

Scaling Up Pyramid Model Implementation in Preschool and Kindergarten Classrooms

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A. Significance

This mid-phase application specifically addresses two absolute priorities: a) supporting high needs students; and b) supporting students' social-behavioral competencies. Because it focuses on preschool (Pre-K) and kindergarten (K), it also addresses the absolute priority related to early learning and developmental outcomes. This project will occur within Pre-K and K classrooms in Metropolitan Nashville Public Schools (MNPS) and neighboring rural district(s) that serve high needs students. In Tennessee, state Pre-K programs were designed to provide priority enrollment to children living in poverty, followed by children at risk of poor educational outcomes due to disability, foster care, or exposure to abuse and neglect. In MNPS, 72.4% of students in elementary schools are eligible for free- or reduced-price lunch. Our intent is to expand and scale up the Pyramid Model (PM), an evidence based intervention for promoting social emotional competence and addressing challenging behavior in young children (Hemmeter et al., 2016), for use in K and in rural schools. In these "new" environments, coaching on the PM will, for the first time, be implemented by district personnel to facilitate scale-up of the model. The section that follows addresses (a) the magnitude of the problem; (b) national significance; and (c) extent to which this project represents an exceptional and innovative approach to solving the problem.

Severity of the Problem

Decades of research have shown that when social skill deficits and problem behavior are left untreated or ignored, the negative consequences for the student, classrooms, and schools are large (Strain, 2017). The evidence is remarkably strong – if students' social-emotional needs are not met, if they continue to cycle through negative interactions and often are rewarded unintentionally, they tend to disengage from learning and ultimately drop out, but not before disrupting the learning of others and taxing the teacher and the educational systems. For the past

40 years, researchers in epidemiology, psychology, psychiatry, education, and criminal justice have all reached the same conclusion: untreated or poorly treated social and emotional skill deficits get worse over time while the costs of later intervention rise dramatically, and at the same time, the probability of successful behavioral improvement plummets (Strain, 2017).

What are the school-age negative consequences for these children?

1. Rejection and isolation from peers, teachers, and care providers (Dodge et al., 1990; Boivin et al., 1995)
2. Engagement in fewer teaching opportunities of any kind (Strain & Timm, 2001)
3. Poor academic outcomes (McDougal et al., 2001; Buhs et al., 2014)
4. High incidence of further suspension and expulsion (Gilliam, 2006)
5. School dropout (Coie et al., 1992; 1995)
6. High incidence of gang membership, drug use, and contact with the juvenile justice system (Loeber et al., 1998; Moffitt, 2011)

The adult consequences for students who have these difficulties in school are sobering and include the following: loneliness and few stable relationships (Parker & Asher, 1987); high incidence of diagnosed mental disorders (Shinn & Walker, 2010); high incidence of early accidental death (Strain & Timm, 2001); chronic unemployment and underemployment (Strain & Timm, 2001); and a high incidence of incarceration and recidivism (Loeber et al., 2005).

Considering these outcomes, it should surprise no one that when economists have calculated the cost benefit ratio of timely, evidence-based social-emotional interventions, we see these efforts save 7 dollars for every dollar spent (Snyder et al., 1974; Blonigen et al., 2008). Negative consequences do not stop with child outcomes however. They impact caregivers and adult family members as well. For families, we see a high incidence of coercive, punitive and inconsistent

parenting (Ladd, 1988); isolation of adults from friends, other family members and community supports (Dumas & Wahler, 1986); and a high incidence of reported stress (Lee et al., 2006).

For educators who are ill-prepared to address child social-emotional challenges we see the following: a) high staff turnover (Bullough & Holl-Kenyon, 2012); b) high levels of job dissatisfaction (Blackburn, 2016); c) downward spiraling levels of self-confidence (Eberhart-Wright, 2002); and d) increasing incidence of adult mental disorders (Hamre & Pianta, 2004). Although the picture is bleak when left unaddressed or ignored, there is a huge opportunity to impact students in the short- and long-term. There is no group of children for whom actually providing timely, evidence-based intervention is more effective in altering the trajectory of their success in school and in life (Dodge & Haskins, 2015).

National Significance

The prevalence and impact of social emotional challenges and associated challenging behaviors for young children in early care and education settings is a growing concern for families, teachers, administrators, policy makers, and researchers (Benedict, Horner, & Squires, 2007; Squires & Bricker, 2007). Approximately 10 to 15% of young children demonstrate problem behavior in the classroom and getting along with others, and up to 30% of children with risk factors (e.g., from low-income households) demonstrate challenging behaviors associated with social emotional delays (Campbell, 1995; Egger & Angold, 2006; Kuperschmidt, Bryant, & Willoughby, 2000; Qi & Kaiser, 2003). Further, data exist that indicate that social emotional needs may occur at increased rates for young children living in rural areas. For example, the incidence of children with disabilities and percentage of children living in poverty may be higher in rural communities (Helge, 1992; Huang & Van Horn, 1995; Miller, 1993; Weiss & Correa, 1996). Consider as well that one in three children in the United States attend a rural school

(Rosenkoetter, Irwin, & Saceda, 2004; The Rural School and Community Trust, 2003).

Rosenkoetter, Irwin & Saceda (2004) note that many rural schools are in crisis due to the lack of educators who are prepared to meet the needs of young children.

Pre-K teachers (urban and rural) report being underprepared to address social emotional needs despite the fact that dealing with these issues are the teachers' greatest concern in their classrooms (Alkon, Ramler, & MacLennan, 2003; Bennedict et al., 2007; Joseph & Strain, 2003). In the Survey of Early Care and Education (2012), only 20% of teachers report receiving training on promoting children's social and emotional competence. This lack of preparedness is one reason that the expulsion and suspension rates of young children in early childhood settings has reached a level that is three times the estimated rate for all students in K through twelfth grade (U.S. Departments of Health and Human Services and Education, 2014).

Given the current rate of suspensions and expulsions for young children, the U.S. Departments of Health and Human Services and Education have issued a policy statement (2014) for preventing and limiting expulsion and suspension in early childhood settings. The statement lists the PM as an example of a Positive Behavior Intervention and Supports (PBIS) framework specific to young children for reducing the suspension and expulsion of young children.

