000 students in 80 residency schools over three years, and collectively serve 20,000 students in high-need schools in partner LEAs each year once they are teachers of record. Furthermore, these teachers will meet critical human capital needs in partner LEAs, who serve high concentrations of students of color and students eligible for free- and reduced-price lunch. The project will increase the diversity and

retention of teachers in partner LEAs, both of which have been shown to increase student achievement, and increase the pipeline of effective math and science teachers in partner LEAs.

Another significant outcome of this project will be a model – and the first, as far as we know – computer science teacher residency program. Currently, schools are desperate for effective teachers trained to teach computer science. We need to prepare and support a first wave of new computer science teachers to fill immediate vacancies, and to later become mentors for the next generation of computer science teachers. There is an urgency to start now, and start within a context likely to be successful, such as the BTR program at Dearborn STEM Academy [CPP].

While our approach centers on student learning in residency classrooms, our theory is that by putting student learning at the center of the residency experience, we will prepare teachers who are more effective at increasing student achievement long-term. Our graduates will be trained to hold themselves accountable for student learning outcomes, and to respond appropriately when students do not understand the content. Importantly, residents will develop the tools and habits of mind to continue improving their own practice, as demonstrated by higher improvement rates of BTR graduates over other Boston teachers (Papay et al., 2012). The project increases alignment and coherence between theory and practice, between teacher preparation programs and partner schools, and between what students need to learn and what candidates are capable of delivering.

Reasonable costs. In 2015, Boston lost 22% of its teaching force. The cost of turnover among Boston teachers who leave within their first three years is about \$3.3 million annually in recruiting, hiring, training, and supporting new teachers. Unfortunately, Boston is no exception. The cost of teacher turnover (hiring and training replacement teachers) nationwide is estimated to be about \$2.2 billion each year (*On the Path to Equity*, 2014). And, this doesn't account for the financial impact of less effective teaching by the more novice replacement teachers, which can result in students graduating without the knowledge and skills they need to thrive in today's

workplace. ATR and BTR teachers have higher retention rates than other teachers, reducing the cost of teacher turnover in partner LEAs.

Traditional Master's degree programs in teaching charge candidates about \$25,000-\$40,000. These costs are prohibitive for many of the teachers our students need most. Our students need teachers who look like them and understand the world they live in. Our programs attract graduates from partner LEAs, first generation college graduates (60% ATR; 33% BTR), teachers of color (71% ATR; 50% BTR), and teachers from low-income backgrounds (51% of ATR residents are Pell grant recipients). We provide financial support to remove the barrier to entering the profession for these high-potential teacher candidates.

This project will cost about \$15,000 per resident (including federal and match funds) and study an unexamined risk factor in the push to increase the intensity and duration of candidate practice. The return on this investment is significant, as described above. The project evaluation will result in a rigorous study which can inform the field of teacher preparation more broadly about the costs and benefits of the team teaching approach. The cost that this investment replaces is the opportunity cost students pay in lost learning when their expert teacher steps aside while a teacher-in-training takes over full responsibility for the classroom.

Incorporation of project purposes, activities, or benefits into the ongoing program at the end of Federal funding. The project proposed herein is at the core of both Alder's mission (which is to create opportunity and cultivate success for every student by recruiting and educating excellent teachers and leaders who reflect our schools' communities) and BPE's mission (which is to drive exceptional outcomes for all students by developing great teachers and great schools). Alder and BPE are at the forefront of the effort to move students to the center of teacher education. Students come first, in our mission statements and in our work, and we cannot achieve our goal of developing excellent teachers without crucially examining the impact of

graduates *and* residents on student learning. The proposed project, and the learning that comes from both implementation and evaluation, will help both organizations to get to the next level of quality teacher preparation. We intend to continue the proposed activities long after the end of federal funding, and partner buy-in will ensure all stakeholders are invested in the project's long-term success. For example, Alder's partner LEAs sign contractual agreements which include a financial contribution to support ATR operating in their schools. There is an upfront investment cost to developing, testing, and evaluating the model. These costs will decrease over time as the mode of operating shifts. Additionally, increased coherence and alignment between the residency programs and the schools, centered on student learning, can result in cost savings. For example, current duplicative professional development costs could be streamlined as a single clinical faculty member supports both mentors and residents to drive student learning within the school context. The proposed project is an innovation on the residency model which should not, long term, add ongoing operating costs.

