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Project BUMP UP

(**B**uilding **U**p **M**athematics **P**roficiency **U**tilizing **P**ush-in)

Introduction and Significance of the Project

Research from the National Center for Research on Gifted Education (NCRGE; Siegle et al., 2016) indicates pullout programs are the dominant delivery model for gifted services (73% of schools), yet pullout programs seldom addressed core academic content. Only slightly over a quarter of schools in the three states NCRGE surveyed reported offering gifted programing in math. Even more alarming, only a quarter of that 25% indicated they had a math curriculum specifically designed for their gifted program related to math. The limited exposure to advanced content results in gifted students starting ahead in math achievement at grade 3, but not growing any faster than other groups by grade 5, and in some cases, gifted students actually show slower growth than their non-gifted peers (Long et al., 2019). Gifted programs are simply not providing the majority of gifted students with the necessary advanced academic content or differentiated instruction in math needed for talented students to reach their full academic potential. We propose addressing this problem by offering push-in programming in general education classrooms with an emphasis on math instruction as an add-on to the traditional pullout option seen in most schools.

Pullout refers to instruction provided by gifted specialists by removing students from general education classrooms. Pullout programs generally focus on enriching and extending the curriculum. Push-in refers to instruction provided by gifted specialists as part of the students' usual classroom experience. Because push-in occurs in general education classrooms during academic instructional time, push-in models tend to focus on advanced content in core subjects (e.g., math, reading/language arts). The NCRGE site visit team noted that push-in services were less prevalent than pullout services but occurred more often at the schools that NCRGE identified as having higher than expected levels of reading/language arts and math growth. Therefore, push-in services show promise for developing gifted students' math skills.

The primary goal of our project is to ensure that talented math students, including students from underserved populations, receive services that allow them to make continuous progress and excel in math by using the pedagogy of advanced instructional practices in general education classrooms. This project has the potential to change the way gifted students are served. We will achieve this not by asking schools to abandon the pullout service model to which they are wed, but to supplement it with a push-in model that shows promise at addressing advanced academic needs. The proposed intervention implements push-in programming to supplement already existing pullout services for gifted students. Gifted specialists who are responsible for providing pullout services to gifted students will dedicate 3 hours per week/per class collaborating and co-teaching in general education classrooms of identified gifted students with those students' general education teachers. The special education field has a history of implementing a similar push-in model with students who have difficulty learning (Scruggs, Mastropieri, & McDuffie, 2007) and the model has been shown to be effective in other core subject areas (Coyne et al., 2016).

There are a number of reasons why we expect the addition of a push-in program to an existing pullout gifted program will improve gifted students' math achievement and help identify more underserved students.

- The addition of a push-in component to pullout programming will create a **connection between traditional pullout services** for gifted students that are the dominant program delivery option **and students' classroom learning environment**, where gifted students typically spend the majority of their time (Reis, Renzulli, & Burns, 2016).

- Gifted and talented services are often perceived as elitist and separate from other school services (Borland, 2005). A combination of pullout and push-in has the potential to **break down this elitist barrier**.
- Gifted specialists collaborating with classroom teachers and working with gifted students in their students' traditional classrooms **exposes classroom teachers to gifted education pedagogy** while **providing gifted students with more appropriate instruction at advanced levels for a longer period of time.** Classroom teachers will better understand the importance of providing gifted students with challenging and intellectually stimulating activities within core academic areas as they first observe gifted specialists providing these services and later as they apply the services themselves.
- The co-teaching that occurs with push-in "**draws on the strength of both the general educator**, who understands the structure, content, and pacing of the general education curriculum, **and special educator**, who can identify unique learning needs of individual students and enhance curriculum and instruction. . ." (Zigmond & Magiera, 2001, p. 2).
- The push-in also **extends the instructional time devoted to special services for gifted students**. Gallagher (2000) cautioned against accepting insufficient time for gifted services, which he described as "*a nontherapeutic educational dosage*, that no one can really defend as good education for gifted students, but many of us tolerate through silence" (p. 10). Increased exposure to advanced content matched to gifted students' advanced learning needs in the classroom can encourage higher achievement and enjoyment of learning for gifted students.
- Classroom teachers will also observe differences in how giftedness manifests itself within

different populations, which should **improve their ability to identify underserved gifted students** (Castellano & Frazier, 2011).

- Push-in **exposes gifted specialists to a wider population of students** while they are in the classroom, which will include high achieving students from underserved populations not already identified as gifted. Our project plan includes push-in services for an additional number of high achieving math students who have not been formally identified as gifted. Card and Giuliano (2015) found that non-gifted "high achievers" benefited academically from gifted services. Gubbins et al. (under review) found that schools identified more underserved students when they strove to establish a "Web of Communication" where all personnel were talent scouts to identify students' talents.
- The gifted specialists' experiences working with classroom teachers in math **may prompt modifications to the services provided in the gifted pullout program**. Specifically, specialists may begin to focus more on advanced content and extensions in core academic areas within the pullout program.

Project Design

We will employ a school randomized design to test the effects of supplementing pullout services with 3 hours of push-in services weekly/per class in math. We will conduct the study in one large urban district serving high percentages of underserved students. Eligible schools will currently be serving gifted students via pullout services but not via push-in services. Schools participating in our study will agree to add a push-in component to their current pullout service delivery model. We will randomly assign half the schools that agree to participate in the study (*J*=15) to implement the pullout/push-in model with co-teachers in 2021-2022 (Year 3). The other half of the schools (*J*=15) will maintain the district's already established pullout model during the 2021-22 school year with 4th and 5th grade students. The Year 3 push-in/pullout model will involve 400 students. In 2022-23 (Year 4), the push-in pull-out model will be implemented with 4th and 5th grade students (n=400) at the 15 schools who were control schools the prior year. The intervention schools from the prior year will be expected to continue to implement the modified and differentiated instruction; however, they will no longer receive co-teaching support. This design allows us to determine the degree to which classroom teachers are able to maintain any positive effects of the intervention after the support year, in the absence of additional personnel/resources. This design allows us to directly compare push-in/pullout with pullout only in 2021-22 and to compare push-in/pullout with the maintenance effect of having experienced push-in/pullout with a gifted specialist in 2022-23.