Project Approach

This project will use the Pyramid Model intervention (Hemmeter et al., 2016) to promote the social and emotional competence of children in Pre-K and K classrooms. The Pyramid Model is a tiered framework that organizes empirically supported classroom practices for promoting social emotional competence and addressing challenging behavior of preschool children. The efficacy of the Pyramid Model has been evaluated and changes in classroom practices and children's

social and behavioral outcomes were observed in two randomized studies (Hemmeter et al., 2013; Hemmeter et al., 2016; see evidence form in Appendix B).

There are 7 elements of the PM that speak to the likelihood of success in this scale-up effort as well as in future, expanded efforts. To accommodate a range of teacher preferences and needs, the PM training materials (1) are available in print and web-based; (2) are available in English and Spanish; and (3) include video examples of practitioners implementing the PM across diverse populations of students and teachers in early education settings. To accommodate the use of the different curricula in early education settings, the PM has been developed to support the implementation of high quality curricula (4), and the model has been used with fidelity in classrooms using various curricula (e.g., High Scope, Creative Curriculum, Tools of the Mind).

To ensure that we are studying the PM as it is intended to be used, (5) we will use the PM fidelity tool, Teaching Pyramid Observation Tool (TPOT) (Hemmeter, Fox, & Snyder, 2014). The TPOT has undergone rigorous psychometric study and has excellent short-term test-retest reliability and internal consistency. Also, classroom teacher improvements measured by the TPOT are related to improvement in children's social emotional outcomes (Snyder et al., 2013).

To ensure that practitioners reach fidelity of implementation, (6) the PM developers have carefully studied the use of practice-based coaching that is the heart of professional development efforts in the PM (Artman & Hemmeter, 2013; Fox et al., 2011; Hemmeter et al., 2016; Hemmeter et al., 2013). Practice-based coaching allows for the coach and coachee to develop individualized plans and strategies while always keeping a focus on fidelity of implementation. Finally, to ensure that individual coaches and practitioners are provided with the support and guidance they need, the PM includes a manualized approach (7) that guides programs to make data-based decisions, scale-up and sustain the PM (Fox et al., 2016).

B. Strategy to Scale

Unmet Demand for Social Emotional Intervention

The need for ensuring that young children have the social emotional and school readiness skills to be successful in elementary school is demonstrated by the large numbers of students who experience exclusionary discipline actions. In MNPS, reducing the number of out-of-school suspensions and expulsions has been a priority for multiple years. However, in 2016 we had 82 students in K, 110 students in first grade, and 197 students in second grade receive out of school suspensions. These data suggest that earlier intervention could provide an alternative path for many children who need additional support in this area. MNPS has made addressing challenging behavior a priority. In MNPS, we have also been tracking self-regulation skills in Pre-K children and found more and more children are scoring lower than expected for their age on these skills (e.g., from 19% of our preschoolers in 2014 to 41% in 2016).

MNPS and partner districts are committed to providing high quality early learning programs that equip children with essential school readiness skills. This includes implementing evidence-based practices that prepare children in social emotional skills. MNPS has made a commitment to address these needs in our strategic plan for early learning programs 2016-2018, including objectives focused on increasing family engagement, offering intensive and focused professional development related to social emotional learning, providing classroom coaching, fully integrating Pre-K into the K-12 system, and establishing a MNPS Office of Social Emotional Learning (SEL). The Director of the SEL Office is the project director for this project (Krengel). We are seeking to develop and strengthen the implementation of social, emotional, and behavioral intervention practices in our Pre-K and K classrooms so that students have the social, emotional, and behavioral skills needed to be successful in elementary grades and beyond.

Addressing Past Barriers that Prevented Reaching Proposed Level of Scale

While PM training has been provided to some MNPS staff over the last decade, no systematic effort has been made for large scale implementation across Pre-K classrooms. In addition, the provision of coaching as an essential component of the professional development to ensure that teachers reach fidelity of implementation of the PM has not occurred. Moreover, there has been no training or implementation with K teachers. The lack of understanding about the developmental continuum from Pre-K to K was an issue identified in the 2015-2016 MNPS strategic plan as a barrier to supporting children as they move from Pre-K into K.

Project Implementation Goals and Objectives. In this project, we will provide a systematic professional development intervention that will include classroom coaching by school district personnel to establish the Pyramid Model intervention in Pre-K and K classrooms and ensure scale-up and sustainability. This project has six major goals with related objectives and activities. The goals, objectives, timelines and expected outcomes are described in Table 1 on p. 13 and clearly specified activities that are aligned to objectives are in Appendix G. Goals 1 and 2 focus on enhancing and refining the PM implementation and coaching materials for application in Pre-K and K classrooms. Goal 3 focuses on providing professional development to Pre-K and K teachers in preparation for conducting the independent evaluation of the PM in Nashville and a neighboring district(s). Goal 4 is the independent evaluation described in Section D. Goal 5 focuses on sustainability, and Goal 6 focuses on the project Management Plan (Section C).

Goal 1: Refine a comprehensive set of coach training and implementation materials.

MNPS will be supported by Drs. Hemmeter and Fox to refine previously developed PD materials and approaches for use in this project. Hemmeter and Fox have been engaged in work around a professional development model for supporting the implementation of the PM in Pre-K

classrooms for the last 10 years (Hemmeter et al., 2013; Hemmeter et al., 2016). With funding from the Institute for Education Sciences, they developed and evaluated a professional development intervention that included high quality workshops, implementation guides and materials, and a coaching model referred to as “Practice Based Coaching” (Snyder, Hemmeter, & Fox, 2015). This professional development intervention will form the foundation of the materials that will be used in the proposed evaluation and in building the capacity of MNPS and a neighboring district(s) to support implementation beyond the funding of this project. As part of the earlier projects, Drs. Hemmeter and Fox developed coach training and implementation materials but primarily employed coaches who worked with them on previous projects. For the current project, they will train a cadre of district coaches to support the implementation of the PM. Using existing materials and lessons learned from earlier projects, they will develop the following materials for this project: 1) a manualized training for classroom coaches; 2) a process for supporting coaches as they support teachers; 3) materials for documenting coaching efforts; and 4) a handbook for classroom coaches that includes action plan materials, guidance for implementing coaching cycle components, and strategies for managing coaching caseload.

