

Supporting Preschool and Kindergarten Students’ Self-Regulation Through HighScope
Curriculum Enhancements: Plan-Do-Review and Conflict Resolution

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A. Significance

Magnitude and Severity of the Problem

The primary goal of the proposed project is to improve the self-regulation skills of preschool and kindergarten students in Detroit, a city where almost 60% of children live in poverty, the second highest out of 51 large US cities (Kids Count Center, 2014). Combined with a violent crime rate that is four times that of New York City and 2.5 times higher than Chicago (U.S. Census, 2015), children in Detroit not only face daily stress due to food scarcity and economic insecurity, but also dangerous environments.

Severe and chronic stress in their first five years appears to have particularly toxic effects on children's brain development, seen in reduced cognitive functioning and ability to regulate behavior and attention (Blair & Raver, 2012; Noble et al., 2012; Shonkoff, et al., 2012). Lower levels of self-regulation skills may in turn lead to fewer opportunities to learn in the classroom (Raver, Garner, & Smith-Donald, 2007), contributing to gaps in achievement between children in poverty and their more affluent peers (Alexander, Entwisle, & Kabbani, 2001; Duncan & Magnuson, 2005). In fact, a preliminary study by the PI and Co-PI of the proposed project demonstrated that preschoolers in Detroit indeed display self-regulation abilities well below average (Scharphorn & Wakabayashi, 2015, 2016).

Conducted in partnership with the Detroit Public Schools (DPS), the proposed project will, therefore, enhance two key elements of the HighScope curriculum, Plan-Do-Review (PDR) and Conflict Resolution (CR), to improve students' self-regulation. The HighScope curriculum is best known for its landmark HighScope Perry Preschool Study (Schweinhart et al., 2005), which showed significant lifetime effects on participants' increased social responsibility and reduced involvement in crime. It is speculated that the PDR sequence and emphasis on CR were the "key ingredients" improving Perry children's abilities to plan, problem-solve, and reflect on

consequences, thus regulating their behaviors, which led to later reductions in crime (Heckman, Pinto, & Savelyev, 2013; Schweinhart et al., 2005). The enhanced PDR and CR proposed in this project, infused with new research on self-regulation, will, therefore, offer a promising way to support the development of students' self-regulation skills in the high crime city of Detroit. This project is particularly timely, as Detroit has received national and international attention for its bankruptcy, struggling economy, and failing schools. A recent cost-benefit analysis showed that much of the benefit of investments in early childhood education in Detroit results from cost savings of reduced crime (Chase & Diaz, 2015). Clearly, children in Detroit need initiatives to improve their abilities to plan behavior and control impulses, which may translate to future school success, less crime, and greater economic growth for this city.

Given the immense challenges that the children of Detroit face, if the enhanced PDR and CR successfully raise children's self-regulation, these strategies will most likely do the same for children in other high-poverty, urban communities. With almost a quarter of children under age 6 living in poverty in the United States, child poverty is a severe, **national issue** (Kids Count Data Center, 2014). **This project, targeting self-regulation as a means to reduce achievement gaps and increase school and life success, therefore addresses a problem that could affect 25% of young children not only in Detroit, but nationally.**

Development of Promising New Strategies

Key goals of this project are to 1) **enhance** PDR and CR by infusing PDR/CR training/coaching with new self-regulation research and developing a PDR/CR resource kit that supports teachers' implementation of the enhanced PDR/CR (enhanced PDR/CR hereafter); 2) **assess usability/feasibility** of the enhanced PDR/CR training/coaching and resource kit; 3) **train/coach** preschool and kindergarten teachers to implement the enhanced PDR/CR with

fidelity, and build in-house DPS training/coaching capacity for sustainability; and 4) **examine the preliminary impact** of the enhanced PDR/CR on preschool and kindergarten students' self-regulation and whether improved self-regulation also supports academic achievement.

The proposed project builds on the HighScope Perry Preschool Study, a randomized control trial conducted with low-SES, African-American children in Ypsilanti, Michigan, which supports the efficacy of the HighScope curriculum. The focus of the HighScope curriculum on socioemotional skills has produced strong lifetime effects by giving children the skills to regulate behavior and control impulses, thereby reducing subsequent crime (Heckman, Pinto, & Savelyev, 2013; Schweinhart & Weikart, 1997). Since 1962, the study followed participants over the course of their lives, finding at each time point that children who attended the HighScope preschool had higher educational achievement, employment rates and incomes, and less crime (Schweinhart et al., 2005). While it is speculated that PDR and CR were the key components leading to these results, **attempts to test whether PDR and CR are indeed the contributors to these effects have not yet been conducted. This project extends and builds upon this work by enhancing the preschool PDR/CR and developing the kindergarten PDR/CR.**

In addition, the Perry study was conducted with three- and four-year olds, but our intervention presents **new strategies for preschool and kindergarten students**. We have two reasons for the enhancement/development: 1) the prefrontal cortex develops rapidly through age five, so it is important to target the development of self-regulation skills throughout this critical period, 2) kindergarten is a more academically-focused environment with greater teacher-student ratios. Students may need more structure to learn to attune to and complete tasks, modulate emotions, and develop skills for successful peer interactions. Intentionally supporting children's self-regulation skills **starting at preschool as they transition into school** gives children the

skills they need to succeed in their first year of formal schooling, and sets them on a positive trajectory for school success. Children need skills that help them sit quietly, listen, attend to relevant information, follow directions, control impulses, and complete the activities they begin to be able to learn in the classroom (Ansari & Gershoff, 2015). These skills, however, cannot be blind obedience to authority, but thoughtful and intentional choices that children actively make. Only then will such “soft skills” promote sustained learning and contribute to children’s school and life success (Heckman & Kautz, 2012).