Dissemination of information and strategies. Alder and BPE are well-positioned to disseminate practices nationally in order to scale success. First, Alder will disseminate the information and strategies within its growing network. Over the next five years, we plan to add five new partner LEAs per year, including large and small, district and charter. By 2023, ATR will prepare 410 new teachers each year. We scale up promising practices within our network through twice-weekly meetings via video calls and quarterly in-person retreats with all directors, each of whom is responsible for a cohort of 20 residents. Three times per year, we hold regional meetings. Weekly, ATR staff receive weekly newsletters which include research and practices from within the network.

Second, we will share our strategies, documents, learnings, and evidence of progress among existing teacher education networks, including the National Center for Teacher Residencies

(NCTR), Deans for Impact, Teacher Squared, the Schusterman Family Foundation Learning to Teach group, and the Overdeck Foundation Research Group, all organizations with whom Alder and BPE actively engage. Third, we will share the work across LEA partners which also host teacher candidates from other programs, including KIPP, Aspire Public Schools, and Boston Public Schools. Methods of broad dissemination will include presentations at 10 national conferences such as AERA and AIR, a white paper or journal article, and a blog post. We will draft, iterate on, and codify role descriptions for mentors and residents, lesson plan templates maximizing the use of multiple adults for various points in the year, and guiding documents for the computer science residency. We will make these resources, and all other project deliverables, publicly available through various list serves, social media, BTRgrad.org, in-person communities of practice, and direct outreach. The networks listed above will assist in the dissemination of strategies and information resulting from this project.

We have a strong track record of dissemination. In the 15 years since BTR was founded, we have seen a rapidly growing focus on the issue of quality teacher preparation. To address the many requests BPE received to replicate BTR, BPE collaborated with the Boettcher Teachers Program and the Academy for Urban School Leadership to launch NCTR, a national nonprofit designed to support the development of residency programs. NCTR disseminates the best practices of BTR and other residency programs; in the last decade, with support from ATR and BTR, over 20 residency programs have been established, and many traditional programs are incorporating more opportunities for clinical practice. We have directly supported the replication by training staff from other programs, sharing materials and tools, and sharing lessons learned with local and national partners. BTR currently serves as a National Demonstration Site for NCTR. Through this project, BTR will do the same, first with existing and new ATR sites, and then with residencies and other teacher education programs more broadly.

QUALITY OF THE MANAGEMENT PLAN

Specified and measurable goals, objectives, and outcomes. Our long-term goal is to demonstrate that by using a team teaching approach, teacher preparation programs can increase student achievement for high-need students in the schools where candidates train. Our evaluation plan describes a method to evaluate the impact on instructional quality and student achievement in mentor-resident classrooms. Below we describe a set of performance measures for this project.