Goal 2: Refine the Pyramid Model for implementation in K classrooms. While previous work on the PM has focused on programs serving infants, toddlers and preschoolers, a common request for the developers has been to train K teachers in the intervention as the developmentally appropriate nature of the PM seems to have direct application for K. Further, we believe that the use of the PM by K teachers would result in better alignment between Pre-K and K and thus would be more supportive of the transition for young children, especially those with behavior challenges and social emotional needs. Given this, a primary goal of this project is the development of PM implementation and training materials for use with K teachers. This will

involve two primary objectives and associated activities. The first objective will be to refine the PM practices to fit the academic and classroom structure of K classrooms. Vanderbilt and USF will begin this process by conducting two focus groups, one with K teachers and one with administrators who provide support to K teachers around social emotional learning and behavior. During these focus groups, they will obtain input onto the process and design of the K materials. They will reconvene these groups after the materials are refined to seek further input and verification about their appropriateness for K classrooms. The PM uses an inventory of practices (see Appendix G) that makes explicit the practices teachers should implement related to the PM. We propose a refinement of that tool for use across Pre-K and K classrooms. Further, Vanderbilt and USF will determine how the Teaching Pyramid Observation Tool (TPOT) will need to be revised to align with the Pre-K to K model. In addition to the Inventory of Practices, the PM includes a set of implementation guides that provide teachers with strategies, examples, and materials related to implementing the PM. We propose to also refine these guides for use by K teachers. A second objective related to the K refinement will be the revision of the professional development materials described in goal 1 to ensure that the materials for training and supporting classroom coaches reflect the use of the model in K classrooms. To further support this alignment, some of the district coaches will coach across Pre-K and K classrooms.

Goal 3: Provide training to classroom teachers, behavior specialists, and support coaching for implementation fidelity. As described in Section D, there will be an independent evaluation of the efficacy of the PM in Pre-K and K classrooms in MNPS and a neighboring district(s) conducted by SRI. In the year preceding each year of the independent evaluation, the teachers whose classrooms will serve as the sites for the evaluation in the subsequent year will be

trained and coached to implement the PM practices. To ensure teachers are implementing the PM with fidelity, the following activities will be implemented:

Using the process and materials described in Goal 1, we will provide training, support and materials to coaches who will work with classroom teachers to ensure they are implementing the PM practices with fidelity. Coaches will be hired by MNPS and surrounding districts or will be current employees. We will conduct the following activities to train the coaches: a) provide a three-day training including 1.5 days on the coaching model and 1.5 days on using the Teaching Pyramid Observation Tool; and b) review videotapes of the coaches working with teachers, score them for fidelity to the protocol and provide feedback to the coaches. Audiotapes of coaching sessions will be randomly selected and scored for fidelity of coaching throughout the study.

Using the materials described in Goals 1 and 2, teachers will receive two days of training conducted by project staff in collaboration with district coaches. Following training, coaches will observe and meet with teachers on a weekly basis until teachers achieve an acceptable level of fidelity. These activities will occur during the year preceding the evaluation. At the beginning of the school year in which the evaluation is occurring, the teachers will receive a booster training to ensure they continue to use the practices during the study year. In previous coaching work, PM developers found that teachers maintained their use of the practices in the year following coaching (Hemmeter et al., 2013). To ensure this occurs during the study year, coaches will visit the teachers on a monthly basis, assess fidelity and provide needed feedback.

Using a model developed by Drs. Strain and Joseph and colleagues, we will train and support behavior support specialists (BSS) to support teachers around children who need individualized behavior support plans. Prevent-Teach-Reinforce for Young Children (PTR-YC: Dunlap, Wilson, Strain, & Lee, 2013) is a manualized, evidence-based approach for addressing severe

challenging behaviors that are not responsive to the implementation of PM prevention and promotion practices. In the year prior to the study, Drs. Strain and Joseph will train district BSSs to develop and implement behavior support plans. During the study year, they will serve as consultants to the BSSs and will monitor fidelity with which they do behavior support planning.

Goal 4: Implement the Independent Evaluation. This goal is described in Section D.

Goal 5: Develop a sustainability system across Pre-K and K. In the design of the project, we have identified sustainability and scaling strategies to ensure that we will have the tools and competencies to sustain implementation of the PM. To scale the project across schools within MNPS and across district(s) in the region, the PM team will develop materials to establish buy-in for implementation at all levels. This will include materials to gain buy-in of teachers prior to training, buy-in of schools for supporting teacher implementation, and buy-in of leadership within the districts to ensure sustainability and expansion. Districts will be provided with a guide to ongoing professional development (PD) for continued scale-up, a funding strategies guide for supporting PD, and a data decision-making guide. We will also establish implementation stakeholder groups (across schools and across districts) to deepen buy-in, examine effectiveness data, and develop sustainability and scaling strategies. The cross-district implementation stakeholder group will build the foundation of a regional infrastructure for continued scale-up beyond this funding. Coaches will provide intensive support to teachers until they reach fidelity and then provide less frequent coaching in the following year to ensure sustainability. Coaches will be provided with sustainability supports to guide their work and scale-up to new classrooms.

All materials and processes that are developed through this project will be made available at no cost through the website of the Pyramid Model Consortium (pyramidmodel.org). The mission of the Pyramid Model Consortium is to promote the high fidelity use of the *Pyramid Model for*

Supporting Social Emotional Competence in Infants and Young Children through dissemination and systems change activities. Drs. Hemmeter, Fox, and Strain are leaders of the PMC.

Goal 6: Project Management Plan. This goal is described in Section C.

Feasibility of Successful Replication

This project will result in an evidence-based framework that can be used within Pre-K and K classrooms to promote social emotional competence. This framework allows for adapted implementation of the core evidence-based practices so that they might be tailored to the classroom, school, or district context. The project will be implemented in multiple districts thus informing scale up efforts in different settings on an ongoing basis. In addition, districts will have the data tools, professional development training and materials, and coaching strategies to continue replication and scale-up. Another important feature of the PM that will enhance successful replication is that it is highly aligned with multi-tiered systems of supports, school-wide positive behavior support, and school climate efforts. This alignment will enhance the likelihood of replication within school districts that are implementing related K-12 frameworks.

C. Quality of Project Design and Management Plan

Goals, Objectives, and Outcomes

The PM is an evidence-based approach to supporting young children's social emotional development and addressing challenging behavior. The purpose of the proposed project is to refine, evaluate, and build sustainability to improve social and academic outcomes for young children. A logic model that guides our work is included in Figure 1 (p.19). The goals, objectives, timelines and expected outcomes are listed below in Table 1 (p. 13) and described above. Activities associated with each goal and objective are described in detail in Appendix G.

