Effects of the “High Impact Leadership for School Renewal” Project on Principal Leadership, School Leadership, and Student Achievement: A Randomized Controlled Trial

Jianping Shen, Ph.D., John E. Sandberg Professor of Education, Gwen Frostic Endowed Chair in Research and Innovation, Western Michigan University

Xin Ma, Ph.D., Professor, University Research Professor, University of Kentucky

Patricia L. Reeves, Ed.D., Professor Emeritus, Western Michigan University

Huang Wu, Ph.D., Western Michigan University

LaSonja Roberts, Assistant Professor, Western Michigan University

Yunzheng Zheng, Ph.D. Candidate, Western Michigan University

Q. Chen, Ph.D. Candidate, University of Kentucky
Abstract

In this study, we used randomized controlled trial to evaluate High Impact Leadership for School Renewal project’s impact on principal leadership, school leadership, and student achievement. Both principals and teachers in the experimental group reported statistically significantly more growth in principal leadership than their counterparts in the control group. Teachers in the experimental group reported statistically significantly more growth in school leadership than their counterparts in the control group; but principals in the two groups reported no difference in the growth in school leadership. Schools in the experimental group also showed statistically significantly larger annual growth in English language arts proficiency rate. Implications of the findings were discussed for the construct and practice of school renewal.
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Introduction

How to improve our schools via the leadership approach is among the most important questions for educational research, policy and practice. Most of the research on this topic focuses on either principal leadership or teacher leadership, without integrating the two. A preponderance of research on this topic is correlational, and randomized controlled trials are very rarely conducted to study the effect of a leadership development program on schools, including student achievement. In this article, we report the efficacy results of a randomized controlled trial, a federally funded project titled High-Impact Leadership (HIL) for School Renewal.

Literature Review and Justification for the Study

The Effect of Principal Leadership

There is a vast body of literature addressing whether there is an association between principal leadership, on the one hand, and outcomes related to teachers, students and schools, on the other. First, numerous empirical studies demonstrated associations between principal leadership and a wide range of teacher outcomes. Principal leadership is related to teachers’ sense of well-being at school (Dou et al., 2017; Shen, Leslie, et al., 2012; Tesfaw, 2014; Torres, 2019), self-efficacy (Wu et al., 2021; Zheng et al., 2019), and commitment to teaching (Freeman & Fields, 2020; Thien et al., 2021; To et al., 2021). For example, Burkhauser’s (2017) longitudinal analysis of North Carolina public schools showed that principals significantly influence teachers’ satisfaction with schools’ working conditions. Relatedly, studies have
revealed that principal leadership predicts teacher turnover and attrition (Grissom, 2011; Grissom & Bartanen, 2019; Kim, 2019; Player et al., 2017). In a longitudinal study in Tennessee, Grissom and Bartanen (2019) found that effective principals are associated with a lower rate of teacher turnover. In addition to teacher well-being and teacher turnover, principal leadership also exerts powerful influences on teachers’ professional learning (Hallinger et al., 2019; Liu & Hallinger, 2018, 2021; Pan & Chen, 2020) and classroom teaching practice (Bellibaş et al., 2020; Holzberger & Schiepe-Tiska, 2021). In a recent meta-analysis, Liebowitz and Porter (2019) estimated the effect size of principal leadership was 0.34–0.38 SD on teacher well-being, and 0.35 SD on teacher instructional practices.

Second, recent studies bring to light some of the ways principals shape organizational outcomes. A significant amount of empirical literature connects principal leadership with school climate and culture (e.g., Chen, 2018; Dou et al., 2017; McCarley et al., 2016; Printy & Liu, 2021). For example, McCarley et al. (2016) found that transformational leadership is positively associated with a supportive and engaged school climate. Research also documented that principal leadership is the key to fostering family involvement and engagement (Smith et al., 2021; Yulianti et al., 2020). Drawing data across 18 schools in a U.S. Midwest state, Smith et al. (2021) showed substantial impacts of principal leadership on both baseline and change in family engagement after controlling for background variables.