We will provide three types of professional development to gifted specialists and classroom teachers in the intervention (push-in/pullout) schools. First, we will provide information regarding the structural elements of the push-in model, which includes the co-teaching strategies of rotation teaching, lead/support roles, team teaching, and the grouping strategies of tiered and simultaneous instruction groups. Second, we will provide information regarding content and instructional differentiation for implementing advanced math in general education classrooms, and we will help the school to implement continuous progress monitoring to determine students' need for advanced academic content in math (Subotnik, Olszweski-Kubilius, & Worrell, 2019). In the treatment group, the gifted specialists who conduct each school's pullout program will collaborate with their students' classroom teachers to assess, monitor, and modify math instruction in the classroom setting for identified gifted students, as well as additional students who can benefit from advanced instruction in math. Third, we will provide information about identifying mathematically talented students (Subotnik, Olszewski-Kubilius, & Worrell, 2019) and students from underserved populations (Peters & Rambo-Hernandez, 2019; Peters, Rambo-Hernandez, Makel, Matthews, & Plucker, 2019), and we will work with the schools to recognize students with math potential, with a particular emphasis on helping teachers to recognize math talent in students from traditionally underserved populations. We will support the collaboration between the gifted specialists and the classroom teachers, and we will monitor research activities and assure treatment fidelity. We will also employ six former gifted specialists from the district (each to be shared by two to three schools), to assist with pullout services. The addition of these specialists, who will have familiarity with the district's pullout services and have state certification in gifted education, will "buy time" for the existing gifted specialists to interact with the classroom teachers and to provide push-in math support for gifted 4th and 5th graders during their classroom math instruction time.

We will develop all of our training materials, in conjunction with our advisory board, during the first year (2019-2020) of the project. We will use the second year (2020-2021) to finalize sites, obtain informed consent, develop the continuous progress monitoring system and the researcher developed measures, and to field test and revise training materials. Professional development for treatment teachers will begin in Summer 2021. We will implement the study over the entire third (2021-22) and fourth (2022-23) years. We will complete data analysis and disseminate our results during the fifth and final year (2023-24).

Setting and Sample

We will conduct our project in a setting with large numbers of underserved children. Given that we will mainly be studying children identified as gifted, we will also require a district that has successfully identified a reasonable number of underserved children (free or reduced-price lunch eligible, Black, Hispanic/Latino, Native American, twice-exceptional, and/or English learner) as gifted. To minimize project costs, we will conduct our project in one school district. A large school district is interested in participating in the project (see Appendix). For a school to be eligible to participate in the study, at least 4 children in each grade (4th and 5th) must be identified as gifted at the beginning of the 2020-21 school year. In addition, at least one of the classrooms in each of the grades should have at least four high ability math students.

Students are rarely identified as gifted prior to 3rd grade, and students are most likely to be identified as gifted during 3rd grade (Siegle et al., 2016). Schools with large percentages of traditionally underserved students are also less likely to identify students as gifted. An analysis of a Florida database reveals that schools with over 80% of the population eligible for free or reduced-price lunch typically have between 2 and 6 identified gifted students per grade (with an average of 4 per grade). As a result, we propose to conduct our project in both 4th and 5th grade classrooms to ensure an adequate number of identified gifted children per school. Conducting a study in 4th and 5th grades also ensures that state standardized test scores from 3rd grade will be available to use as a pretest and covariates in statistical models.

Given that research has found that students from traditionally underserved groups (students of color, students of poverty, English learners, students who are twice-exceptional) are much less likely to be identified as gifted, we plan to expand the population of students being studied for this project beyond those who are already identified as gifted. Initially, we intend to utilize state test scores in math to identify students with high ability in math who may not otherwise have been identified as gifted. Hamilton et al. (2018) found students of poverty are less likely to be identified as gifted even if they have the same reading and math achievement as their more affluent peers. We will invite students whose math score on the state assessment is above the median score for identified students in the same school and at the same grade level to participate in the project. This expansion of the eligible population will help ensure an adequate number of participating students per school and help minimize the number of schools that need to be recruited. It will also provide services to students who potentially may eventually be identified as gifted as the result of participating in this research, particularly students from underserved populations. As a result of interactions in the classrooms, we will also include additional underserved students who the classroom teacher and gifted specialist nominate as having shown high potential in math.

Promising Evidence

The model we are introducing includes continuous progress monitoring, professional learning communities, push-in programming and differentiation, and co-teaching (Rytivaara & Kershner, 2012). In this section we define each and provide evidence of each component's promise.

Continuous progress monitoring. Continuous progress monitoring refers to daily, weekly, or periodic monitoring of content, concepts, and skills using varied approaches to assess students' individual and group mastery of curricula (Foegen, Jiban, & Deno, 2007; Massell, 2000). The goal of continuous progress monitoring is awareness of individual and group performance on selected topics. Common approaches may involve checking a student's level of understanding based on end of chapter questions or unit tests. Understanding students' current knowledge and their ability to apply concepts allows educators "to differentiate instruction, group students on the basis of comparable goals, and manage or adapt instruction based on student performance" (Ysseldyke & Bolt, 2007, p. 453). Continuous progress monitoring incorporates collecting data to determine content mastery, providing feedback to students and teachers, identifying achievement gaps, judging the effectiveness of curricular materials and their match to performance assessments, and documenting the need for exposure to increasingly complex content and concepts for small groups or individual students. These benefits can only be realized if data are used in a feedback loop to inform decision-making (Hattie, 2009). In Hattie and Timperley's (2007) earlier review of research they asserted that "feedback is one of the most powerful influences on learning and achievement" (para. 1). Ysseldyke and Bolt (2007) found that "[s]tudents whose teachers use continuous progress monitoring and instructional management systems significantly outperformed those whose teachers solely use the math curricula used in their district" (p. 464).

Continuous progress monitoring is an essential educational practice that promotes teacher and student accountability and provides direction for accelerating learning opportunities for students who demonstrate content understanding and the ability to apply concepts. Lubinski and Benbow (2000) emphasize the importance of "appropriate developmental placement" (p. 138). Instructional differentiation based on readiness, interests, and learning profiles is designed to maximize student success and demonstrate achievement (Tomlinson & Demirsky Allen, 2000). Working with classroom teachers in our push-in model, the gifted specialist will assist in monitoring gifted students' continuous progress and provide suggestions for differentiating content so that gifted students have the opportunity to master more advanced content. *Student performance feedback and continuous improvement are integral to the design of our project.* With our assistance, the gifted specialist-classroom teacher teams will develop a data collection system to monitor student progress and to make ongoing instructional adjustments (e.g., grouping, pacing, re-teaching; Coyne et al., 2013) to ensure students are making continuous progress in math.