Table 1. Goal and objectives, timeline, persons responsible, outcomes

Goals/ Objective	Responsible	Outcomes	Timing	2017	2018	2019	2020	2021
1. Refine a comprehensive set of coach training and implementation materials								
1. Refine coach training materials	VU, USF	Manualized coach training	Oct-Dec	X				
2. Refine coach implementation materials	VU, USF	Coach handbook/materials	Oct-Dec	X				
2. Refine the Pyramid Model for implementation in K classrooms								
1. Refine practice implementation materials for K classrooms	VU	Implementation Guides and Inventory of Practices for K	Jan-June	X				
2. Refine training and coaching materials for K classroom practitioners	VU	Manualized training materials	Jan-June	X				
3. Provide training and support to classroom teachers, behavior specialists, and support								
1. Train & support district classroom coaches	TN, VU, MNPS, PS 2/3	Trained Classroom Coaches in MNPS and PS2/3	Ongoing	X	X	X	X	
2. Support classroom teachers to implement the PM with fidelity	MNPS, PS 2/3	Trained Classroom Teachers in MNPS and PS2/3	Ongoing	X	X	X	X	
3. Train & support behavior support specialist (BSSs)	CO	Trained Classroom BSPs in MNPS and PS2/3	Ongoing	X	X	X	X	
4. Establish & monitor implementation fidelity	CO, MNPS, PS 2/3	High fidelity Implementation of Pyramid in Pre-K and K	Ongoing	X	X	X	X	
4. Evaluate the impact of implementation of the Pyramid model in Pre-K and K classrooms on children’s social, behavioral, and early learning outcomes in MNPS and Additional District(s)								
1. Conduct Randomized Control Trial (RCT) of Pre-K implementation	SRI	Pre-K Child outcomes associated with PM	Aug – May	X	X	X		
2. Conduct RCT of K implementation	SRI	K Child outcomes associated with PM	Aug – May		X	X	X	
3. Implement data management plan (Appendix G) for making research data accessible to others	SRI	Publicly available data	Jan-Oct					X
4. Measure the cost-effectiveness of Pre-K	SRI	Ratio of costs to child	Ongoing	X	X	X	X	X

implementation		outcomes in Pre-K determined						
5. Measure the cost-effectiveness of K implementation	SRI	Ratio of costs to child outcomes in K determined	Ongoing					
6. Publish final evaluation results of PM implementation	All	Publications for researchers & policy makers	Jan-Oct					X
5. Develop a sustainability system for PM Implementation across Pre-K and K								
1. Develop materials that can be used to establish buy-in for implementation from districts, schools, & teachers	USF, CO	Buy-in materials for teachers and schools	Oct – June	X	X			
2. Develop sustainability materials & tools for districts and schools	USF, CO	Sustainability materials for schools & districts	Oct-June	X	X			
3. Implement sustainability supports with participating districts & schools	VU, USF	Sustained implementation of district & school supports	Ongoing	X	X	X	X	X
4. Develop & implement sustainability supports for coaches, BSSs, and teachers	VU, USF	Sustained implementation of PM practices	Ongoing	X	X	X	X	X
6. Program management								
1. Manage the project using a management-by-objectives system	MNPS, VU, PS 2/3	Activities completed in timely fashion & on-budget	Ongoing	X	X	X	X	X
2. Monitor implementation of the project activities, timely implementation, & achievement of milestones	MNPS, VU, PS 2/3	Activities completed in timely fashion & on-budget	Ongoing	X	X	X	X	X
3. Implement procedures for ensuring feedback & continuous improvement in project operation	MNPS, VU, PS 2/3	Modified goals & activities based upon input from different consumer groups	Ongoing	X	X	X	X	X
4. Budget and match	MNPS	Activities completed as proposed in budget	Ongoing	X	X	X	X	X

MNPS – Metro Nashville Public School; PS2/3 - Additional School District(s) to be named; VU – Vanderbilt University; USF – University of South Florida; CO – University of Colorado Denver; PM – Pyramid Model Practices

Management Plan

Manage the project using a management-by-objectives system. As described above, we have developed a set of goals, objectives, outcomes and associated activities for the proposed project (see Table 1 and Appendix G). Based on this information and in collaboration with our Federal Project Officer, we will develop and review monthly a detailed management plan that includes key milestones, performance metrics, and annual targets as required by the cooperative agreement. We will employ a management-by-objectives system to systematically track the implementation of the objectives, activities, and outcomes. This system will be crucial for regularly and systematically communicating expectations, problems or barriers, as well as ensuring accountability in conducting activities and producing deliverables. We will work with our Federal Project Officer on a yearly basis to update progress and outcomes.

The project will be implemented by a team of highly qualified personnel who have extensive experience with similar projects. The management team will include: Kyla Kregel (Director, Social Emotional Learning, MNPS); Mary Louise Hemmeter (Vanderbilt University); Lise Fox (University of South Florida); Phil Strain (CU-Denver); and Erika Gaylor and Abby Schachner (SRI). Vita for each of these individuals are included in Appendix C. Ms. Kregel will be the project director and will coordinate all project activities. Dr. Hemmeter, in collaboration with Dr. Fox, will lead all activities related to refining the model and associated materials and the professional development activities associated with ensuring fidelity of implementation. Dr. Strain will coordinate all work related to the behavior support specialists. Together, Drs. Strain, Fox, and Hemmeter have collaborated for nearly 2 decades on the PM. This work includes multiple RCTs, the development of the Teaching Pyramid Observation Tool (TPOT) for measuring fidelity, and the development of training and coaching materials and processes.

Finally, Drs. Gaylor and Schachner will co-lead the independent evaluation. They have extensive experience conducting quantitative and qualitative research including designing and conducting RCTs in Pre-K and K settings to inform scaling of policies, programs, and practices to improve classroom quality and children's academic and non-academic outcomes. The full management team will meet at least monthly (and more frequently as needed).

Ms. Krengel, Dr. Hemmeter, their staff, and a member of the partnering districts (when identified) will meet **weekly** to monitor progress of project activities, review data on project outcomes, and resolve issues or problems that arise. In addition, Ms. Krengel and Dr. Hemmeter will be in regular contact with the Federal Project Officer. Dr. Hemmeter has successfully led several large federally funded research, training and demonstration projects and will work with Ms. Krengel to guide the planning and implementation of the proposed project. Ms. Krengel and the MNPS Federal Grant Manager will work collaboratively with the partnering districts and subcontractors to ensure all goals and objectives are met. Further, the MNPS Federal Grants Department, Department of Research and Evaluation, and Department of Social Emotional Learning will collectively monitor the budget throughout the project.