Third, a more extensive set of empirical studies establish the association between principal leadership and student achievement (e.g., Grissom et al., 2021; Leithwood et al., 2004; Shen, Wu, et al., 2021; Wu, Gao, et al., 2020; Wu, Shen, et al., 2020; Wu & Shen, 2022). In their highly referenced review, Leithwood et al. (2004) argued that “leadership is second only to classroom instruction among all school-related factors that contribute to what students learn at
school” (p. 5). Another recent meta-analysis by Grissom et al. (2021), which was based on six rigorous studies that utilized longitudinal data, showed that on average one standard deviation in principal leadership is associated with 0.13 standard deviations in math achievement and 0.09 standard deviation in reading achievement. By summarizing results from 12 previous meta-analyses since 2000, Wu and Shen (2022) provided meta-meta-analytic confirmation on the positive association between principal leadership and student achievement (Cohen’s $d = 0.34$). Furthermore, principal leadership is related to not only average student achievement but also the growth of student learning (Heck & Hallinger, 2009, 2010; Shen, Ma, Mansberger, Wu, et al., 2021). For instance, Shen, Ma, Mansberger, Wu, et al.’s (2021) study revealed that via data from 24 schools and multilevel multiset time-series models, improvement in principal efforts in promoting parent involvement was associated with student achievement growth in both reading and math.

Finally, there is also a body of literature on how principal leadership is associated with various outcomes which, in turn, are positively associated with student achievement in other studies. These studies fall into three categories. First, principal leadership impacts various outcomes directly. For example, principals can improve teacher job satisfaction and commitment directly through distributed leadership practices such as providing teachers with instructional support, intellectual stimulation, opportunities to participate in school decision making, and building a collaboration (Hulpia et al., 2009; Torres, 2019). Some principal leadership practices can also produce a direct relationship with student achievement, such as engaging in formal or informal discussions with students (Silva, 2010). Second, since school administrators, teachers, students, families, and communities are mutually connected, principals’ effect on student achievement may be exerted through their direct influence on school and teacher outcomes.
Leithwood et al. (2010, 2020) suggested principal leadership impacts student learning via four paths: rational, emotional, organizational, and family paths. Third, principal leadership may have interactional effects with school background and conditions on student learning; i.e., the impacts of principal leadership on student learning are moderated by school background and conditions (Sebastian & Allensworth, 2019; Wu, Gao, et al., 2020; Wu, Shen, et al., 2020). In sum, the wide range of empirical evidence suggests that principal leadership is ubiquitous and versatile.

**Teacher Leadership**

In recent years, teacher leadership has received growing attention as an essential ingredient in school improvement from educational policymakers, practitioners, and researchers. The notion of teacher leadership refers to teachers’ formal and informal influence over instructional practice and organizational decision-making processes in efforts to transform and improve schools (Shen, Ma, Mansberger, Bierlein Palmer, et al., 2021; Wenner & Campbell, 2017; York-Barr & Duke, 2004). Some other important leadership concepts such as collaborative leadership (Heck & Hallinger, 2010), distributed leadership (Spillane et al., 2001), and teacher empowerment (Marks & Louis, 1997) carry similar meanings, all of which emphasize that school leadership is a collective activity that, not restricted to designated formal positions, involves teachers and other school personnel (Harris, 2003; Shen et al., 2019; Shen, Ma, Mansberger, Bierlein Palmer, et al., 2021).

Existing research on teacher leadership and professional standards for teachers recognize that there are various domains of practice in which teachers can show their leadership (Shen, Wu, et al., 2021). For example, York-Barr and Duke (2004) summarized from literature seven domains of teacher leadership practice: (a) coordination and management, (b) school or district curriculum work, (c) professional development of colleagues, (d) participation in school
change/improvement, (e) parent and community involvement, (f) contribution to the profession, and (g) preservice teacher education. More recently, Shen, Wu, et al.’s (2021) meta-analysis of the literature and professional standards identified seven dimensions of teacher leadership: (a) promoting a shared vision, mission, and goals of student learning, (b) coordinating and managing beyond the classroom, (c) facilitating improvements in curriculum, instruction, and assessment, (d) promoting teachers’ professional development, (e) engaging in policy and decision making, (f) improving outreach and collaboration with families and communities, and (g) fostering a collaborative culture in school.

Studies suggest that teacher leadership has significant positive effects on student, teacher, and school outcomes (Sebastian et al., 2016, 2017; Shen, Wu, et al., 2021; Wenner & Campbell, 2017; York-Barr & Duke, 2004). For example, meta-analyzing 21 empirical studies, Shen, Wu, et al. (2021) found positive relationships between teacher leadership and student academic achievement, with an average effect size $r = .19$ ($r = .18$ for reading and $r = .24$ for math). These impacts equate to roughly 8.1 months of learning in reading and 8.5 months in math at fourth grade in the standard nine-month school year (Bloom et al., 2008; Kraft, 2020). Further analyses on teacher leadership dimensions by Shen, Wu, et al. (2021) indicated positive relationships between student achievement and teacher leadership in (a) facilitating improvements in curriculum, instruction, and assessment ($r = .21$), (b) promoting teacher professional development ($r = .19$), (c) engaging in policy and decision making ($r = .19$), (d) promoting shared vision and mission ($r = .18$), (e) coordinating and managing beyond the classroom ($r = .18$), (f) fostering a collaborative culture ($r = .17$), and (g) improving outreach and collaboration with families and communities ($r = .15$). Further meta-regression analyses
indicated that teacher leadership in “facilitating improvements in curriculum, instruction, and assessment” seems to matter the most \(r = .21\).