Goal 1: Address the human capital needs of partner LEAs.	
<p>Objectives:</p> <p>1.1. This project will develop effective educators through non-traditional pathways to teach high-need students in underserved LEAs in California, Massachusetts, and Tennessee.</p> <p>1.2. This project will scale up a diverse pipeline of effective teachers overall, as well as the STEM teacher pipeline in partner LEAs.</p>	<p>Outcomes:</p> <p>Over three years:</p> <p>1a. Prepare 630 new teachers (135 in Year 1, 187 in Year 2, and 308 in Year 3).</p> <p>1b. 500 new graduates secure teaching positions in partner LEAs, which have high concentrations of high-need students (SEED Performance Measure A).</p> <p>1c. Prepare 370 teachers for K-12 math, science, or computer science classrooms.</p> <p>1d. Prepare 315 teachers of color.</p>
<p>Objective:</p> <p>2.1. This project will coordinate resident and mentor roles through a team teaching approach so that residents (a) increase teachers' capacity to personalize instruction, (b) contribute to student learning, and (c) learn how to teach effectively.</p>	<p>Outcomes:</p> <p>2a. On a survey, mentor teachers (60% in Year 2, 85% in Year 3) report that having residents in the classroom increased their capacity to personalize instruction or increase the amount of small group instruction.</p> <p>2b. On a survey, mentor teachers (50% in Year 2, 75% in Year 3) report that residents played a key role in driving student learning.</p> <p>2c. The number of classrooms implementing the team teaching model with fidelity increases to 90 in Year 2 and 220 in Year 3.</p> <p>2d. 100% of new graduates will demonstrate teaching effectiveness prior to graduation through high-stakes gateway assessments and oral exams.</p>

Goal 3: Retain effective teachers in schools

<p>Objective: 3.1. Through selective admissions, intensive pre-service training, and in-service supports, this project will increase the effectiveness and retention of teachers in partner LEAs.</p>	<p>Outcomes: 3a. 92% of graduates are rated effective or higher on formal (LEA or state) teacher evaluations, which include a measure of student achievement (SEED Performance Measure B). 3b. 80% of graduates placed in partner LEAs are retained for two or more years (SEED Performance Measure C).</p>
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In addition, this project will ensure a reasonable cost per participant and include an evaluation which meets WWC standards with reservations in order to ensure replicability of and evidence from the model (Performance Measures D&E).

Adequacy of the management plan to achieve the objectives on time and within budget, including clearly defined responsibilities, timelines, and milestones. Alder and BPE have evaluated our capacity to carry out the project and created a feasible timeline and budget to support the project’s success. We bring significant capacity to this work.

Capacity of Lead Applicant. Alder has a strong track record of success, highly skilled staff, and the ability to manage federal funds. We have the proven capacity to manage this project, both in terms of achieving the objectives on time and within budget, and in terms of fiscal responsibilities. ATR has prepared 205 teachers and reached 23,000 K-12 students to date. Since ATR was founded in 2010, it has demonstrated a strong track record:

- 97% of program graduates secure a full-time teaching position, and 88% of graduates are employed by partner schools.
- The share of ATR teaching candidates from historically underrepresented communities grew from 35% in school year 2010-2011 to 71% in the 2017-2018 cohort. 60% of ATR residents are first generation college graduates.
- In school year 2017-18, ATR graduates over five cohorts (Classes of 2012-2016)

remained teaching in partner LEAs at rates higher than their peers who began teaching in the same LEA at the same time: 65% for ATR graduates compared to 47% for other teachers.

- On a scale of effectiveness with a range of 1-5, ATR graduates score an average of 0.2 higher than other teachers with similar levels of experience, which is statistically significant. Effectiveness scores combine multiple measures: student progress on standardized tests (e.g., SBAC); observation scores from principals; survey data from peers, students, and families; and school/team environment scores. 100% of principals report satisfaction with ATR graduates.

"As a resident, I taught in a safe, supported environment with an esteemed mentor and director who were able to provide real-time observations and coaching in order to help me make action-oriented reflections. I was well-prepared for my first independent year teaching. Joining the ATR program was one of the best decisions I have ever made." --Shawna Koga, ATR Alum & Mentor

ATR was incubated within Aspire Public Schools from 2010 to 2015. In 2015 the program was launched as a separate legal entity with 501(c)(3) status. On July 1, 2017, the institution adopted the name Alder Graduate School of Education. As an independent entity, Alder is able to pursue partnerships with multiple charter management organizations and districts to provide teacher candidates, while continuing to provide candidates to Aspire Public Schools.