Although enhanced PDR/CR will be developed as HighScope curricular enhancements, they can be incorporated into any developmentally-appropriate curriculum.

That is, many of HighScope’s approaches have been disseminated and integrated into the early childhood field as best practices. For example, planning is now a recommended component of the National Association for the Education of Young Children’s (NAEYC) developmentally-appropriate practices (Copple & Bredekamp, 2009). Similarly, many early childhood training, curricula, and state standards support *intentional teaching*, developed by HighScope researcher and author emeritus, Ann Epstein (2007), as a part of the HighScope approach to adult-child interaction. We believe that a similar level of acceptance and integration of enhanced PDR and CR into early childhood practices is possible, if proven effective. After this Development grant, we hope to apply for a Validation grant to examine the effectiveness of enhanced PDR/CR in other contexts across the nation.

Absolute Priority 4 – Influencing the Development of Non-Cognitive Factors

The proposed project addresses AP 4, as well as **Competitive Preference Priority – Supporting Novice i3 Applicants**, using the evidence standard of **strong theory**. The strong theory includes the HighScope Perry Preschool Study described above, along with research on

self-regulation and our current findings of low self-regulation skills in Detroit children. Figure 1 displays the Logic Model for our theory of change.

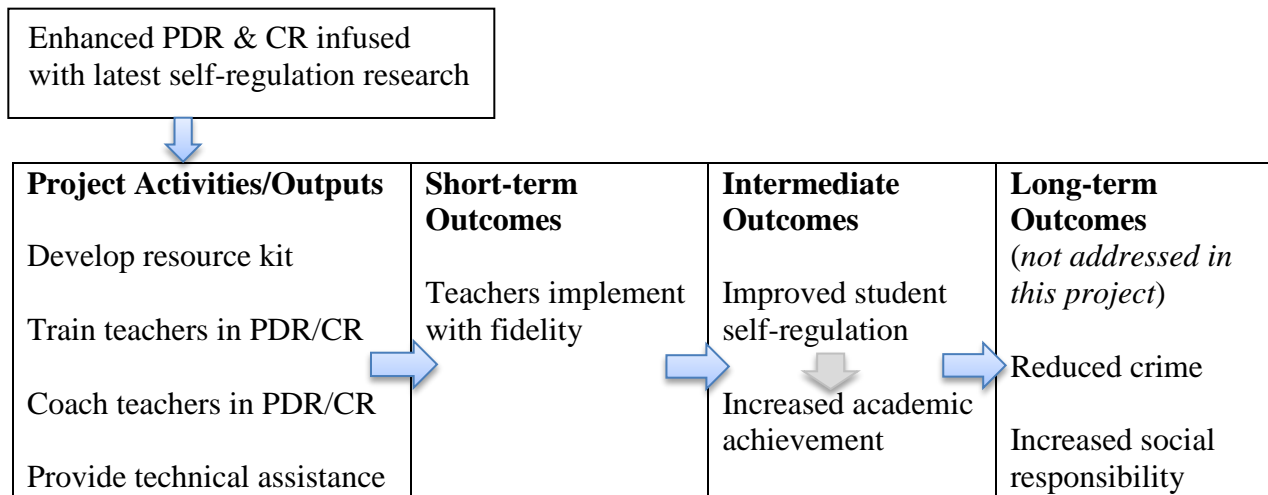


Figure 1. Logic Model

Self-Regulation Research. Self-regulation is the mental processes that enable children to plan for the future, listen to and follow instructions, control impulses, and adjust behavior to meet the demands of the situation. These skills are controlled by the prefrontal cortex, which develops rapidly in the first five years of life (Carlson, Zelazo, & Faja, 2013). In preschool and kindergarten, low levels of self-regulation might look like misbehavior in the classroom, inability to appropriately manage emotions, or failure to follow through in completing tasks. In adolescence and adulthood, low self-regulation is associated with crime, dropping out of school, and inability to maintain employment (Daly, Delaney, Egan, & Baumeister, 2015).

Current conceptualizations of self-regulation include the abilities to integrate three components: working memory, inhibitory control, and attention (Best & Miller, 2010; McClelland, Ponitz, Messersmith, & Tominey, 2010). Working memory allows children to recall a set of steps or directions for accomplishing a task and modulate their behavior to fit the rules or demands of a situation. Inhibitory control allows children to stop a dominant or automatic

response and use a response more adaptive to the situation. Attention allows children to maintain focus on the task at hand and shift to changing goals, rules, or priorities.

Self-regulation also requires complex thinking and advanced adaptive skills that children use to become flexible problem-solvers who modulate, adapt, and focus their attention and behavior. It is therefore not surprising that employing these skills in the classroom may in turn contribute to increased academic achievement, including math and literacy (McClelland et al., 2007; Ng, Tamis-LeMonda, Yoshikawa, & Sze, 2014).

Self-regulation skills are malleable and responsive to classroom-based interventions, and opportunities to develop these skills are critical in early childhood (Barnett et al., 2008; Domitrovich, Cortes, & Greenberg, 2007; Reid, Webster-Stratton, & Hammond, 2003). Many interventions, however, are add-ons to classroom activities, targeting only narrow components of self-regulation, and include lessons that occur just once or a few times per week. If children are to actively and intentionally integrate these skills into their everyday life, they need daily opportunities to practice (Jones et al, 2010). Figure 2 shows HighScope’s comprehensive early childhood conceptual model, Wheel of Learning. PDR lies in the “Daily Routine” and CR lies in the “Adult-Child Interaction” pillar. Thus, PDR occurs within a scheduled part of each day where children can practice self-regulation skills daily, and CR arises within spontaneous interactions with teachers and peers.