Professional learning communities. Professional development as a series of short-term commitments within schools has not resulted in changes in teaching behaviors, instructional pedagogy, and content knowledge because they are not “tailored to individual needs, and there is no application and follow-up” (Butler-Kisber (2015, p. 7). Yoon, Duncan, Wen-Yu Lee, Scarloss, and Shapley (2007) reviewed the evidence on the impact of professional development on student achievement and noted the requirements for high quality professional development: offers sustained, intensive, and content focused opportunities; aligns to state content, achievement, and assessment standards; improves teachers’ content knowledge; advances instructional strategies; and determines teacher effectiveness and student achievement. Van Tassel-Baska and Brown (2007) also noted that schools “should receive professional development sessions on curriculum implementation targeted at curriculum differentiation pedagogical practices, and embedded in a context of how to support teachers in implementing curriculum pitched above state-level curriculum frameworks” (p. 352).

Current professional development trends to emphasize establishing Professional Learning Communities (PLCs) promoting the “practice of inquiry co-constructed by and with teachers that includes an ongoing, iterative, and critical examination of practices” (Schnellert, Kozak, & Moore, 2015, p. 217). PLCs also promote collaborative decision-making about content and practices. Gifted specialists working with classroom teachers in a push-in model form such collaborations. In our proposed intervention, the gifted specialist collaboratively co-teaches with the general education teacher. Additionally, the gifted specialist presents model lessons. We will use a summer workshop experience to begin the process of bonding the collaborative pairs of gifted specialists and classroom teachers into collaborative teams. In addition to summer workshops, we will provide our collaborative pairs with professional development through opportunities throughout the school year.

Differentiation and collaboration through push-in. Differentiation is a proactive strategy, using multiple approaches to content, process, and product based on academically variability (e.g., readiness, interest, and learning needs). Hertberg-Davis (2009) described the underlying philosophy of differentiation beneficial for gifted students: greater depth and complexity, adjusted pace, greater independence, and curricular and instructional modifications based on students' needs. Hertberg-Davis concluded classrooms should be "places where teachers uncover and foster talent in all students by finding pathways into content through students' interests and ways to scaffold learning so that rich, high-level concepts are accessible" (pp. 251-252).

One model that was designed to serve gifted students with the push-in programming model that is based on differentiation is known as the Catalyst Model (Slade, 2009), as it focuses on integrating collaboration and consultation and combining expertise and resources from gifted education and general education programs and personnel. An evaluation of the Catalyst Model in a 2-year pilot with 10 elementary schools in an urban district revealed that the model was an *effective service delivery strategy for providing differentiated education to gifted learners*, had *positive spill-over effects for the entire school*, and led to a *redefined role of the gifted education specialist* (Landrum, 2001, p. 139). With this model, the gifted specialists' roles are redefined as they serve as catalysts to promote advocacy and enhanced service delivery for gifted students.

Purcell and Leppien (1998) viewed collaboration in gifted education as the need for "dialogue and planning between professionals in which the goal is to provide differentiated services for high achieving students" (p. 172). The multi-step consultation process includes preparing and initiating consultation, collecting information, isolating and identifying the problem, generating solutions, formulating a plan, evaluating process and progress, following-up, and repeating the consultation process (Slade, 2009, p. 461). Hughes and Murawski (2001) viewed collaboration as a "style for interaction that includes dialogue, planning, shared and creative decision making, and follow-up between at least two coequal professionals with diverse expertise. . . .” (p. 196). Through regularly scheduled collaborative planning sessions, the gifted specialist and classroom teacher will coordinate their efforts to provide appropriate advanced math content in the classroom.

Co-teaching. Co-teaching is defined as “Two or more professionals delivering substantive instruction to a diverse, or blended, group of students in a single physical space” (Cook & Friend, 1995, p. 1). The rationale for co-teaching includes increasing instructional time and improving program continuity. Kaplan (2012) stated that “co-teaching allows more opportunities for small group and one-to-one learning, and stronger modeling during lessons. The co-planning process that is integrated into co-teaching encourages two teachers to bounce ideas off each other in order to deliver the strongest, most creative lessons” (para. 7). In their study of two primary teachers’ professional learning, Rytivaara and Kershner (2012) determined that co-teaching was a context for learning and “joint knowledge construction,” “a collaborative process with serendipitous origins,” “shared knowledge construction crucial in the learning process,” and “may support teachers in meeting their professional responsibilities” (p. 999). Friend (2008) further promoted the benefits of co-teaching due to common planning time and collaborative planning and delivering of instruction. Co-teaching requires collaboration between teaching specialists who have the best interests of their students as their priorities in construction of learning opportunities (Honigsfeld & Dove, 2010). Hughes and Murawski (2001) stipulated that collaboration for effective co-teaching requires planning, communication, shared decision-making, resources, accountability, and trust. We are building these behaviors into our intervention.

Co-teaching and collaboration may support multiple learning opportunities for gifted students. Renzulli and Reis (2014) discussed the importance of a continuum of services for gifted students; however, the options are, at times, limited. In an earlier book about promoting the goal of “schools for talent development,” Renzulli (1994), described a 3/5ths solution for the gifted specialist in which time is divided between direct services, resource and leadership responsibilities, and the infusion of enrichment know-how and materials.

Co-teaching and collaboration in general education classrooms, while maintaining pullout classes, will increase frequency, duration, and intensity of the options for learning for students. It may also affect teachers’ professional learning given that co-teachers can share knowledge and support each other as they apply new practices (Rytivaara & Kershner, 2012). Therefore, our proposal examines the effect of offering push-in programs that promote the features just described in addition to pullout programs on the math achievement and engagement of gifted and high ability students from historically underrepresented populations, while also examining the impact of these experiences on the practices of classroom teachers and gifted specialists.

Goals, Objectives, and Outcomes

This project builds on a series of randomized control trials in elementary math conducted under the Javits Program by Gavin et al. (2007), Gavin, Casa, Adelson, Carroll, and Sheffield (2009), Gubbins, Bellara, Casa, and Montrosse-Moorhead (2017), and McCoach, Gubbins, Foreman, Rubenstein, and Rambo-Hernandez (2014). The goals, objectives, and outcomes focus on the importance of providing challenging math content for both gifted students and students with high math ability who are not identified as gifted.

Goal 1: To support advanced mathematics instruction in the general education classroom for identified gifted students.

Objective 1a: Recruit 30 schools to assess potential changes in math achievement between treatment and control group students.

Objective 1b: Provide professional development & support services for push-in programming.

Objective 1c: Promote student achievement by providing 3 hours of push-in service related to mathematics instruction in each classroom/each week to identified gifted students.