Procedures for Ensuring Feedback and Continuous Improvement

A number of procedures will be implemented to ensure ongoing feedback and continuous improvement in the project's operations. First, as described above, we will employ a management-by-objectives system to systematically track the implementation of objectives, activities, and outcomes. This system will be crucial for regularly and systematically communicating expectations, problems or barriers, and unforeseen opportunities, as well as ensuring accountability in conducting activities and producing deliverables. Second, we have included in our key personnel a data specialist who will provide ongoing feedback on project

activities based on relevant data. Third, we will collect ongoing fidelity data on the teachers, coaches and behavior support personnel to ensure that practices are being implemented with fidelity and to provide feedback when practices fall below acceptable fidelity levels. Fourth, our external evaluators will provide interim data that will be used to guide our efforts in subsequent years. Finally, MNPS has an early childhood advisory group that will be called upon to provide input and recommendations on a regular basis. There are also mechanisms that will add significantly to the feedback and improvement processes: 1) initial and ongoing meetings in Washington DC with the project officer; 2) refinement of materials in the first year with review and input from Pre-K and K teachers and administrators; 3) review of our materials by PM Consortium Members; 4) systematic review of evaluation data; and 5) annual reports to the funder, and frequent exchanges of information and status reports.

Ensuring the Integration of Project Activities, Materials and Processes into the Ongoing Work of the Participating Districts

This project includes procedures and supports that are carefully **designed to ensure that the activities are integrated into the ongoing work** of MNPS and our scale-up district(s). These sustainability features are described in detail in **section B** of the proposal.

D. Independent Project Evaluation

Evaluation Methods that Meet WWC Evidence Standards Without Reservations

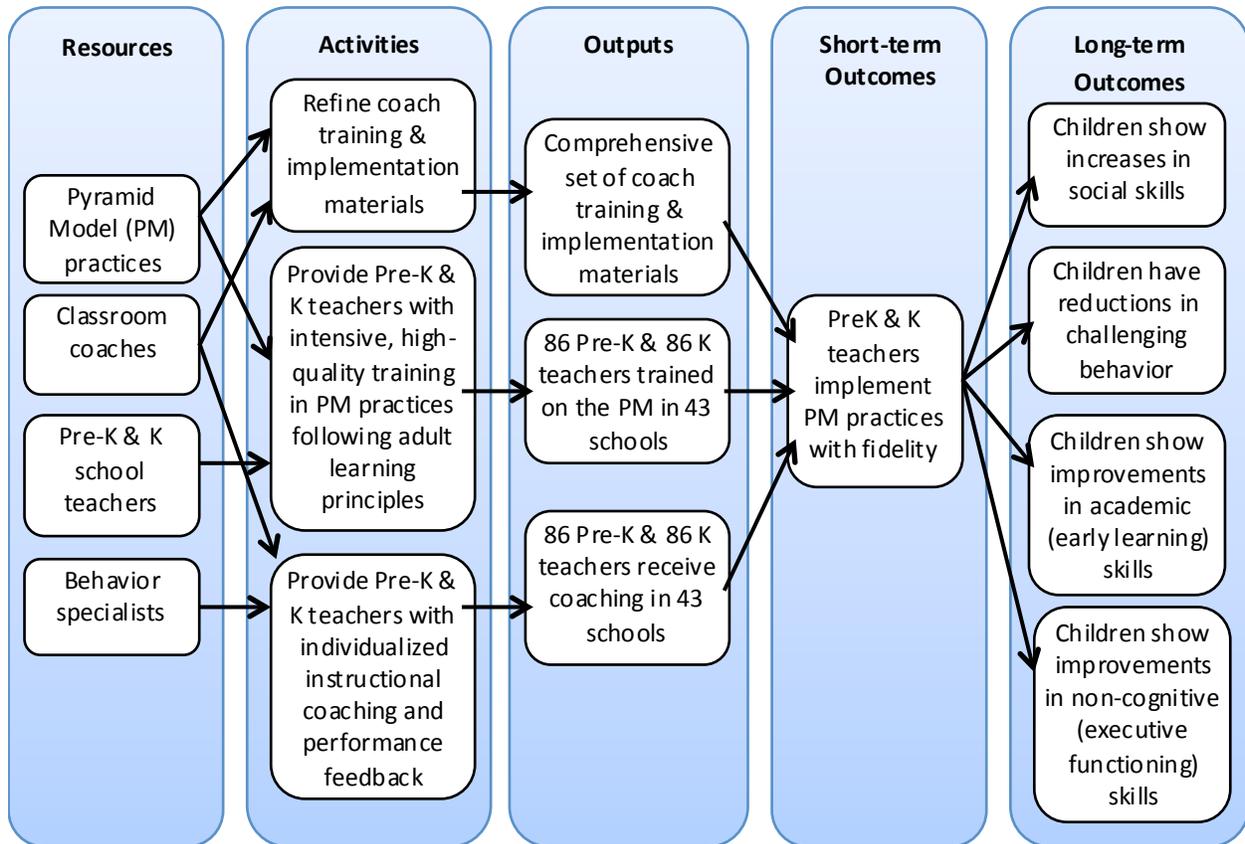
SRI International will conduct an independent evaluation of the PM intervention aimed at preventing and reducing challenging behaviors in Pre-K and K students and increasing other non-academic skills that promote learning and school success. The evaluation for the mid-phase grant will employ two cluster randomized controlled trials (RCTs) to test the impacts of the PM on student outcomes (one for Pre-K students and one for K students). The evaluation will include

approximately 800 Pre-K children and 800 K children in 86 schools (172 Pre-K classrooms and 172 K classrooms) in MNPS and a neighboring rural district(s). We have included letters of interest from rural districts surrounding MNPS (Appendix D). During Year 1, we will invite districts to apply to be involved in the project. Depending on the size of the district, we will select 1-2 districts. Funds have been allocated for supporting the work in these districts.

Data collection includes measures of family demographic characteristics, student outcomes, and implementation fidelity. We propose a cost effectiveness analysis that will involve collecting and comparing estimates of program costs to student outcomes. Findings on outcomes and implementation, and feedback on progress toward intended outcomes will be shared through annual reports and regular project briefings. Figure 1 shows the evaluation logic model.