Plan-Do-Review (PDR). Part of each day is set aside for students to plan their “free time” or “work time” (10-15 minutes), execute their plans (45-60 minutes), and then reflect on what happened (10-15 minutes). During Planning time, students come together in a small group with a supportive teacher who provides individual attention to each student as they share their plans. PDR promotes working memory, as children make and execute their plans, as well as inhibitory

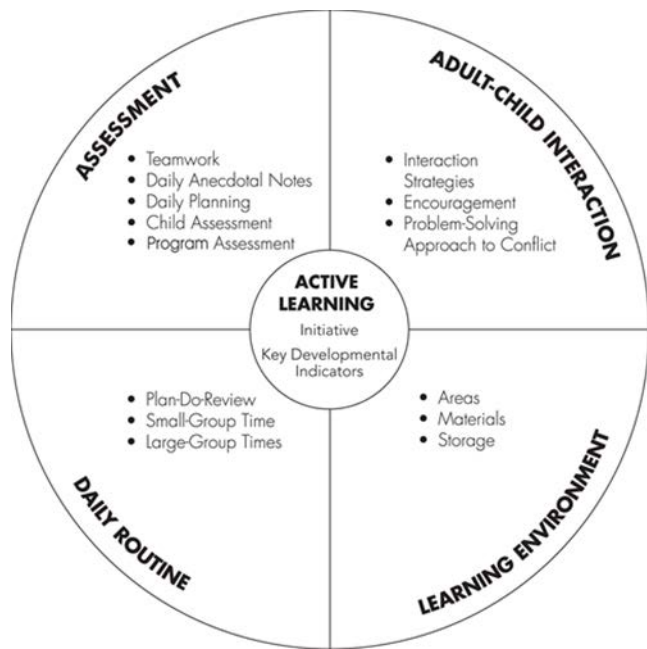


Figure 2: HighScope Wheel of Learning

control as children wait for their turn to share or persist in their plans even when it becomes difficult. As children focus on executing their plans, teachers guide their attention. After children have had time to work, they come together again in small groups to Review, reflecting on, sharing, and discussing their work time experiences. With PDR, children learn to play with intention.

Conflict Resolution (CR). Research indicates that co-regulation, where adults assist children in regulating their emotions and behavior, helps children develop abilities to regulate themselves (Blair & Raver, 2012). Throughout the day, as conflicts arise because children want to use the same toy or disagree on their shared goals for play, adults facilitate children’s interactions by guiding children through HighScope’s six-step conflict resolution process. Teachers help children acknowledge one another’s feelings and goals, communicate these feelings and goals, share ideas to solve the problem, decide on a solution together that works for both children, and carry out their agreed-upon plan. In this way, teachers create an environment that supports children’s self-regulation through CR.

Both PDR and CR are child-centered, ensuring that students actively participate in planning and learning. As such, PDR and CR promote students’ initiative-taking as they plan or problem-solve, execute their plans, and reflect on their plans and solutions. Infused with the latest self-regulation research, which did not exist when the HighScope curriculum was first envisioned for Perry in the 1960s, the enhanced PDR/CR will not only offer everyday

opportunity to practice, but also ensure that teachers deliver PDR and CR more systematically, so that children will learn to integrate the strategies acquired through PDR/CR into their routine thoughts and actions, not just during the prescribed time of the day. The enhanced PDR/CR may also support academic achievement as children use reasoning, vocabulary, and language skills to make predictions, assess outcomes, and solve problems.

In addition, interventions that promote self-regulation make economic sense. A recent report found that social and emotional learning interventions have an average benefit-cost ratio of 11 to 1 (Belfield et al., 2015). That is, for each dollar invested in self-regulation interventions, \$11 is returned to society in reduced costs from crime, delinquency, and substance abuse.

We will partner with Detroit Public Schools (DPS), a **high-poverty, high-minority LEA** to develop the enhanced PDR/CR, train teachers in these strategies, and provide coaching to assist teachers' implementation fidelity. At a rate of 82% Black and 13% Hispanic students, DPS falls within the top quartile in Michigan as a high-minority district; 73% of students are economically disadvantaged (MiDashboard, 2016). Our extensive work in Detroit, including as partners and evaluators for Head Start grantees, Early Learning Communities, and private foundations, provides us the experience and platform to meet the needs of Detroit students. The proposed project will build upon our existing relationships and extend the scope of our work to reach more teachers and students. Given our reputation as a premiere early childhood curriculum, training, and research organization, the Fisher Foundation has conditionally awarded the HighScope-DPS partnership with the matching amount of \$450,000, contingent upon approval of the i3 Development grant (see Appendix G).

B. Project Design and Management Plan

Goals, Objectives, and Outcomes

To support development of self-regulation skills for Detroit students, the proposed project will address four key goals: 1) develop the enhanced PDR/CR training and resource kit that explicitly connects PDR/CR to self-regulation (enhanced PDR/CR); 2) assess usability/feasibility; 3) train/coach teachers to ensure fidelity of implementation; and 4) conduct a preliminary impact evaluation. To address Goals 1, 2, and part of 3, HighScope will partner with Oakland University (OU) researchers. We will utilize teacher surveys, focus groups, and observations collected from DPS early childhood administrators, teachers, and project advisors to refine the intervention, and provide technical assistance for implementation fidelity. To address Goals 3 and 4, HighScope will partner with external evaluators from Michigan State University (MSU) who have experience in self-regulation research (see Table 1).