Objective 1d: Document student mathematics achievement.

Outcome 1: General education teachers and gifted specialists will collaborate on providing appropriately challenging push-in math experiences to students in the general education classroom. The teachers will build a system to monitor and guide student math progress with the assistance of the research team. Students who receive the push-in math services in their classrooms, in addition to their pullout program, will exhibit higher math achievement on their state achievement test than control group students who only received pullout services.

Goal 2. To support advanced mathematics instruction in general education classrooms for students not identified as gifted but show high potential in mathematics.

Objective 2a: Identify students, particularly from underserved populations, who would benefit from advanced math instruction and provide push-in services in their classroom.

Objective 2b: Document student mathematics achievement for students who are not traditionally identified as gifted.

Outcome 2: The partnership formed between the general education teacher and the gifted specialists will enable more students to receive differentiated math services. Therefore, students identified through alternative methods who receive push-in mathematics services in their classrooms will exhibit higher mathematics achievement on their state achievement test than control group students who do not receive push-in services.

Goal 3: To increase gifted students' engagement, motivation, and self-efficacy in math.

Objective 3a: Document pre/post changes in gifted students' engagement, motivation, and self-efficacy in math during focus group interviews with classroom teachers and gifted specialists.

Objective 3b: Document pre/post changes in gifted students' engagement, motivation, and self-efficacy in math with self-rating scales.

Outcome 3: By providing learning experiences based on students' interests and readiness for advanced content, student engagement, motivation, and self-efficacy in math will be higher in classrooms with push-in programming services.

Goal 4: To increase exposure to advanced mathematics content in traditional gifted pull-out programs.

Objective 4a: Document the effects of push-in services on the content or focus of the pullout program during focus group interviews with gifted specialists and students.

Objective 4b: Document the effects of push-in services on the content or focus of the pullout program through onsite observations.

Outcome 4: Gifted pullout programs will include more advanced mathematics content when gifted specialists participate in push-in services that address advanced content in the general education classroom. As a result of the experience, gifted specialists will be more confident in their ability to deliver advanced content and accept the importance of it after observing student mathematical success during push-in.

Goal 5: To increase classroom teachers' practices to address gifted students' academic needs in the general education classroom.

Objective 5a: Expose classroom teachers to gifted pedagogy through professional development and involvement with team-teaching in the classroom with a gifted specialist.

Objective 5b: Evaluate the impact of gifted specialists' involvement with supplemental math services on classroom teachers' perceptions of gifted students/programming through pre/post teacher beliefs' surveys and onsite observations.

Outcome 5: As a result of team-teaching with gifted specialists, general education classroom teachers will recognize the importance of addressing gifted students' learning needs in the general education classroom. General education teachers will embrace the practice when they observe students in their classrooms being mathematically successful.

Goal 6: To implement a developmental identification process to identify gifted students who are not identified by traditional identification practices.

Objective 6a: Determine the success of challenging math lessons for students identified as gifted based on a developmental identification.

Objective 6b: Implement focus group interviews with classroom teachers and gifted specialists to determine the extent to which challenging math lessons promoted the identification of gifted students from underserved groups

Objective 6c: Administer a checklist of gifted mathematics characteristics to assist teachers in the developmental identification process.

Outcome 6: Students identified through a developmental identification process will successfully participate in advanced math activities as measured by math achievement and self-report attitude instruments. Careful documentation of this developmental identification process will enable replication of the process beyond the participants in this study.

Meeting Application Requirements

We are applying evidence-based practices to supplement services for gifted and talented students. We are also building in opportunities to identify talented in at-risk students. What we learn from the alternative identification processes we develop potentially can be adapted and applied with a wider selection of students (Carman et al., 2019). While the push-in model has shown promise with special education students, we believe it has promise with gifted and talented students as well.

Addressing the Secretary's Priorities

This project addresses Priority One and Priority Three and sets a foundation for Priority Two. We are identifying and testing alternative strategies to identify and serve gifted students. We are placing an emphasis on including economically disadvantaged students, individuals who are English learners, and twice-exceptional students (students who are gifted and also have a disability; Priority One). Our work promotes effective instruction in classrooms located in high poverty schools (Priority Three).

We are addressing the STEM area of math. In addition to providing advanced math instruction tied to state standards, the problem-solving emphasis we will implement includes critical thinking skills that are the foundation of logic use for computer science coding (Priority Two). While our project does not directly involve students in coding, the mathematical thinking we will employ will provide a strong computational-thinking base for future coding instruction.

Project Personnel

Our team brings a track record of leadership in gifted education, research experience on multiple research projects, and expertise in identifying giftedness in underserved populations, professional development, program evaluation, research methodologies, and content area instruction.

Senior Personnel

Del Siegle, Ph.D. will serve as PI and project director. He is a Professor in gifted education at the University of Connecticut (UConn) and Associate Dean for Research and Faculty Affairs in the Neag School of Education. He has successful grant management experience as Director and Principal Investigator of the National Center for Research on Gifted Education (NCRGE), where he studied best practices for identifying and serving gifted students from underserved populations. He will provide overall supervision of this project and be responsible for all communications. He will oversee final school site selection and negotiate agreements with the participating schools. He will work with the professional development team on training materials for the study participants. He will work with the site team on issues of scheduling testing and professional development. Dr. Siegle is a well-respected leader in gifted and talented education. He is a past president of the National Association for Gifted Children, past board member of the Council for Exceptional Children–The Association for the Gifted, past chair of the Research on Giftedness, Creativity, and Talent SIG of AERA, 2011 recipient of the NAGC Distinguished Service Award, and 2018 recipient of the NAGC Distinguished Researcher Award. He was a founding co-editor of the *Journal of Advanced Academics* and co-editor of *Gifted Child Quarterly*. Dr. Siegle is coauthor of the 6th and 7th editions of *Education of the Gifted and Talented.* In 2016, he received the Palmarium Award, which is given yearly to the individual most exemplifying the vision of a future in which giftedness will be understood, embraced, and systematically nurtured. He also served as Co-PI for the Javits Act-funded Project EDGE in Montana and PI for the Increasing Academic Achievement Study for the former national research center, NRC/GT.