CEO Dr. Heather Kirkpatrick has over twenty years' experience in education and executive experience as Chief People Officer for Aspire Public Schools. During her 16-year tenure with Aspire, Dr. Kirkpatrick was instrumental in growing the organization from two schools in 2000 to 40 schools today and growing ATR from 20 to 60 residents. Dr. Kirkpatrick will utilize her expertise and experience growing Aspire to scale ATR up from 115 residents in 2018-19 to 410 in 2022-23. Alder has maintained ATR program quality and effectiveness as it has scaled. Its continued growth will be supported by eleven engaged volunteer Board members with a broad range of expertise and experience in education, business, philanthropy, finance, and law.

Alder deans oversee the ATR program, ensuring coherence and accountability across the

network. Five clinical faculty members serve as regional directors (Aspire Bay Area, Central Valley, Los Angeles, Memphis, and KIPP Bay Area, Summit). They teach courses, lead weekly seminar classes, meet regularly on school sites with residents and mentors, and assess residents. A Senior Director of Diversity, Equity, and Inclusion and adjunct instructors round out our instructional team. Two full-time researchers use qualitative and quantitative data to drive organizational improvements and hold ATR accountable for student and teacher success. As Alder grows, it will hire one additional dean and researcher, plus another regional director for each cohort of 20 residents.

Alder continues to collaborate with and receive operating support from Aspire: a shared services agreement provides that Aspire deliver finance and human resources services. With over \$92M in net assets and 2,000 employees, Aspire is one of the nation's largest open-enrollment K-12 public charter school systems serving 16,000 predominantly low-income students. Aspire has extensive experience with federal grants over its 20 year history and has built its capacity to manage them effectively. Federal funding received includes not just Title I/II/III funds, but also over \$56M in competitive grants from the Teacher Incentive Fund, Charter School Program, Investing in Innovation, and School Improvement Grant programs.

Aspire's Director of Finance, Erik Brown, has over 15 years of experience in finance and federal grant management and an MBA from the Haas School of Business at the University of California, Berkeley. Mr. Brown provides financial services to Alder on a part-time basis in accordance with the back office services agreement with Aspire. He collaborates with Alder's COO/CFO Monica Bonny, who has 16 years of experience in finance and planning and an MBA in Finance from the Wharton School at the University of Pennsylvania.

Capacity of Lead Partner. Since its establishment, BTR has prepared over 600 teachers who serve 18,000 students in Boston Public Schools. BTR has been replicated in 22 cities and 3

countries. BTR graduates continually post higher retention rates than the district average, with a six-year retention rate 20 percentage points higher than other BPS teachers. 96% of BTR residents from the past two years secured teaching jobs in Boston Public Schools. Every year, over 50% of residents are people of color. BTR is also focused on building the pipeline of STEM teachers in Boston. 75% of all residents learn to teach math and/or science in grades 1-12 and over half of secondary BTR graduates are teaching STEM in Boston. BPE's Teaching Academy model shines light on the future of teacher education: schools which are designed to promote teacher, resident, and student learning simultaneously and coherently.

A graduating BTR resident last year noted BTR's orientation to student learning during the residency year in their graduation speech: "As educators, our success is directly connected to the achievements of our students. As I grew into my role as a teacher, I saw my growth reflected back at me through my students'." On a recent survey, 100% of principals said they would hire another BTR graduate. One remarked, "I would hire a BTR graduate because they come with a reflective perspective, a network of resources and a 'can-do' attitude...BTR graduates always consider alternative means to solve problems, meet goals, and meet student needs."