Goal 1: Develop enhanced PDR and CR. The majority of development work will take place in Year 1 (preschool) and Year 2 (kindergarten) as follows:

Develop enhanced PDR/CR training/coaching. **We will enhance PDR and CR training/coaching in four specific ways:** 1) explicitly link PDR and CR to components of self-regulation, increase teachers' understanding of self-regulation, and promote intentional instruction of PDR/CR; 2) add explicit guidance for scaffolding PDR and CR to meet children's developmental levels, including supporting children who are nonverbal, developmentally delayed, and/or English Language Learners; 3) help teachers identify mini-PDRs (i.e., problem-solving situations that are teachable moments for planning, resolving, and reflecting throughout the day), kindergarten teachers will be trained to use mini-PDR strategies during instruction in content areas; and 4) train/coach teachers to use the new PDR/CR resource kit so that they

Table 1. Timeline with Goals and Roles.

	PreK Development				PreK Small Pilot				reK Pilot Evaluation				Dissemination								
					K Development				K Small Pilot				K Pilot Evaluation								
	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				
	Role	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr
GOAL 1: Development & Enhancement																					
Preschool PDR/CR resource kit	HS	X	X	X	X																
Preschool PDR/CR training	HS			X	X																
Preschool PDR/CR coaching	HS			X	X																
Kindergarten PDR/CR resource kit	HS					X	X	X	X												
Kindergarten PDR/CR training	HS							X	X												
Kindergarten PDR/CR coaching	HS							X	X												
Development of tools for assessing usability/feasibility	HO/MSU			X	X			X	X												
Development of PDR/CR fidelity checklist	HO/MSU			X	X			X	X												
Revisions	HS				X	X			X	X			X	X			X	X			
GOAL 2: Usability/Feasibility																					
Pre-post training self-regulation knowledge test	HO/DPS						X				X				X						
Preschool teacher training feedback survey	HO/DPS						X				X										
Preschool teacher coaching feedback survey	HO/DPS						X		X		X		X								
Preschool PDR activity plan rating form	HO/DPS						X	X	X												
Preschool teacher focus group	HO/DPS								X												
Kindergarten teacher training feedback survey	HO/DPS										X				X						
Kindergarten teacher coaching feedback survey	HO/DPS										X		X		X		X				
Kindergarten PDR activity plan rating form	HO/DPS										X	X	X								
Kindergarten teacher focus group	HO/DPS												X								
Advisor feedback	HO				X				X				X								
GOAL 3: Pilot Implementation & GOAL 4: Evaluation																					
Preschool PDR/CR training	HS/DPS						X				X									X	
Preschool PDR/CR coaching	HS/DPS						X	X	X		X	X	X							X	
Kindergarten PDR/CR training	HS/DPS										X				X					X	
Kindergarten PDR/CR coaching	HS/DPS										X	X	X		X	X	X			X	
Parental consents	DPS										X				X						
Child assessment	MSU										X		X		X		X				
PDR/CR fidelity checklists	MSU						X		X		X		X		X		X				
CLASS observation	MSU										X				X						
Training of in-house trainers	HS/DPS																			X	
Data Input/Processing/Analysis	MSU							X	X	X		X	X	X		X	X	X			
Reporting	HO/MSU					X				X				X						X	
Dissemination	HO/MSU										X		X		X		X		X	X	X
Production/Marketing	HS																			X	X

Red=PreK; Blue=K; Green=Both PreK & K

HS=HighScope; HO=HighScope & Oakland University; DPS=Detroit Public Schools; MSU=Michigan State University

X=HighScope trains DPS in-house trainers on enhanced PDR/CR; DPS trainers/coaches train control group teachers on enhanced PDR/CR

implement the enhanced PDR/CR in a more consistent manner.

Develop PDR/CR resource kit. To develop the **new PDR/CR resource kit, we will revise and expand the current preschool “Planning and Recall Game Ideas” into more structured, research-based activity lesson plans that are developmentally-appropriate for preschool and kindergarten students.** There are currently 50 ideas in the book (see Table 2 left column for examples). We will modify these and add 40 ideas, totaling 90 ideas expanded into comprehensive activity plans in Year 1. In Year 2, we will develop 90 additional plans that are aligned with kindergarten standards for oral language, writing, and math, for a total of 180 comprehensive activity plans. This will give teachers an ample number of PDR activities to choose from during the school year. We plan to model the format of the activity plan after HighScope’s small group time activity plans and provide scaffolding charts to support teachers’ implementation of Planning and Reviewing with children at a variety of developmental levels. See Exhibit 1 for a current version of the scaffolding charts; note how these do not explicitly guide teachers to intentionally scaffold children’s self-regulation. The step-by-step approach to Planning and Reviewing will make it easy for a wide variety of teachers to apply in the classroom. Each activity plan will be printed on a separate card for easy use by teachers and be accessible online. The CR resource will consist of ideas and tips compiled in an easy-to-read booklet that includes a scaffolding chart that explicitly supports teachers to implement CR with fidelity (i.e., intentionally connect how they interact with children to promoting children’s self-regulation skills) and a poster that visually presents HighScope’s six steps to Conflict Resolution for young children. Our ideas about how to format and package/present our resources are tentative, and may change as we incorporate feedback from teacher collaborators and advisors

Exhibit 1: Current PDR/CR Scaffolding Charts.

(see Goal 2 for our iterative development process). HighScope’s outdated PDR and CR DVDs will be updated and made accessible online.