D. Betsy McCoach, Ph.D. will serve as a co-principal investigator and director of research. She is a Professor in the Research, Measurement, and Evaluation Program at UConn, and is Co-Principal Investigator and Director of Research for the NCRGE. Dr. McCoach has served on numerous federal grant review panels because of her expertise in multilevel modeling, instrument design, factor analysis, and structural equation modeling. Dr. McCoach will lead the project's methodological team, overseeing all issues related to study design, data gathering and data management, measurement, and statistical analyses. She is the Director of the Data Analysis Training Institute of Connecticut (DATIC) and teaches week-long training courses in structural equation modeling (SEM) and hierarchical linear modeling (HLM) every summer. Dr. McCoach is also the founder and Program Chair of the annual Modern Modeling Methods conference. Dr. McCoach has co-authored over 100 peer-reviewed journal articles, book chapters, and books, including *Instrument Design in the Affective Domain* and *Multilevel Modeling of Educational Data*. *S*he was a founding editor of the *Journal of Advanced* Academics and a co-editor of *Gifted Child Quarterly*. Dr. McCoach was the Principal Investigator for Project PAPER, a US Department of Education-sponsored GAANN grant to train doctoral students in the areas of educational measurement and quantitative methodology. She has served as Co-Principal Investigator and research methodologist for several federally-funded projects.

E. Jean Gubbins, Ph.D. will serve as a co-principal investigator. She is a Professor-in-Residence in gifted education at UConn, Associate Director and Co-Principal Investigator of the NCRGE, and Director and Principal Investigator of a Javits Project: Thinking Like Mathematicians: Challenging All Grade 3 Students. Dr. Gubbins has expertise in professional development and extensive experience in curriculum modifications and program evaluation.

Dr. Gubbins will work with Dr. Siegle to prepare reports. She will be involved in creating the professional development, overseeing treatment implementation, and conducting observations and focus group interviews. Through grant funding from the USDE for The National Research Center on the Gifted and Talented (NRC/GT: 1990-2013), Dr. Gubbins implemented research studies focusing on the curricular strategies and practices in science, technology, engineering and math (STEM) high schools, reading and math education in elementary schools, professional development, and gifted education pedagogy for all students. Dr. Gubbins has conducted over 50 program evaluations for school districts around the country. Her research, evaluation, and teaching interests stem from prior experiences as a classroom teacher, gifted specialist, evaluation consultant, and professional developer. She teaches graduate courses in gifted education and talent development related to identification, programming, curriculum development, and program evaluation.

Other Personnel

Daniel Long, Ph.D. will serve as a research scientist. He received his Ph.D. in Sociology of Education from the University of Wisconsin-Madison. Prior to joining the University of Connecticut as a research scientist for the NCRGE, he worked for the Philadelphia Education Research Consortium. Dr. Long has extensive experience in data management and statistical analysis. He will collaborate with Dr. McCoach on data analysis, as well as preparing manuscripts for publication.

Siamak Vahidi, Ph.D. will assist with technology needs that include graphic designing of training material and maintaining the project website.

Lisa Muller will serve as the Executive Program Director. She obtained her Master's Degree in Forensic Psychology in 2003 and has a Bachelor's Degree in Psychology from the University of Connecticut. She has coordinated multiple previous grants through the Renzulli Center and the National Research Center on the Gifted and Talented. Her primary responsibilities will include arranging professional development efforts and providing support for budget management.

Ashley Carpenter, Ph.D. is an assistant professor at the College of William and Mary. She has extensive experience conducting site visits and collecting and analyzing qualitative data for the NCRGE. She is a former gifted specialist in the district where we anticipate conducting the project and has a positive working relationship with district personnel through professional development in the district. As the Professional Developer, Ashley will work with Dr. Gubbins and other members of the team on professional development and conduct site visits to monitor implementation.

Sarah Newton will serve as research assistant. She has experience managing databases and data management systems for funded research projects. She will assist with refinement of measurement instruments and will help develop and oversee the implementation of the data management plan and system.

Susan Dulong Langley will initially serve as a graduate assistant and later as a post doc. She is currently completing her doctoral dissertation in giftedness, creativity, and talent development. She has extensive experience conducting site visits and collecting and analyzing qualitative data for the NCRGE. As the Site Coordinator, she will oversee data collection, conduct site visits to ensure treatment fidelity, and conduct professional development.

Advisory Board

Our previous grant experiences demonstrated the importance of having an advisory board. Therefore, we are proposing a five-member advisory board of policymakers, scholars, and practitioners. The group will meet one time each year and will be consulted on all aspects of this research and progress to date, including professional development for participants, instrumentation, data analysis, performance feedback and continuous progress monitoring, and outreach activities. *This board feedback loop ensures review of, and continuous improvement in, the project operations.* Advisory Board members will include:

- **Dr. Scott J. Peters**, a professor at the University of Wisconsin-Whitewater, has conducted extensive research in *improving identification of underserved populations*.
- **Dr. Michael Coyne**, a professor of special education at the University of Connecticut, has extensive *experience using a push-in model* to supplement reading instruction.
- **Dr. M. Katherine Gavin**, author of the M^2 and M^3 mathematics curriculums, has *expertise in mathematics instruction and content* for gifted students.
- **Dr. Carol Ann Tomlinson**, a professor at the University of Virginia, made *instructional and curricular differentiation strategies* applicable for classroom teachers.
- **Dr. Rena Subotnik**, founder of the Esther Katz Rosen Center for Gifted Education Policy at the American Psychological Association, recently co-edited a volume on *developing human potential* in different domains, including mathematics.

Our Advisory Board combined with our research team will provide an array of expertise in instructional and curriculum modification, professional development, program evaluation, math achievement, research design and data analysis, gifted education programming, push-in programing and collaborative teaching, and educational issues related to underserved populations.

Project Management Plan

Research Questions

1. What is the impact of adding push-in services to the existing pullout program on math

achievement of identified gifted students?

2. What is the impact of push-in services on math achievement for high achieving math students who are not identified as gifted?
3. Does the addition of push-in services affect gifted students' engagement, motivation, or self-efficacy in math?
4. Does the content or focus of the pullout program change as a result of the addition of push-in services?
5. Does the addition of push-in services change/affect perceptions of gifted students/programming among classroom teachers?
6. Does involvement with challenging math content serve as a development identification process for high achieving math students who are not identified as gifted?

Instruments

Academic achievement outcome measure. We will use the state standardized test scores in math in spring 2022 and 2023 as the outcome measure. We will use corresponding scores from spring 2021 and 2022 as a pretest covariate. The state test is vertically scaled and has a relatively high measurement ceiling. In addition, we will work with the 4^{th} and 5^{th} grade teachers in the district to create an assessment to measure mastery of the 4^{th} and 5^{th} math concepts that are taught by the school district, while simultaneously ensuring that the measure has adequate ceiling for evaluating the growth of high achieving and gifted math students. This researcher developed assessment will serve as a supplemental measure of math achievement.