Evaluation questions. SRI will address two confirmatory major impact research questions: (1) Do students in the treatment schools show greater social skills compared with students in the control schools? (2) Do students in the treatment schools show fewer challenging behaviors compared with students in the control classrooms? SRI will also address four exploratory research questions: (3) Do students in the treatment schools show greater academic (i.e., early learning or school readiness) skills compared with students in the control schools? (4) Do students in the treatment schools show greater non-cognitive skills (i.e., executive function skills) compared with students in the control classrooms? (5) Do outcomes vary as a function of implementation fidelity? (6) Do outcomes vary as a function of child, family, and classroom characteristics? That is, under what conditions and for whom, are the effects strongest? We show the samples and proposed measures in Tables 2 and 3.

Figure 1. Logic Model for Evaluation



Design. SRI will employ an RCT design to examine impacts of the PM in both Pre-K and K in MNPS and additional rural districts. Schools with Pre-K programs will be stratified by district then randomized into either treatment or control conditions. Using this stratified random assignment process will help ensure the resulting treatment and control groups are similar in terms of school characteristics captured by the strata, thereby maximizing the power of the school-level study (Imai, King, Nall, 2009). K school randomization will be based upon Pre-K randomization such that schools randomized to treatment for Pre-K implementation

will also be randomized for treatment for K implementation and schools randomized for control in Pre-K implementation, will also be randomized for control for K implementation.

Samples and recruitment plan. Two to three school districts in Tennessee will participate in the study: Metro Nashville Public Schools (MNPS) ($n = 70$ schools), and one to two neighboring rural districts ($n = 16$ schools total) (see letters of interest in Appendix D). Table 2 shows the numbers of schools, classrooms, and children per site and as a whole. MNPS will identify the scale-up district(s) in year 1 of the project and across the districts, we plan to assign 43 schools to the PM treatment group and 43 schools to the control, business-as-usual group. Implementation will be staggered across two years for both Pre-K and K classrooms in each district. During the first year, teachers will receive training and coaching to reach fidelity on the Pyramid Model. During the second year, the RCT will occur in those classrooms. This will be staggered across pre-k and k classrooms within districts and across districts and will occur over four years. For example, MNPS pre-k teachers will receive training in the PM in Year 1 of the project, and the RCT will occur in those classrooms in Year 2 of the project. MNPS K teachers will receive training in Year 2 of the project and the RCT will occur in those classrooms in Year 3. The same process will be used in the additional district(s) but it will begin in Year 2 of the project.

Beginning in the year of the RCT for a given district and school, consent forms will be sent home with all entering 4-year olds in the study schools and classrooms to obtain parent permission to participate in the study. We will sample 5 children per classroom across two classrooms per school yielding a final projected sample of 860 treatment and 860 control group children. If we receive more than 5 4-year old children consenting for each classroom, we will randomly select 5 children to serve as the sample for that classroom.

Human subjects. SRI maintains strict procedures to protect clients' rights, welfare, privacy, and confidentiality. SRI staff members are required to register every project with our internal Institutional Review Board (IRB), which has the primary responsibility for the oversight of the protection of human subjects. The final evaluation design will be reviewed by SRI's IRB and the evaluation team also will prepare and submit any additional IRB packets to the participating school districts as needed (see Human Subjects narrative for more details).

Table 2. Projected Sample Sizes, by School District and Overall

	Pre-K				K			
	MNPS	District 2	District 3	Total	MNPS	District 2	District 3	Total
	# Treatment/# Control				# Treatment/# Control			
Schools	35/35	5/5	3/3	43/43 (86)	35/35	5/5	3/3	43/43 (86)
Classrooms	70/70	10/10	6/6	86/86 (172)	70/70	10/10	6/6	86/86 (172)
Children	350/350	50/50	30/30	430/430 (860)	350/350	50/50	30/30	430/430 (860)

Child Outcome Measures and Data Collection Plan and Timeline.

To assess social skills and challenging behavior, we plan to collect the teacher-report measure, the Social Skills Improvement System (SSIS; Gresham & Elliott, 2008), of children's social skills and problem behaviors. To explore the impact of the PM on non-academic outcomes, we plan to conduct direct observations of children using the peg-tapping measure of inhibitory control (self-regulation; Diamond & Taylor, 1996), item-selection measure of attention shifting (Jacques & Zelazo, 2001), and the Social Problem Solving Test Revised (social problem solving; Rubin, 1988). Finally, to explore the impact either direct or indirect on academic outcomes, we will collect the teacher-report Academic Rating Scale developed for use in the Early Childhood Longitudinal Studies (ECLS). All measures will be collected at both pretest and posttest during the year of implementation.

Teacher report measures will be collected via a secure online survey that the team regularly uses for research studies. Direct observations will be collected by a team of trained local data collectors who will attend trainings and be required to pass strict certification and reliability before completing study assessments. The evaluation team will hire, train, and oversee the direct assessment data collection with a group of local experienced field assessors who will be blind to the status of the schools' and children's group assignment.

Proposed measures. All of the measures selected have well established reliability and validity for Pre-K and K children, are sensitive to change, can be used for diverse populations of students, and can be available or administered in Spanish.

The SSIS (Gresham & Elliott, 2008) is used for teachers to report about the social skills and problem behaviors of children. The normative sample for the SSIS was a representative national sample of 950 children between the ages of 3 and 18, including over 200 preschoolers. On the SSIS, Pre-K children are assessed on two key domains: social skills and problem behaviors.

The Academic Rating Scale (Rock & Pollack, 2002) is a teacher-report assessment battery developed for the Early Childhood Longitudinal Study (ECLS) to obtain teachers' evaluations of children's academic achievement in three domains: language and literacy, general knowledge (i.e., social science and science), and mathematical thinking. Unlike other more limited cognitive assessment batteries, the Academic Rating Scale includes items designed to measure both the process and products of children's learning in school. It also has been correlated with measures of social competence in early childhood (Walker & Henderson, 2012).

The peg tapping measure of inhibitory control is used as a direct assessment of self-regulation skills in Pre-K and K children (Diamond & Taylor, 1996). The task requires children to inhibit a natural tendency to mimic the action of the experimenter while remembering the rule

for the correct response. The internal consistency score reliability (Cronbach’s alpha) ranges from .75 to .82. The peg tapping measure of inhibitory control has been correlated with and predictive of early academic skills in Pre-K and K (Blair & Razza, 2007).

The item-selection measure of attention shifting task (Jacques & Zelazo, 2001) requires children to identify two of the three objects that are similar along one dimension (i.e., shape) but then to shift cognitive set and identify two of the three objects that are similar along a second dimension (i.e., size). The internal consistency score reliability (Cronbach’s alpha) ranges from .73 to .77. The item-selection measure of attention shifting has been correlated with early academic skills in Pre-K and K (emerging math and literacy; Blair & Razza, 2007).