Table 1. Enhanced PDR/CR Self-Regulation Implementation Resource Kit

Current PDR/CR Resource	New PDR/CR Resource Kit
Planning and Reviewing Activities	
<p>“Planning and Recall Games and Experiences” are available as ideas for teachers. E.g.</p> <p>Telephones: “Call up” children one at a time on an old telephone and talk about their plans for work time.</p> <p>Magic Wands: Children point a “magic wand” at an area they played in or a material they used. Wands can be purchased or made with materials such as a cardboard tube or dowel and streamers, glitter, or paint.</p> <p>Old Computer Keyboards: Children “type” their plans as they discuss them with the group.</p>	<p>A total of 180 comprehensive activity plans will be developed. Each enhanced plan and review activity plan will include:</p> <ul style="list-style-type: none"> • Specific strategies to support children’s working memory, inhibitory control, and attention, e.g. <ul style="list-style-type: none"> ○ Plan/review questions such as where, why, with whom, and what if; ○ Key points for behavior management, such as ensuring all children have a turn. • Explicit connection to HighScope’s Key Development Indicators (i.e., learning standards), and scaffolding charts that help teachers better plan instruction and support children at different developmental levels (preschool through kindergarten; nonverbal vs verbal), e.g., <ul style="list-style-type: none"> ○ Increasing expectations for children to make multi-step plans and to co-plan/co-review. ○ Increasing expectations for children to connect their plan or recall to those done before or to look ahead. • Adaptations for children with special needs. • Adaptations for children who are ELLs. • For kindergarten, advanced planning and review activity plans; activities promote and align with oral language, writing, and math Common Core Standards.
CR Strategy	
<p>Teachers guide children through 6 steps to solve their problem:</p> <ol style="list-style-type: none"> 1) approach calmly, stopping hurtful actions, 2) acknowledge children’s feelings, 3) gather information, 4) restate the problem, 5) ask for ideas for solution and choose one together, 6) provide follow-up support. 	<p>Each step will be explicitly connected to self-regulation:</p> <ul style="list-style-type: none"> • Explicit connection to the three components of self-regulation: working memory, inhibitory control, and attention. • Develop materials (e.g., a poster) that help children visually understand the 6 steps. • Charts that show ways to scaffold children to identify their own feelings, others’ feelings, and take multiple perspectives. • Ideas for adaptations for children with special needs. • Ideas for adaptations for children who are ELLs. • Kindergarteners begin to use CR on their own.

Current PDR/CR Resource	New PDR/CR Resource Kit
DVD	
DVD	An updated DVD, as well as internet-based videos of exemplar practices, will be made available for training purposes and as publicly-available learning resources.

Goal 2: Assess usability/feasibility of enhanced PDR/CR. In Year 1, four pairs of lead-assistant teacher teams (i.e., eight teachers) from four DPS preschool classrooms will be selected as teacher collaborators through an invitation-application process. In Year 2, four DPS kindergarten teachers will be selected using the same procedure. Teacher collaborators will be engaged in an iterative process of development during the initial development year and the subsequent pilot implementation year (i.e., Years 1 and 2 for preschool teachers; Years 2 and 3 for kindergarten teachers), and their feedback will inform usability/feasibility of the enhanced training/coaching and resource kit. Tools to assess usability/feasibility (i.e., teacher feedback surveys and a PDR activity plan rating form) will be developed for preschool teachers in Year 1 and kindergarten teachers in Year 2. Each teacher collaborator will try out 30 PDR activity plans from the new resource kit and score them using the PDR activity plan rating form during the pilot implementation phase (i.e., Year 2 for preschool and Year 3 for kindergarten). This will allow for at least two teachers to rate each activity plan. All teachers trained in Years 2, 3, and 4 (both pilot implementation and evaluation) will complete a training and coaching feedback survey immediately after the training and again at the end of the year. The HighScope-OU research team will also conduct preschool teacher focus groups at the end of Year 2, and kindergarten teacher focus groups at the end of Year 3. Collaborating with teachers to develop interventions has been shown to increase teachers’ participation and implementation of an intervention (Diamond & Powell, 2011). Additionally, the team will conduct conference calls

with our advisory committee in Years 1, 2, and 3 (see p.18, “Procedures for Ensuring Feedback and Continuous Improvement”). Feedback will inform revisions during the summer months.

Goal 3: Train and support teachers to implement enhanced PDR/CR with fidelity. DPS teachers will be trained in the enhanced PDR/CR and receive coaching to support their fidelity of implementation. HighScope’s Early Childhood Department, which has 50 years of curriculum development, teacher training, and coaching experience, will train and coach teachers in enhanced PDR/CR. The training will last a total of five and a half days: ½ day for self-regulation, two days for PDR (½ day for planning, ½ day for work time/”do”, ½ day for review, ½ day for resource kit), and two days for CR and the new CR resources. A one-day follow-up training in advanced CR strategies will take place later in the school year.

Teachers will receive tiered coaching support from a curriculum coach in the form of job-embedded professional learning. That is, teachers will receive eight to fifteen coaching visits; classrooms needing more support will receive more visits. HighScope employs a reflective coaching protocol, and coaches will use a variety of tools and strategies to help classroom teachers better understand how to support children’s self-regulation. These include self-assessment checklists, structured observation feedback sessions, demonstration teaching and modeling, over-the-shoulder coaching, videotaping, analysis, and self-reflection, and formative assessment tools. In between coaching visits, coaches and teachers will utilize weekly electronic “touch points” to support learning, including emails, phone calls, reflective assignments, or online forum discussions. Coaches will regularly assess teachers’ fidelity of implementation using the checklists developed for this project, and submit coaching plans, logs, and progress reports to HighScope.

In Year 4, Early Childhood Specialists at DPS will be trained to become PDR/CR trainers and coaches. In Year 5, control group teachers will be trained/coached by these internal trainers with support from HighScope Early Childhood team, and 100 PDR/CR resource kits will be distributed, thereby ensuring sustainability for current and future DPS teachers and students.

Goal 4: Evaluate the impact of enhanced PDR/CR on self-regulation and academic achievement. The evaluation plan is described in Section C: Project Evaluation.

Management Plan

Dr. Laura Scharphorn, Research Associate at HighScope Center for Early Education Evaluation, will serve as the Principle Investigator and Project Director. She will oversee all aspects of the project and will work with the HighScope finance department to manage the project budget. Ms. Beth Marshall, Director of Early Childhood at HighScope, and Dr. Tomoko Wakabayashi, Associate Professor at Oakland University (OU), will serve as Co-Principal Investigators and work closely with Dr. Scharphorn (see Figure 3).