Psychosocial measures. To measure academic self-perceptions, motivation/self-regulation, attitudes toward teachers and classes, attitudes toward school, and goal valuation, we will employ the *School Attitude Assessment Survey-Revised* (McCoach & Siegle, 2003). This 35-item scale has been used in numerous studies, and each of the subscales produces scores with internal consistency reliabilities greater than .80. In addition, we plan to administer the *Mathematics and Me* scale, which assesses the self-perceptions, enjoyment, and perceived usefulness of math. The instrument was designed for grades 3-6, and scores on the three subscales exhibit reliabilities above .90 (Adelson & McCoach, 2011).

We will use the *Educators' Perceptions About the Gifted* (O'Shea, n.d.) to measure classroom teachers' attitudes toward gifted students and their beliefs about appropriate educational services for gifted students. Cronbach alpha reliability estimates for the instrument's three scales range from .70 to .91.

Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS)-Mathematics Scale. The SRBCSS (Renzulli et al., 2004; 2009) measures students' interest in math, strategies used to solve math problems, and level of understanding math concepts. The 10 items are rated on a 6-point Likert scale (*Never* to *Always*). Cronbach alpha reliability ranged from the high .80s to low .90s. Validity was assessed by correlating students' math grades and the teachers' ratings on the math scale, and the resulting correlation was .731.

Fidelity of implementation measures. Fidelity of implementation refers to the degree to which an intervention is implemented as it was originally intended. Fidelity of implementation is generally viewed as multidimensional. Five of the most common elements include adherence, quality, dosage, program differentiation, and participant responsiveness (Dane & Schneider, 1998; Gersten et al., 2005; Gresham et al., 2000; O'Donnell, 2009). *Adherence* refers to the degree to which teachers implement specific components of an intervention. The second dimension, *quality*, refers to the caliber of the instruction. Assessing quality is generally more subjective than assessing adherence, but it is certainly no less important. The third dimension, *dosage*, which involves measuring and documenting how much instruction or intervention was actually provided to participants. The fourth dimension, *program differentiation*, involves documenting the degree to which the intervention is unique and documenting the degree to which the intervention deviates from normal classroom practices or programming. Finally, *student responsiveness* assesses the degree to which the students engage in the intervention content and activities (O'Donnell, 2009).

To measure adherence, we will create a checklist that includes critical components of the intervention and documents the presence or absence of these components. The teachers will be asked to self-evaluate their adherence on a weekly basis, using a simple checklist. In addition, we will send researchers to observe each of the treatment classrooms at least four times over the school year, and they will monitor adherence using the same checklist. To document dosage, all classroom teachers and gifted specialists will complete a brief implementation log, documenting the amount of time devoted to push-in each week.

Documenting quality is more difficult, given the subjective nature of determining quality. In addition to the adherence checklist, the research team will create an observational protocol that assesses the degree of interaction between the classroom teacher and the gifted specialist, the quality of instruction delivered to the gifted students, the level of content delivered to the students, and the types of grouping used in the math classroom. The researchers will conduct observations in the comparison schools, using an adapted version of the quality protocol that eliminates any items relating to the interactions between G/T specialists and the general education classroom teachers. This protocol will be used to assess both quality and differentiation. Classroom observations will occur at least four times per year in the push-in math classes, and at least two times per year in the pullout classes and the comparison math classrooms. Our objective for observing the pullout classes is (a) to determine if working collaboratively with classroom teacher during push-in changes the nature of what is happening in pullout and/or (b) to determine if PD related to advanced content in math changes focus of pullout to make it less focused on “tangential” content and more focused on math (particularly advanced content in math).

Finally, to assess student responsiveness, we will create a very short scale that we will administer to all students at least 8 times during the academic year. The scale will ask several simple questions about the degree of math challenge and the degree to which the students believe that they are learning new math content. We anticipate that the scale will include no more than 8 closed-ended response items, and it will take the students only 1-2 minutes to complete. Again, the scale will be administered in both the treatment and the control classrooms, so that we can compare the students’ perceptions of math challenge across conditions.

Timeline and Project Personnel Involved

The leadership team will ensure project goals, objectives, and outcomes are accomplished with the highest level of quality and in a timely manner (see Table 1 with the following codes: 1=PI, 2=Co-PI Project Implementation and Professional Development, 3=Co-PI Research, 4=Graduate Assistant, 5=Gifted Specialists, 6=Former Gifted Specialists, 7= Site Coordinator, 8=Professional Developer, 9=Classroom Teachers, 10=Research Assistant, 11=Research Scientist. Milestone Quarters: Q1=Fall, Q2=Winter, Q3=Spring, Q4=Summer).

Table 1: *Management Plan by Year, Personnel, Milestones, & Quarters*

Year	***Project Objectives & Key Personnel’s Main Responsibilities**	**√ Milestones**
1	Conduct literature searches for instruments to be created (2, 4, 7, 8)	√ Q1-Q4
1, 2	Design and conduct needs assessment (1, 2, 3, 4, 7, 8, 10)	√ Q3

Year	*Project Objectives & Key Personnel's Main Responsibilities	√ Milestones
1	Develop training materials (1, 2, 4, 7, 8)	√ Q1-Q4
1	Develop Fidelity of Math Implementation Checklist (2, 3, 4, 7, 8)	√ Q1-Q4)
1	Develop Push-in Dosage Documentation Log (1, 2, 3, 4, 7, 8)	√ Q1-Q4)
1	Develop Math Observation Protocols (2, 4, 7, 8)	√ Q1-Q4)
1-5	Hold Annual Advisory Board Meetings (1, 2, 3, 11)	√ Q3
2	Develop Mathematics Assessment (2, 3, 4, 7, 8)	√ Q1-Q4)
2	Develop Student Math Challenge Scale (2, 3, 4, 7, 8)	√ Q1-Q4)
2	Field test and revise training materials (1, 2, 3, 4, 7, 8)	√ Q1-Q4
2	Obtain informed consent (1, 7)	√ Q3-Q4
2	Create professional development toolkit (1, 2, 4, 7, 8)	√ Q1-Q4
2	Recruit former gifted specialists (1, 2, 4, 7, 8)	√ Q2, Q3, Q4
2	Work with administrators, gifted specialists on schedules (2, 4, 7, 8)	√ Q4
2-4	Obtain test data on 3rd and 4th grade students (3, 10, 11)	√ Q4
2	Identify eligible schools and conduct randomization (1, 3, 10, 11)	√ Q4
2, 3	Provide one-day training (treatment teachers) (2, 7, 8)	√ Q4
2, 3	Hold 4-day training (gifted specialists) (2, 4, 7, 8)	√ Q4
3, 4	Hold a one-day workshop (g/t specialists and classroom teachers) (2, 4, 7, 8)	√ Q1
3, 4	Administer gifted mathematics scale (9)	√ Q3-Q4
3	Provide training to control group teachers (2, 7, 8)	√ Q4
3, 4	Develop and administer performance feedback and continuous improvement data collection system (2, 5, 7, 9)	√ Q1-Q4