The Social Problem Solving Test revised (SPST; Rubin, 1983; 1988) is a widely used assessment of children’s social problem solving skills for children as young as 3 years of age. The internal consistency score reliability (Cronbach’s alpha) for a national sample was .67 (NICHD ECCYD) and it is predictive of higher academic skills (Walker & Henderson, 2012).

Table 3. Proposed Child Assessment Measures and Timeline

Measure	Pre-K (Y1-Y3)		K (Y2-Y4)	
	F	S	F	S
Teacher Report				
SSIS	✓	✓	✓	✓
Academic Rating Scale	✓	✓	✓	✓
Direct Assessment				
Peg-tapping	✓	✓	✓	✓
Item-Selection	✓	✓	✓	✓
SPST	✓	✓	✓	✓
SSIS – Social Skills Improvement System (Gresham & Elliott, 2008). Peg-Tapping – Peg tapping measure of inhibitory control (Diamond & Taylor, 1996). Item-Selection - Measure of attention shifting (Jacques & Zelazo, 2001). SPST – Social Problem Solving Test revised (social problem solving; Rubin, 1983, 1988).				

Data analysis plan. Given the clustered nature of the data, the magnitude of Pyramid treatment effects on student outcomes will be estimated using a Hierarchical Linear Modeling

(HLM) strategy. HLM adjusts standard errors to account for the dependence among students within classrooms within schools, thereby avoiding the overestimation of statistical significance of the effect size (Hedeker & Gibbons, 2006; Raudenbush & Bryk, 2002). Main treatment effects for preschool and kindergarten will be estimated at the school level by comparing group means on post-test outcomes collected at the end of preschool and kindergarten respectively. Additionally, pre-test measures (collected at the beginning of their respective grade levels) will serve as covariates in preschool and kindergarten outcomes models to reduce effort variance, thereby further increasing statistical power to detect treatment effects. In addition to these main treatment effects, SRI will also examine moderators of treatment (i.e., whether treatment effectiveness is related to certain student, classroom, and/or school characteristics). Details of main treatment effect and moderator analyses are provided below.

Attrition. Though attrition at the school level is expected to be small and similar across conditions, before conducting the impact analyses, SRI will monitor both overall and differential attrition rates throughout the course of the study. If the achieved overall and differential attrition rates do not meet WWC standards, SRI will address missing data with non-response weights for missing outcome data (Hawkes & Plewis, 2006), and by incorporating indicators for schools missing covariate data into impact models.

Examining Group Equivalence. Before conducting the impact analyses, SRI will also test for baseline equivalence based on the Intent-To-Treat (ITT) assignments (i.e., group membership determined by initial assignment, regardless of later adherence to assignment protocols). SRI will pool student baseline data across schools to determine whether treatment and control students differ on baseline covariates and/or demographics – SRI will utilize the

WWC criteria for establishing group equivalence (i.e., standardized mean differences < .25).

WWC standards requires that characteristic be included as a covariate in the statistical analysis of intervention effects when the magnitude of their corresponding standardized mean differences is less than .25 but exceeds .05. For the purpose of explaining student-level error variance and increasing statistical power however, SRI will use all student-level baseline scores and demographics in the impact models as covariates.

Impact analyses: Intent-to-treat analysis (ITT) of Pyramid effects on child outcomes.

Little to no cross-over or contamination across conditions is expected because the level of assignment is the school. However, in the case that contamination does occur, ITT analyses will be conducted. ITT is the average effect of the treatment based on the initial treatment assignment regardless adherence to assignment protocols. Thus, the ITT impact estimate is the expected effect of Pyramid when implemented in the real world, with less than perfect implementation. Three-level HLM models will be constructed to estimate ITT treatment effects. Level-1, the student level, will be specified by:

$$Y_{ics}^{posttest} = \beta_{0cs} + \beta_{1cs}Pyramid + \beta_{2cs}COV_{ics} + r_{ics} ,$$

where i represents students, c represents classrooms, and s represents schools; $Y_{ics}^{posttest}$ is the post-test outcome scores for student i in classroom c in school s ; β_{0cs} is the mean for control students in classroom c in school s ; Pyramid = 1 for students assigned to the treatment and 0 for control students (regardless of adherence to assigned condition) so that β_{1cs} is the estimated mean difference between treatment and control students in classroom c in school s , COV_{ics} is a matrix of student-level covariates (including baseline scores and student demographics) and β_{2cs} is the corresponding vector of fixed effects in classroom c in school s ; and r_{ics} is the student-level residual error variance. Level-2, the classroom level, will be specified by:

$$\beta_{0cs} = \gamma_{00s} + \gamma_{01s}(\mathbf{Classroom_COV}_{cs}) + u_{0s}$$

where γ_{00s} is the adjusted grand mean of β_0 across classrooms in school s , $\mathbf{Classroom_COV}_{cs}$ is a matrix of classroom-level covariates and γ_{01s} a vector of fixed effects in school s , and u_{0s} is the classroom-level random effect for β_0 . β_{1cs} and β_{2cs} will unmolded fixed effects at the classroom level. Level-3, the school level, will be specified by:

$$\gamma_{00s} = \pi_{000} + \pi_{01}(\mathbf{School_COVs}) + e_{0os}$$

where π_{000} is the adjusted grand mean of γ_{00} across schools, $\mathbf{School_COVs}$ is a matrix of school-level covariates and π_{01} is a vector of corresponding fixed effects, and e_{0os} is the school-level random effect for γ_{00s} .

Covariates to be included in this study will be derived from the extensive literature on predictors and correlates of children's social skills and behavior (Eisenberg, et al., 1993; Domitrovich, Cortes, & Greenberg, 2007; Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Raver, 2004; Roberts & DelVecchio, 2000; Rose-Krasnor, 1997; Thompson, 2006). Specifically, we will include the following student-level covariates in the three-level ITT HLM because previous studies have shown that these background characteristics are related to social skills and behavior: gender, age at pretest, low-income status, ethnicity, home language/dual language learner (DLL) status, special education placement in Pre-K and K, and child pretest scores.