Goal 1, development of enhanced PDR/CR at the preschool level, will be led by Ms. Marshall and will take place in Year 1. The preschool PDR/CR will be expanded and adapted for kindergarten in Year 2, led by Dr. Jeffrey Beal, Senior Research Associate at HighScope Center for Early Education Evaluation and Co-Investigator on the project. Goal 2, assess usability/feasibility of the enhanced PDR/CR, will be led by Dr. Scharphorn and Dr. Wakabayashi. They will lead the iterative development process to engage DPS Early Childhood administrators, teacher collaborators, and the advisory committee for feedback, and use the data collected to identify areas in need of improvement. Training logistics for Goal 3 will be coordinated by HighScope's Director of Educational Services, in collaboration with Ms. Marshall. Drs. Lori Skibbe and Ryan Bowles at MSU will serve as external evaluators to address

Goals 3 and 4. They will collect fidelity of implementation data from training/coaching and classroom observations, investigate the impact of enhanced PDR/CR on children’s self-regulation skills, and explore whether increased self-regulation also supports academic achievement.

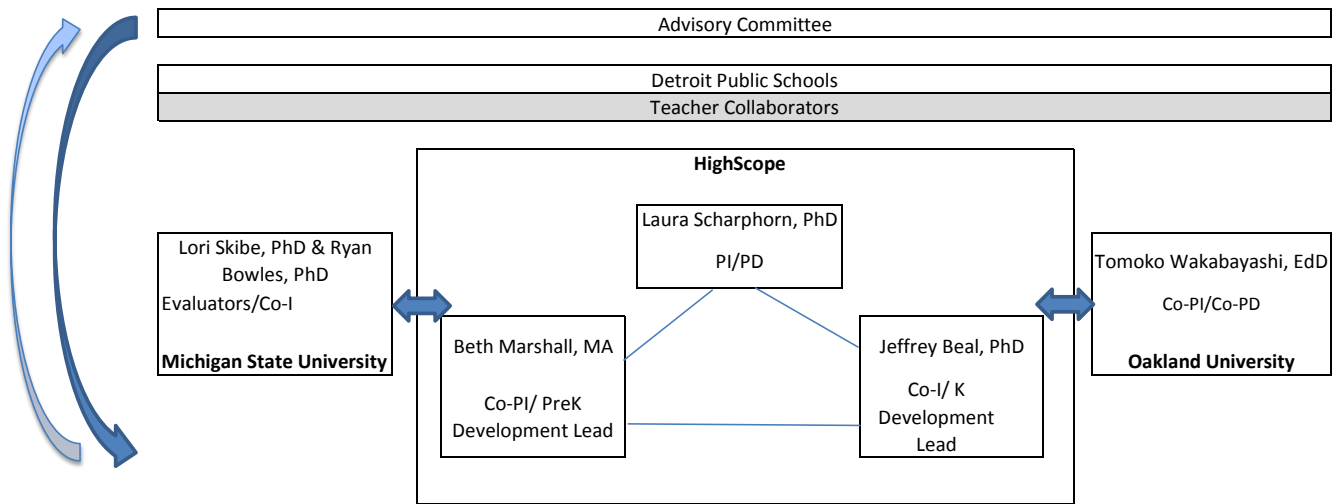


Figure 3. Management Structure

Procedures for Ensuring Feedback and Continuous Improvement

The HighScope-OU team will remain in constant communication and meet regularly with DPS Early Childhood administrators and teacher collaborators to obtain feedback, troubleshoot areas of concern, ensure the intervention is working as expected, and make improvements as needed. We will provide technical assistance to ensure the quality and rigor of the intervention. Coaches will meet regularly with teachers to improve their delivery of PDR/CR in the classroom. In addition, an advisory committee consisting of Dr. Fred Morrison, an expert in self-regulation at the University of Michigan, Dr. Walter Gilliam, an expert in child mental health at Yale University, Dr. Julie Ricks-Doneen, an expert in inclusive classrooms at Oakland University, and DPS Early Childhood staff will provide feedback on the enhanced PDR/CR training/coaching and resource kit. In Years 1-3, the advisory committee will meet annually over conference calls.

During the summer months, training/coaching materials and content of the resource kit will be reviewed and revised based on teacher and advisor feedback.

Mechanisms to Broadly Disseminate Information

We will disseminate findings through academic and practitioner conferences, and issue press releases to local and national news sources to share findings. Pending positive pilot results, HighScope Publications and Marketing Departments will professionally package the PDR/CR resource kit for dissemination. Because the resource kit supports teachers' fidelity of implementation of the enhanced PDR/CR, it can be easily adopted in preschool and kindergarten classrooms nationwide. HighScope has trained more than 18,400 teachers in the past three years, and has a wide distribution network. The enhanced PDR/CR will be advertised as supplemental strategies that can be used seamlessly in any developmentally-appropriate classroom.