Year	*Project Objectives & Key Personnel's Main Responsibilities	√ Milestones
3, 4	Implement ongoing support and progress checks (7, 8)	√ Q1-Q4
3, 4	Conduct sessions in pullout program (6)	√ Q1-Q4
3, 4	Complete Fidelity of Implementation log (9)	√ Q1-Q4
3, 4	Administer School Attitude Assessment (7)	√ Q1, Q4
3, 4	Administer Mathematics and Me (7)	√ Q1, Q4
3, 4	Administer Educators' Perceptions About the Gifted (7)	√ Q1, Q4
3, 4	Complete Fidelity of Math Implementation Checklist (5) weekly	√ Q1-Q4
3, 4	Complete Push-in Dosage Documentation Log (5, 9) weekly	√ Q1-Q4
3, 4	Administer Students' Perceptions of Math Challenge (5, 7)	√ Q1-4 (x2)
3, 4	Develop and conduct Focus Groups & Observations (2, 4, 7)	√ Q3-4
3, 4	Complete Scales for Rating Behavioral Characteristics-Math (9)	√ Q3-Q4
4	Analyze quantitative data (3, 10, 11) and qualitative data (2, 4, 7)	√ Q1-Q4
4	Prepare draft articles and summaries (1, 2, 3, 4, 7, 8, 10, 11)	√ Q1-Q4
4	Present draft project results at conferences (1, 2, 3, 4, 7, 8, 10, 11)	√ Q1-Q4
4	Revise math lessons (2, 4, 7, 8)	√ Q1-Q4
5	Finalize articles, summaries, & brochures (1, 2, 3, 4, 7, 8, 10, 11)	√ Q1-Q4
5	Create professional development module for control group teachers and persons interested in replicating the project (2, 4, 7, 8)	√ Q1-Q4
5	Disseminate professional development module (1, 4)	√ Q1-Q4

Project Services

Intervention

We outline general guidelines for the intervention that are based on the literature in (a) gifted education on effective models of curriculum and instructional modifications in the general education classroom based on Common Core and/or state curriculum standards; (b) a model of collaboration in gifted education that has been shown to be effective, and (c) the models and practices from special education documented as critical. We will refine the intervention for the push-in component based on needs assessment data collected from our implementation site. We will conduct a needs assessment, collecting data from gifted specialists and classroom teachers at the site in the first and second year of the study. Previous work we have conducted confirmed that gifted specialists and classroom teachers have widely varying background knowledge about the ways to appropriately modify/differentiate curriculum and instructional practice. Just as we do not advocate for providing repetitive instruction to students, we believe variation in preliminary knowledge and skill indicates professional development for teachers and or administrators should not be one-size-fits all. Once we have identified those areas gifted specialists and classroom teachers know, understand, and are able to apply, we will customize professional development.

Generally speaking, the goal of the training provided through the intervention will equip gifted specialists to position themselves as essential collaborative partners with classroom teachers. Using the research literature from both gifted and special education, we have determined the training should be composed of two separate but equally important components. First, we will provide information regarding the implementation of the structural elements of the push-in model, which includes co-teaching strategies such as rotation teaching, lead/support roles, and team teaching as well as grouping strategies such as tiered and/or simultaneous instruction groups (Hughes & Murawski, 2001; Landrum, 2001). Second, we will provide information regarding content differentiation and instructional strategies for implementing gifted education programming in general education classrooms informed by a combination of research, theory, and observed practices. The final protocol will depend on the needs assessment results from the site. Each potential aspect of professional development is elaborated on briefly.

Structural components of push-in model. The first focus of the structural professional development will concentrate on building and supporting the relationship between the gifted specialist and the general classroom teacher. Prior research indicates that the relationship between the specialist and the classroom teacher is essential (Cook & Friend, 1995; Hughes & Murawski, 2001; Landrum, 2001; Latz, Neumeister, Adams, & Pierce, 2008).

The second focus of the structural professional development will be on introducing multiple push-in co-teaching and grouping strategies. Examples of the kinds of grouping options available include simultaneous grouping (where the class is divided into two large groups and each educator works with one of the groups) and simultaneous instruction (where one educator works with most of the class while the other works with a small group of students). Other co-teaching strategies with large groups include rotation teaching (where educators trade off responsibility for whole-class instruction), lead/support (where one educator leads the class while the other provides individual support as needed), and true team teaching (where both educators fully collaborate and teach each class). The goal of the professional development is to increase understanding of multiple grouping strategies and how they can be used with content/instructional components of the push-in model to best serve all students.

Content/instructional components of push-in model. Several curricular and instructional models implemented within general education classrooms have been documented as effective in increasing achievement of gifted students in math and other content areas, including those from underrepresented populations (e.g., Callahan, Moon, Oh, Azano, & Hailey, 2015; Feng, VanTassel-Baska, Quek, Bai, & O'Neil, 2005; Gavin, Casa, Adelson, Carroll, & Sheffield, 2009; Little, Feng, VanTassel-Baska, Rogers, & Avery, 2007; McCoach, Gubbins, Foreman, & Rubenstein, 2014; Pierce et al., 2011). These models include the implementation and/or synthesis of several curricular or instructional frameworks long hypothesized to be effective for gifted students (e.g., Differentiated Instruction (Tomlinson, 1999), Schoolwide Enrichment Model (Renzulli & Reis, 1985, 2014), Depth and Complexity (Kaplan, 2005), the Integrated Curriculum Model (VanTassel-Baska, 2003) and Concept-based curriculum (Erickson, 2002)). The essence of the successfully implemented models has been some combination of these key elements: (a) intentional, well planned, ongoing assessment, (b) well-defined, high quality, relevant learning goals, (c) flexible instruction based on student data (about readiness, interest, and learning profile), (d) real-world content that is authentically delivered and assessed, and (e) content that includes depth, breadth, complexity, and opportunities for abstraction (Azano, 2013; Hockett, 2009). Therefore, the professional development will be tailored based on assessed need and practical implications of each of these elements. The content/instructional components of the push-in model training will include guidance throughout both curriculum planning and implementation.