BPE has successfully managed several federal grants, including Transition to Teaching, Investing in Innovation, and Teacher Quality Partnership grants. As a result, BPE has built its capacity to contribute to a project of this size and scope. Executive Director Jesse Solomon founded BTR in 2003 after teaching math in Boston for over a decade as a National Board-certified teacher. He has led BPE since 2011. Dr. Edward Liu, BPE's Chief Improvement Officer, was a high school teacher and an Assistant Professor of education at Rutgers University. He was an original member of the Project on the Next Generation of Teachers and co-authored *Finders and Keepers: Helping New Teachers Survive and Thrive in Our Schools* (AACTE Outstanding Book of 2005). BPE employs clinical faculty who play a similar role to Alder

directors (teaching and coaching residents) and also lead school-wide professional development.

Responsibilities, Timelines, and Milestones. Many activities are cyclical: recruitment occurs year round; selection occurs between January and May; residents complete intensive courses in the summer and once a week during the school year, and work closely with mentors 4-5 days per week from late August through June. Most residents are hired between March and July. Each year, clinical faculty and mentor teachers utilize authentic assignments for residents, increasing alignment between coursework and practicum, and hold residents accountable for their performance and student learning through gateway assessments. Clinical faculty and LEA partners provide a suite of supports to graduates, including summer institutes prior to new teaching assignments, in-service coaching, weekend workshops, and more. Progress monitoring occurs year-round, with peaks around assessment periods and end-of-year surveys. In the table below, "faculty" includes deans and regional directors at ATR as well as clinical faculty at BTR.

Activity	Responsibility	Year 1 Milestones	Year 2 Milestones	Year 3 Milestones
Residents prepared	ATR and BTR admissions staff; faculty	135 total; 77 STEM; 67 teachers of color	187 total; 110 STEM and 93 teachers of color	308 total; 186 STEM; 155 teachers of color
Graduates placed in partner LEAs	faculty, alumni support staff	108	150	242
Co-teaching model	Faculty and mentor teachers, with support from Alder CEO, BPE Executive Director, and research staff	Begin to shift resident and mentor roles. Establish common vision and language. Pilot new strategies and tools. Take note of existing variation.	Share practices and tools across network. Draft and pilot role descriptions and lesson plan templates. About half of classrooms are using co-teaching model.	Document & codify role descriptions and lesson plan templates, which are in use across network. About three-quarters of classrooms are using co-teaching model.

Evaluation	Research staff, external evaluator	Select external evaluator. Complete detailed evaluation plan. Construct or adopt tools for measurement. Submit data requests.	Collect and analyze data for performance measures, implementation study, and outcomes study.	Complete implementation and outcomes study. Measure progress towards performance measures.
Dissemination	Research and communications staff, Alder CEO, BPE Executive Director, faculty	Share promising practices between BTR and ATR.	Disseminate within growing ATR network and within partner LEAs.	Share the project externally with national teacher education organizations, potential replication sites, and LEAs through conferences, a white paper or journal article, and other methods.

Procedures for ensuring feedback and continuous improvement. Alder and BPE are data-rich organizations that embrace a culture of evidence. Alder’s full-time research scientists are charged with collaborating with our CEO and regional directors to drive continuous improvement. BPE’s Chief Improvement Officer plays a similar role. They collect and analyze multiple types of formative and summative data to identify areas in need of improvement and bright spots to scale up. In Year 1, we will establish a tight feedback loop among all key stakeholders to ensure the project is implemented with fidelity and is achieving desired outcomes. To evaluate successes and challenges, we will analyze interim reports from the external evaluator as well as our own data. Project directors from Alder and BPE will meet quarterly to discuss high-level progress and make adjustments. Research and program staff across the two organizations will meet every 1-2 months in order to work collaboratively, share learnings, and develop and disseminate the model.