Subgroup and moderation analysis. Moderation analysis will provide information on whether the Pyramid has a differential effect for certain subgroups of students. In addition to DLL students, we will test reasonably sized subgroups defined by other student characteristics (such as gender, age/grade levels, ethnicity) and school characteristics (such as district, school poverty, and urbanicity) to determine whether such subgroups each benefit from Pyramid. To conduct moderation analyses, HLM regressions will be modified by adding the moderators as

covariates and as grand-mean centered interactions with the treatment indicators. The coefficients of the interaction term will be tested using Wald's test to for moderation effects.

Adjustment for multiple outcomes. When necessary, SRI will adjust the estimated treatment effect p-values to account for the examination of multiple outcome measures from the same domain. The Benjamini and Hochberg (BH; 1995) approach, as extended to dependent measures (Benjamini & Yekutieli, 2001), will be applied within separate domains using the approach presented in Thissen, Steinberg, and Kuang (2002).

Power analysis. SRI conducted a power analysis showing the number of schools needed to be sampled to obtain 80% power for detecting significant expected effects within an HLM context using the methodology in Schochet (2008). The analysis assumed a three-level design (students within classrooms within schools) with randomization occurring at the school level; an minimum detectable effect size of .200; 2 classrooms per school on average; 5 student on average per classroom; a classroom-level intra-class correlation of 0.10; a school-level intra-class correlation of 0.10 (based on the average, unconditional ICC between schools in national survey datasets for behavioral outcomes being 0.10, Hedges & Hedberg, 2007); student- and classroom-level covariates will explain 50 of the random variance at their respective levels; and school-level covariates will explain 65% of the random variance at the school level. With these assumptions, along with a 2-sided $\alpha=0.05$, SRI estimates that the 85 schools would need to be sampled in order to obtain 80% power.

Assuming overall school-level attrition is 5% from the original school level sample of 86, differential attrition is 0, and given the same assumptions, MDES rise only slightly to .206. Thus the current design plan's power is robust to expected attrition as well.

Implementation evaluation. To monitor the quality of implementation of the PM, SRI and the developers (Drs. Hemmeter and Fox) will work collaboratively to measure fidelity at both the classroom and school using the Teaching Pyramid Observation Tool (TPOT, Hemmeter et al., 2008). The TPOT will provide information on the extent to which the PM was implemented as intended and to provide feedback to teachers on their implementation of the PM practices consistent with recommendations related to ensuring treatment fidelity in efficacy trials (O'Donnell, 2008). It will also be used to examine how implementation of specific model components lead to changes in outcomes. SRI will work closely with the Drs. Hemmeter and Fox to collect implementation data and monitor fidelity. Implementation data and analyses of the relationship between fidelity of components to child outcomes also will contribute to our understanding of how to scale, replicate, and sustain the intervention beyond the grant period.

Implementation fidelity will be measured using the TPOT (Hemmeter et al., 2014). The TPOT is a tool for measuring adherence and quality of implementation of practices related to each component of the PM. The TPOT includes observable practices that are aligned with the core components of the PM intervention. During the IES Goal 2 study, the PM developers examined the psychometric integrity of the TPOT and demonstrated that it was sensitive to changes in teachers' practices related to the Teaching Pyramid (Hemmeter et al., 2016; Snyder, Crowe, Miller, Hemmeter, & Fox, 2011). A Generalizability theory study was conducted (G-study; Shavelson & Webb, 1991) in 50 Pre-K classrooms not involved in the PM intervention. Results of the G-study showed minimal error variance (i.e., 5%) attributed to occasions and raters and the Generalizability coefficient was .97.

We also will ask teachers to complete a questionnaire (*Teaching and Additional Experiences Questionnaire*) that addresses their use of practices related to children's social competence and

and challenging behavior. While the TPOT will provide information on the practices the teachers are implementing related to the Teaching Pyramid, this questionnaire will provide information about other practices teachers might be implementing related to supporting children's social competence and addressing challenging behavior. This questionnaire was developed and revised during the PM Intervention IES Goal 2 and 3 studies.

Because the control group will be business-as-usual, in which teachers will continue to implement social skills instruction, curriculum practices, and behavior support strategies they are currently using, it will be necessary to describe what is happening in their classrooms. SRI will work with the developers to gather TPOT data and the *Teaching and Additional Experiences Questionnaire* in both the intervention and control classrooms. This will provide a description of what is or is not occurring in the control classrooms relative to the PM practices as well as describing what other practices teachers might be implementing related to social skills or behavior support. Because some of the practices associated with the PM reflect general developmentally appropriate practices, the teachers in the control classrooms are likely to be implementing some practices associated with the intervention but at a minimal level. Repeated TPOT observations will provide data to distinguish levels at which practices are being implemented in control versus intervention classrooms. In the Goal 2 study, implementation of TPOT practices in the control condition remained relatively stable across the Pre-K year (Hemmeter et al., 2016). Data from the *Teaching and Additional Experiences Questionnaire* will be used to determine the extent to which other practices related to social skills and behavioral competence are being implemented in both groups of schools during the study.

Finally, variation in implementation by program, social context, and participant characteristics will be explored. This includes differences by urbanicity (i.e., large urban versus

others), school poverty, and child characteristics such as language minority status. Descriptive profiles of the association between variation in implementation by district, and school and child outcomes will be tested.

Cost effectiveness analysis (CEA). The proposed RCT of the PM intervention creates the opportunity to also determine the program's cost effectiveness. Through analysis that compares the cost of the program to the achieved student outcomes (social, behavior, academic and non-cognitive skills, etc.) on a per unit basis, this evaluation can provide policy-makers with useful information upon which to make decisions regarding the allocation of resources, which in turn will affect program sustainability. SRI proposes to work with a subcontractor to conduct a cost effectiveness study to evaluate the benefit of the proposed interventions against the costs associated with the investment in these interventions. We have extensive experience with CEA methods and working with several national experts on CEA studies in early childhood. For both the treatment and control groups, SRI will collect cost information using the ingredients method (Levin & McEwan, 2001). Researchers will identify each program input through a review of program documents. In addition, project staff will leverage other proposed data collections to understand and document site-based variations in implementation and cost. Based on these data, a master list of program components, or ingredients, will be defined from which to determine costs. Using data collected from school districts, publicly available data, and resources such as the "Cost Out" tool developed by Columbia's Teachers College, analysts will determine the value of resources required for implementation. Our analysis will employ cost-effectiveness ratios to compare the cost of program inputs to student level outcomes that can be achieved for those costs. In order to inform policy decisions, the CE ratio for the PM will be compared to the CE ratio for business as usual, or the control group.

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