Within the structure of the curriculum baseline standards, such as those from the Common Core or Florida standards, scholars in the field of gifted education advocate for extension, enrichment, and acceleration of content beyond these minimums, especially for advanced learners (e.g., Azano, 2013; Renzulli, 1998; Tomlinson et al., 2002). The research indicates there are many ways to ensure those standards are taught within a broader context of knowledge, and the models identified above provide examples that can be used to present teachers with examples of how standards can be extended for gifted students. Integrated models based on expansion of state standards have also demonstrated success in math (e.g., McCoach et al., 2014; Pierce et al., 2011). Teachers will be guided through extensive examples to ensure standards are covered appropriately while expanding standards through additional depth, complexity, and rigor.

The training provided by project staff will include sharing examples of successful standards-based gifted curricula and documenting new lessons developed by the project team that reflect new examples of district standards. Essentially, one element of the professional development results in compiling a toolkit to use for push-in intervention.

Data Analysis Procedures

Our main analysis will estimate the average impact of the push-in/pullout intervention relative to business as usual. The outcome variables used for this main impact analysis will be state math test scores. The basic statistical modeling approach will be to fit two level hierarchical linear models with students nested within schools. Due to the small number of students per classroom and the small number of classrooms per school, we do not plan to account for classroom membership. Given that we are randomizing at the school level, ignoring the classroom level of the three-level model does not introduce bias into either the estimate of the average treatment effect nor its standard errors (Moerbeek, 2004). Level-1 (student) covariates include grade, third grade math achievement (school mean centered), gifted status, free or reduced-price lunch status, and race/ethnicity. Leve1-2 (school) covariates include condition (treatment or control), and school average math pretest.

Moderators

We identified two focal moderators of interest: the underserved status of the student and the identification status of the student. We will targeted high poverty schools (in which the percentage of free or reduced-price lunch students in the school exceeds 80%) as sites because we are interested in testing the effect of the math intervention on traditionally underserved gifted students. However, some students in the schools may be more “traditional” gifted students. Therefore, we will conduct a series of moderator analyses, where we compare the outcomes for traditionally served gifted students with underserved students. Underserved students must meet one or more of the following criteria: free or reduced-price lunch eligible, Black, Hispanic/Latino, Native American, and/or English learner. The moderator analyses will determine whether the treatment effect differs for traditional versus underserved students. In addition, we plan to include students whose math achievement scores exceed the median math achievement for gifted students in their schools as part of the treatment. We will examine whether the treatment effect differs for identified and non-identified students. To test whether student status moderates the effect of treatment on math achievement and other outcomes, we will build a cross-level interaction between treatment (at level-2) and student status (at level 1).

Mediators

To examine the possible mediating effects of the intervention fidelity measures, we plan to fit a multilevel mediational model in which treatment fidelity mediates the effect of treatment on math achievement as measured by state math scores. The particular modeling approach employed will depend on the nature of the fidelity measure. Some fidelity measures will pertain to activities that should occur on the part of the gifted specialist. Because there is typically only one gifted specialist per school, in this case both the fidelity variable and treatment are measured at level 2 of a multi-level model but outcomes are measure at level one. This sort of mediation model is referred to as an “upper-level mediation model” (Krull & MacKinnon, 2001).

Other fidelity measures will pertain to activities that should occur on the part of the classroom teacher or will relate to the experiences of the participating students. Due to the number of classrooms per school and number of students per classroom in our project, we will not include the classroom level in the multi-level model. As such, measures that pertain to the classroom teacher will be treated as attributes of the impacted students. Thus, both measures of the classroom teacher and measures of the student can be thought of as occurring at Level-1 of the model. In this case, the appropriate model would be a cross-level mediation model, or a 2,1,1 model in the terminology of Krull and Mackinnon (2001). As argued in Preacher et al. (2011) both 2,2,1 and 2,1,1 models are best fit using multi-level structural equation modeling software. Accordingly, we will plan to fit all mediational models using ML-SEM in the M-Plus software.

Power Analysis

To compute the number of schools required to achieve power of 0.80, we need to specify the following parameters: the percentage of variance in the outcome variable attributable to variance in school means (the school level ICC), the percentage of variance at the school level explained by relevant covariates and blocking variables (the level 2 R^2 value), the percentage of variance at the student level explained by relevant covariates, the expected number of participating students per school, the anticipated attrition rates at the student and school levels, and the expected effect size for the study. We assume a student attrition rate for our study of 10%. We believe that we will be successful in retaining recruited schools in our study, nonetheless, we compute the required school level sample size assuming a school-level attrition rate of 5%.

Schools are likely to have approximately 2-6 identified gifted students in each of 4^{th} and 5^{th} grade. Using the midpoint of this range we assume there will be 4 participating gifted students per school and per grade. So, we compute power assuming 16 participating students per school.

Rogers (2007) research synthesis of over 20 different types of interventions for gifted children estimated effect sizes estimates of 0.32 or higher for all but three of the intervention types. The average effect size of enrichment programs provided to gifted children was 0.96 in Kim's (2016) meta-analysis. Schochet (2008) notes that effect sizes between 0.20 and 0.33 are typically used in educational evaluations. Given the large effect sizes estimated in the extant literature, we conducted our power analysis using an effect size of 0.33. We compute power using a two-level cluster randomized design in the PowerUp tool (Dong & Maynard, 2013). Using the parameters described above, we need at least 30 participating schools to obtain sufficient statistical power (Power>.80)

Equal Access

Because we randomly assign half of the schools to treatment in Year 3 and provide the treatment to the control students from grade 4 (Year 3) when they are in grade 5 (Year 4), all students identified as gifted and talented in grade 5 and half of the identified students in grade 4 will have access to our push-in services. Additionally, we will provide push-in access to students not identified as gifted, but who show mathematical promise. We will place an emphasis on identifying students from underrepresented populations. In this way, we are able to provide equal access and treatment for eligible project participants who are members of groups who have been traditionally underrepresented in gifted programs. We will further create access for other educators by making our professional development material, learning modules, and identification material available at the end of project through our website.

Talented math students, particularly those from underserved populations, deserve classroom experiences that ensure continuous progress and promote excellence in math achievement. Using the pedagogy of advanced instructional practices in general education classrooms, our collaborative push-in model will more effectively meet the needs of mathematically advanced elementary students in the general education classroom and help them reach their full potential.