We create regular opportunities for staff teams to analyze and discuss findings with research

staff, and to plan for program improvements, so the continuous improvement work will fit into existing structures at Alder and BPE. A diverse group of stakeholders, including students, residents, alumni, mentors, principals, LEA leaders, universities, and consultants, is regularly engaged in the assessment of ATR and BTR. We involve all levels of staff, faculty, and administration in examining data and planning improvements. Structures include: monthly faculty meetings and quarterly faculty retreats focused on debrief, learning, and improvement, annual evaluation and planning process, a multi-year program review process, external reviews by the Teacher Preparation Inspectorate, meetings with LEA leaders to solicit feedback and make sure we are meeting their needs, and surveys, interviews, and focus groups with external stakeholders. At Alder, the multi-year program review involves self-study and an external review. From this process, we create a findings and recommendations report and integrate findings into strategic planning. For example, its first cycle resulted in multiple meaningful changes to the program, including direct assessment of student learning outcomes and formalization of assessment processes. On surveys, principals are asked to compare our graduates with other teachers with the same level of experience and provide detailed feedback on the performance of graduates in a number of areas (such as content knowledge and classroom management). Where there are patterns of strength or weakness from the perspective of principals, we can take action to improve, or to scale up a bright spot.

The data we collect range from residents' admissions information (demographics, past performance, motivation), coursework (grades, completion status), practicum (gateway scores, mentor teacher characteristics, student learning data), oral exam scores, job placement, retention as teachers of record, student achievement in graduates' classrooms, teacher evaluation ratings, and reflections and ideas (through surveys, including NCTR-administered surveys) from all relevant stakeholders on the quality of our programs and our residents.

QUALITY OF THE PROJECT EVALUATION

Alder will contract with an independent external researcher to conduct a rigorous evaluation of the project and will dedicate 8% of the overall project budget (\$575,000) to fund this evaluation. If awarded a grant, we will solicit proposals from research organizations or individual researchers who have experience conducting large-scale evaluations for federally funded education projects. In the past, BPE has worked with Dr. John Papay of Brown University on the evaluation of federal grants.

The evaluation will include an analysis of implementation fidelity as well as quasi-experimental outcome analyses designed to meet What Works Clearinghouse standards with reservations. The evaluation will address the following research questions:

Research Questions	
RQ1	How is the program being implemented across ATR and BTR and to what extent does this correspond to what was proposed? [Descriptive]
RQ2	Is the instructional practice in resident-mentor STEM classrooms of at least comparable quality to those of similar classrooms within the partner LEAs without a resident? [Quasi-Experimental]
RQ3:	What impact does being taught in a classroom with an ATR/BTR resident-mentor team have on student achievement in math and ELA (as measured by standardized test scores), and do students in these “residency classrooms” achieve at least as much as those in comparable classrooms? [Quasi-Experimental]

The first research question addresses implementation fidelity and will also provide periodic formative feedback for performance monitoring and continuous improvement. It will assess the extent to which ATR and BTR are putting into practice key components of the new team-teaching, student-centered approach to organizing the work of residents and mentors envisioned in this proposal. The second research question seeks to generate evidence on whether these implemented program changes have translated into an intermediate outcome: high-quality instruction in classrooms in which residents are teamed with mentors. The third research question addresses the impact of the project on student learning, seeking to confirm whether

student achievement in resident-mentor classrooms is at least on par, and hopefully higher, than that in comparable classrooms, thus providing evidence on whether ATR and BTR have succeeded in the goal of designing a model of teacher education that provides teacher candidates with extensive opportunities for clinical practice while also supporting student learning.

Performance feedback and assessment of progress toward achieving intended outcomes.

To answer RQ1 and provide ATR and BTR with periodic feedback on implementation, performance, and progress toward achieving intended outcomes, the evaluators will collect, summarize, and report on data from surveys, observations, interviews, focus groups, and administrative records. In the early months of the project, the evaluators will work with the residency programs to develop a set of indicators to assess fidelity of implementation of the key program activities (selective admissions, pre-service training, coordination of mentor and resident roles, and in-service support) and to establish minimum thresholds for fidelity of implementation. The evaluators will map the indicators to existing data sources and identify gaps requiring the development of new data collection instruments. The mix of quantitative and qualitative data collected to answer RQ1 will provide ATR and BTR with insight into implementation challenges as well as a better understanding of the contexts and conditions under which the new residency model appears to be working well. All findings from the evaluation process will fuel the feedback and continuous improvement structures described in the Management Plan.