C. Project Evaluation

Key Questions and Methods

The four goals of our proposed project generate the following Key Questions:

- **KQ1: Do the enhanced PDR/CR training/coaching and resource kit increase teachers' understanding of self-regulation and lead to intentional scaffolding of PDR/CR?**
- **KQ2: Do teachers see the enhanced PDR/CR as usable and feasible in the classroom?**
- **KQ3: Do teachers implement the enhanced PDR/CR with fidelity?**
- **KQ4: Do the enhanced PDR/CR increase children's self-regulation skills? Do increased self-regulation skills also support children's academic achievement?**

Sample. Table 3 shows the number of classrooms, teachers, and students included in the pilot implementation and evaluation. An iterative process of development will occur during the initial development year and the pilot implementation year, Years 1 and 2 for preschool and

Years 2 and 3 for kindergarten. In Years 3 and 4, we will conduct preliminary evaluations using randomized control design, with a total of 80 classrooms (40 preschool and 40 kindergarten). Two teachers (lead and assistant) from each preschool classroom and one teacher from each kindergarten classroom will participate. We anticipate about 10% of the students will be ELLs. While all students in treatment classrooms will participate in the intervention (2,024 students total), ten students per classroom will be randomly selected to participate in the impact evaluation, for a total of 800 students. These students will be selected from among those identified by teachers as proficient in English (i.e., able to understand directions and communicate their needs in English). This will ensure fair and accurate testing results. Schools that are open to and stable enough to support a new intervention will be selected in consultation with DPS, and classrooms will be randomly assigned to treatment or control groups. There are 67 schools within DPS that have prekindergarten programs, allowing a large sample to draw upon for this work.

Table 3. Study Sample

	Pilot Implementation	Impact Evaluation (RCT)	
		Treatment	Control
Years 1 & 2: Development of PDR/CR in preschool			
Pilot classrooms/teachers	4/8		
Years 2 & 3: Development of PDR/CR in K			
Pilot classrooms/teachers	4/4		
Year 3: Evaluation of PDR/CR in preschool			
Classrooms/teachers		20/40	20/40
Students		200	200
Year 4: Evaluation of PDR/CR in K			
Classrooms/teachers		20/20	20/20
Students		200	200

In HighScope’s previous research using the HTKS with diverse, low-income samples in Michigan, effect sizes of .40 have been detected (Wakabayashi & Xiang, 2015). Thus, this

design will detect a minimum effect size of .30 under power of .80, confidence level of .95; and intraclass coefficient at classroom level of .10.

Measures. **Self-regulation** will be assessed using a comprehensive battery, including standardized and well-validated measures targeting the three components of self-regulation: working memory, inhibitory control, and attention. They are conceptually related and considered to be the most closely related to academic achievement (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009). **Working memory** will be measured using a task closely related to the **Wechsler Preschool and Primary Scale of Intelligence zoo location** (WPPSI; Wechsler, 2012). In this task, children are asked to remember where cars are parked with increasing numbers of possible spaces to choose from as children mature. This task relies on visual working memory, rather than verbal working memory, which makes it more accessible to younger children (Koppenol-Gonzalez, Bouwmeester, & Vermunt, 2012). To measure **inhibitory control**, we will use an adaptation of the commonly-used **Go, No Go task**, similar to Wiebe and colleagues (2012), where children are presented pictures of butterflies and bees and asked to catch butterflies with their net while avoiding any bees they encounter. **Attention** will be assessed using a **flower search task**, which is based on the WPPSI bug search (Wechsler, 2012). Children choose one of five response flowers that matches the stimulus flower. All three measures have been used successfully from preschool through first grade and last between two to five minutes. These game-like tasks will be presented digitally using a touch screen laptop, a methodology that has been successfully employed with low-income children (Weintraub et al., 2013).

To measure children's **integration of working memory, inhibitory control, and attentional flexibility**, we will use the **Head Toes Knees Shoulders** task (HTKS; Ponitz, McClelland, Matthews, & Morrison, 2009). This structured observation instrument has high

reliability and predictive validity (Ponitz et al., 2009). When compared to other measures of self-regulation, scores on the HTKS predicted academic achievement in prekindergarten and kindergarten classrooms most strongly (McClelland et al., 2014). It is also used in a host of early childhood studies, including HighScope's evaluation of Michigan's state-funded preschool program. The HTKS is similar to the classic game of the same name.

We will also measure **socioemotional factors** strongly related to self-regulation by using a direct assessment of social problem-solving skills. Social problem-solving skills, or the skills needed to choose more competent and less aggressive responses to challenging social situations, will be measured using the **Challenging Situations task** (Denham, Way, Kalb, Warren-Khot, & Bassett, 2013). This task is appropriate for low-income children; children are presented with pictures depicting emotionally-charged situations (e.g., someone hits her/him) and are asked what they would do next (e.g., cry vs. tell the other child it's not a nice thing to do). This task has strong reliability and predicts children's academic achievement in kindergarten.

The **Social Skills Improvement System** rating scale (SSIS; Gresham & Elliot, 2008) complements direct child assessments with additional information on social development. It is commonly used in early childhood research, demonstrated to be reliable and valid, norm-referenced, and recommended as a primary tool for planning behavioral interventions for young children (Frey, Elliott, & Gresham, 2011). Subscales include communication, cooperation, assertion, self-control, empathy, engagement, responsibility, and externalizing problem behaviors. Teachers will complete the SSIS for each child in Years 3 (preschool) and 4 (kindergarten) in the fall and spring and receive \$5 for each SSIS they complete.

Children's **math and literacy skills** will be assessed by the **Woodcock-Johnson Tests of Achievement-IV (WJ-IV)** in Applied Problems, Letter-Word Identification, and Picture

Vocabulary. The WJ-IV is norm-referenced and has been established as both valid and reliable (LaForte, McGrew, & Schrank, 2014). The WJ-IV is widely used in early childhood evaluations for children ages 2 and above, and provides age- and grade-based norm-referenced achievement scores while using entertaining visual stimuli.

Child and family demographics will be obtained from **DPS records**. This includes child's gender, race, ethnicity, birthdate, prior child care experiences, birth weight, primary language, health history, number of siblings, and screening assessments for disabilities conducted by the district prior to entry into preschool or kindergarten, and parental education, marital status, employment, household income, race, and ethnicity. Child attendance logs will be collected, as attendance moderates the effects of interventions on outcomes (Justice, Mashburn, Pence, & Wiggins, 2008). **Teacher surveys** will collect education, years of experience, professional development, age, race, ethnicity, and income.