Use of objective performance measures related to intended outcomes. In addition to collecting implementation data, the evaluators and program staff will collect and analyze objective data from program databases as well as external sources to analyze progress towards the performance measures listed in the Management Plan, which are related to the intended outcomes. The project will produce qualitative and quantitative data related to the performance

measures and relevant outcomes, tracking indicators such as: racial and ethnic diversity of applicants and participants, performance of residents on gateway assessments, information about residents' and graduates' effectiveness, and placement and retention rates in partner LEAs.

Valid and reliable data on relevant outcomes. In addition to collecting a variety of data to study implementation and help ATR and BTR monitor progress, the evaluators will collect objective, valid, and reliable data for the statistical models used to answer RQ2 and RQ3. Alder and BPE will assist the evaluators in obtaining signed memoranda of understanding and data-use agreements with partner LEAs similar to the one BPE currently has in place with Boston Public Schools. Once the agreements are in place, the evaluators will collect a range of student- and teacher-level data, including but not limited to: student demographics, standardized test scores, and ELL and special education status; teacher demographics, teaching assignment, years of teaching experience, years teaching in the LEA, and teacher evaluation scores; as well as classroom enrollment information necessary to establish student-teacher links.

Research Question	Outcome Variable	Data Sources
RQ1	Fidelity of implementation	Surveys Interviews, focus groups Observations ATR, BTR program records
RQ2	Instructional practice as measured by CLASS or comparable protocol	Observations of STEM classrooms in Year 2 of project (2 per classroom)
RQ3	Student test scores in math and ELA	State standardized test data from partner LEAs

For RQ2, the outcome variable, quality of instructional practice, will be measured using an observation protocol that is valid, reliable, and fair, such as the highly-structured Classroom Assessment Scoring System (CLASS) developed by Robert C. Pianta and colleagues at the National Institute of Child Health and Human Development Early Child Care Research Network, the National Center for Early Development and Learning, and the Center for Advanced Study of

Teaching and Learning. Developed over 15 years and studied at great length, the reliability and validity of CLASS has been well established (La Paro et al., 2004; Pakarinen et al., 2010).

Research findings from over 4,000 classrooms demonstrate that students in classrooms with higher CLASS ratings realize greater gains in social skill and academic development than students in classrooms with lower CLASS ratings (Bill and Melinda Gates Foundation, 2010).

Trained and certified raters will be used in this study to ensure the reliability of the collected data. Each classroom will be observed twice for increased precision.

For RQ3, student-level scores on state standardized tests (Smarter Balanced in California, Next Generation MCAS in Massachusetts, and TCAP in Tennessee) will be used for the outcome measures.

Methods that produce evidence meeting the WWC standards with reservations. The two outcome analyses addressing RQ2 and RQ3 will involve different, overlapping samples of program participants because of data limitations (states only collect student achievement data in certain grade levels and subjects, and primarily in ELA and math), capacity considerations, and the project's focus on STEM. They will also use different analytical strategies. The evaluation will use matched-sample study designs to answer RQ2 and RQ3, using an appropriate method, such as propensity score matching (PSM), to create the matched samples. At the classroom-level, matching will be done on factors such as grade-level and subject area, school characteristics (percentage of low income students, students of color, ELLs, prior year's student achievement), and a set of characteristics of the teacher of record (years of experience, prior performance as measured by educator evaluation ratings). The matching factors will be selected thoughtfully, with the understanding that systematically matching on one variable means systematically unmatching on others. Following WWC guidelines, samples will be constructed so that the two groups do not differ by more than .25 standard deviations on baseline characteristics.

RQ2: Is the instructional practice in resident-mentor STEM classrooms of at least comparable quality to those of similar classrooms within the partner LEAs without a resident? To answer this question, the evaluation will create a matched sample of 50 resident-mentor secondary STEM classrooms and 50 classrooms with solo teachers that are baseline-equivalent with respect to important characteristics, allowing the evaluation to produce evidence that will meet WWC standards with reservations. We expect some attrition (roughly 7%) from residents exiting the program before observations are completed, due to failure to pass gateway performance assessments or personal reasons. Thus, we estimate that 47 resident-mentor STEM classrooms will remain in the “intervention” sample at the end of the year. CLASS observations by trained raters will be conducted in the combined matched sample of 100 classrooms.

The average CLASS scores of the resident-mentor classrooms will be compared with the average in the comparison-group classrooms. The analysis will be conducted with the overall CLASS scores as well as separately with the individual component scores (emotional support domain, classroom management domain, instructional support domain, and student engagement).

RQ3: What impact does being taught in a classroom with an ATR/BTR resident-

students from 60 residency classrooms and 60 matched classrooms will be included in the study (factoring in attrition from the program). If year 3 data are available and used in the study, we estimate that students from 117 residency and 117 matched classrooms will be included. Using a conservative estimate of 25 students per elementary team and 80 students per middle school team, we estimate that data from between 4,870 to 9,590 students will be included in the analysis. The matched samples for this analysis will likely be constructed using a method similar to that for RQ2. However, if this does not generate matches of high enough quality, the evaluators may adopt another approach, such as the virtual control record (VCR) approach described by the Center for Research on Education Outcomes to generate “virtual twins” (CREDO, 2009).

Within this sample of similar treatment and comparison group students, the evaluators will fit value-added models to estimate the impact of being taught in a residency classroom, controlling explicitly for other factors such as demographic characteristics and prior achievement. The evaluators will estimate the effect of being taught in a residency classroom in two ways. First, they will compare mean test scores of students in the treatment group to those in the comparison group. Second, within the matched sample, they will account for any minor differences in baseline characteristics by fitting covariate-adjusted value-added models that include prior year test scores as a right-hand-side control variable when predicting the outcome test score. For each subject (math and ELA), they will fit a model that represents the relationship between a student’s standardized test score and a variety of predictors, including previous year’s test scores in both math and ELA ($Y_{i,t-1}$).

A possible model for the analysis is as follows:

$$Y_{ijsgt} = \alpha_g * f(Y_{i,t-1}) + \beta * RESIDENCY_{jt} + X_{ijst} ' \delta + \bar{X}_{jst} ' \zeta + \bar{X}_{st} ' \varphi + \theta_g + \varepsilon_{ijsgt} ,$$

where y_{ijst} represents the math or ELA test score of student i in classroom j in school s , grade g , and year t . The evaluators will allow the coefficients on baseline test scores (y_{ijst-1}) to vary by the student's grade and include grade fixed effects (γ_g). The individual-level control vector, X_{ijst} , includes student demographic characteristics, such as gender, race/ethnicity, family income, special education status, and ELL status. For each student, they will also generate a vector of classroom-level means (\bar{X}_{jst}) and school-level means (\bar{X}_{st}) of these demographic characteristics, as well as the class size and average student baseline test scores for each subject to control for classroom or school composition effects. The zero-mean error term, ϵ_{ijst} , is adjusted to allow for clustering of residuals at the classroom level to account for the fact that students in the same classroom are likely to share common unmeasured influences on their achievement.

If the data allow, the evaluators will also conduct an exploratory analysis, examining the extent to which the impact of being taught in a residency classroom varies according to the level of program implementation. In other words, on average, are the effects different in high fidelity classrooms compared with lower fidelity classrooms?

This evaluation design will lead to new knowledge about the impact of the project on important outcomes.

See Appendix F for references.