The HighScope-OU team will develop the **pre-post training knowledge assessment, training/coaching feedback surveys, focus group protocol, PDR activity plan rating form,** and PDR/CR **fidelity checklists**. The pre-post assessment will be completed by teachers before and after training and will measure self-regulation knowledge gained. To inform the development and revision of the enhanced PDR/CR, feedback surveys will be completed after training and at the end of the year and focus groups will be conducted with teacher collaborators. Teacher collaborators will use the PDR activity plan rating form to rate the usability/feasibility of each new activity plan on a scale of 1 to 4. The PDR fidelity checklist will assess teachers' successful implementation of PDR strategies and activities during the Plan-Do-Review sequence. The CR fidelity checklist will assess teachers' successful implementation of the six steps of Conflict Resolution during a student conflict situation. The **Classroom Assessment Scoring**

System PreK-K (CLASS; Pianta, La Paro, & Hamre, 2008) will be conducted by trained, reliable assessors at the beginning of Year 3 (preschool) and Year 4 (kindergarten) to measure **classroom quality**. It is an observation-based measure of three domains rated on a 7-point scale: emotional support, classroom organization, and instructional support. The CLASS is valid, reliable, and widely-used. It assesses whether treatment and control teachers deliver comparable classroom quality at baseline and whether classroom quality contributes to PDR/CR implementation fidelity and/or student outcomes.

Table 4 aligns each key question with its variables and their measures.

Data Collection. Trained data collectors will contact the teacher and arrange a mutually-agreed upon time to visit for child assessment and classroom observations. Child assessments should take approximately one hour per child, completed in two 30-minute sessions, at the beginning and end of the school year. The CLASS observations and PDR/CR checklist are each expected to take 1-2 hours.

Analysis Plan. Quantitative (averages, frequencies, percentages) and qualitative (anecdotes, themes) methods will be used to answer KQ1 & 2, as we identify areas in need of revision and improve usability/feasibility of the enhanced PDR/CR training/coaching and resource kit. For KQ3, cut-off scores for observed fidelity will be created to indicate teachers’ successful implementation of PDR and CR. In regression analyses, teachers’ background characteristics, classroom quality, and coaching logs will be used to predict implementation, to examine whether particular characteristics influence teachers’ fidelity to the model.

Table 4. Variables and Their Measure to Address each Key Question.

Key Questions	Variable	Measure
KQ 1	Knowledge of self-regulation; intentional instruction of PDR/CR	Pre-Post training knowledge assessment; PDR/CR fidelity checklists

KQ 2	Teacher-perceived usability/ feasibility	Teacher feedback surveys; Teacher PDR activity plan rating form; Teacher focus groups
KQ 3	PDR fidelity CR fidelity Classroom quality Teacher characteristics	PDR/CR fidelity checklists; Coaching logs & notes CLASS Teacher background survey
KQ 4	<u>Self-regulation</u> Working Memory; Inhibitory Control; Attention; Social problem-solving <u>Academic Achievement</u> Math; Literacy Child/Family characteristics	Head Toes Knees Shoulders; Car Parking task; Go, No Go task; Flower Search task; Challenging Situations task; SSIS WJ Applied Problems; WJ Letter-Word Identification; WJ Picture Vocabulary Student records/Parent records

To examine KQ4, we will use two-level hierarchical linear models (HLM; Raudenbush & Bryk, 2002), with child variables at level 1 and classroom variables at level 2. We will not conduct 3-level models, as the intraclass correlation associated with classroom will likely outweigh the school effect due to the small number of classrooms within each school. Analyses will be conducted in HLM 6.08 using full information maximum likelihood estimation to deal with missingness (Raudenbush et al., 2004).

The efficacy of PDR and CR in improving self-regulation will be examined separately for preschoolers and kindergarteners. Separate models will be run for each student outcome to examine the effect of the intervention on each spring outcome, controlling for fall level of the outcome. To reduce the risk of omitted variable and selection bias, we will include several covariates to reduce the possibility of spurious findings and increase confidence in associations found between participation in the intervention and self-regulation and achievement (Duncan, Magnuson, & Ludwig, 2004). At level 1, we will include child (e.g., gender) and family characteristics (e.g., income) associated with children’s self-regulation and academic functioning. At level 2, we will include teacher characteristics (e.g., experience) associated with

student outcomes. We will include treatment group as a level 2 variable; the coefficient on this predictor estimate of the effect of the intervention. To examine whether PDR/CR led to increased school achievement by way of increased self-regulation, we will conduct mediation analyses (Preacher, 2015).

Methods will Produce Evidence about the Project's Effectiveness

This project uses a Randomized Control Trial designed to meet WWC standards without reservations. A random number generator on a list of DPS classrooms will assign treatment and control groups. Parents will sign consent when enrolling their child in school, and 10 students in each classroom will be randomly assigned to participate in the evaluation. We have high support from DPS; however, we are working with an urban school district and may see high attrition rates due to student mobility, which may lead to meeting WWC standards with reservations. We do not expect differential attrition. We will ensure baseline equivalence between groups using child/parent records and scores, and teacher surveys and classroom quality.

Sufficient Resources to Carry out the Project Evaluation

The independent evaluation team includes Dr. Lori Skibbe, who has previously researched self-regulation in young children, and Dr. Ryan Bowles, a respected statistician. Both are associate professors at MSU. This land grant institution supports research as an essential focus; approximately \$538 million was spent on research in 2013-14. Resources from the department of Human Development and Family Studies (HDFS) will be utilized. HDFS has a dedicated server to store data securely and owns all statistical programs to be used in this project (e.g., SPSS and HLM). Skibbe and Bowles have lab space that will be committed to managing project activities.

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