**School Leadership: The Integration of Principal Leadership and Teacher Leadership in the Context of the Theory of Bifurcated Educational System**

It is interesting to notice that principal leadership and teacher leadership are essentially two parallel tracks in policy, practice, and research. However, leadership is shared among stakeholders, relying on school-wide sources of leadership (Ahn, Bowers, & Welton, 2021). Jacob and his colleagues (2015) conducted a randomized trial study of the Balanced Leadership Program’s effect on leadership, principal efficacy, instructional climate, educator turnover, and student achievement. Although principals participating in the program self-reported more positive outcomes than their counterparts in the control group, data collected from teachers indicated that there was no effect on the schools’ instructional climate. There was also no effect on student achievement. When Jacob et al. (2015) discussed their research findings, one of the key discussion points was that leadership training for principals without contextual and sustained implementation was not enough. One important element of contextual implementation is to work with teachers. In our current randomized controlled trial, we argued that we need to integrate principal leadership and teacher leadership, and advocate for school leadership, i.e., leadership that is distributed and characterized by active engagement between and among principals and teachers across the entire school.

The construct of school leadership is particularly important given the history of educational reform and most recent studies on the bifurcated nature of the educational system. For the last 25 years, the theory that the educational system is loosely coupled guided the dominant educational policies. These proliferated policies aimed at tightening the system via
curriculum standards, accountability tests, and evaluation for the school, district, and various types of educators as the way to improve the K-12 schools and student achievement. However, as previously noted, one significant challenge is that educational reform stops at the classroom door (Cohen, 1990; Goodlad & Klein, 1975), despite the high pressure coming with the policy mechanisms of standards and accountability at various levels (Bryk et al., 2009; Shen & Ma, 2006). This raises the question of whether we have been misguided by the assumption that “the educational system is loosely coupled” (Hautala et al., 2018; Weick, 1976), and that the answer is to tighten it.

Shen and his colleagues conducted a series of empirical studies, using national data sets, on the nature of the educational system (Shen et al., 2017; Shen & Ma, 2006; Xia et al., 2020). Among others, they found the technical core of the educational system is “bifurcated”—tightly coupled from the state level to the district level and to the school level, and loosely coupled from the school level to the classroom level. To use a term from geoscience, the educational system consists of two “tectonic plates.” The state, the district, and the school constitute one plate, and the classroom the other, with a “fault line” between the two plates.

The theory of the bifurcated educational system indicates the importance of bridging the fault line between the school and the classroom. Thus, it strongly suggests the importance of the relationship between the principal and teachers in improving the school and student achievement. There have been deeply rooted doubts—the so-called zero-sum game theory—about whether it is even possible to integrate principal and teacher leadership to bridge the fault line. Empirical studies (Shen & Xia, 2012; Xia & Shen, 2020; Xia et al., 2020) indicate that the power relationship between the principal and their teachers is characterized by the win-win theory in almost all decision-making areas. This empirical finding supports the feasibility of integrated
school leadership. Integrated school leadership is not a utopian ideal. Rather, it is a practical approach to bridging the fault line between the two bifurcated tectonic plates of the educational system and, ultimately, improving our schools and student achievement.

**Experimental Studies on Leadership Development Programs**

There are some quasi-experimental studies on the effects of leadership development programs for aspiring or practicing principals, and the findings on statistically significant effects are few, especially the effect on student learning (Corcoran et al., 2012; Steele et al., 2021). Clark et al. (2009) and Corcoran et al. (2009, 2012) assessed the impacts of New York City’s Aspiring Principals Program (APP) on student achievement. Based on propensity score matching there was no statistically significant difference between APP and comparison schools in student achievement in any year (Corcoran, 2012). The National Institute for School Leadership program was evaluated in Pennsylvania (Nunnery et al., 2010b; Nunnery, Yen, et al., 2011), Massachusetts (Nunnery et al., 2010a; Nunnery, Ross, et al., 2011), and Wisconsin (Corcoran, 2017). Although these studies seem to suggest NISL program principals were associated with small, significant student achievement gains, none of them meet the What Works Clearinghouse (WWC) design standards because no information was provided for WWC to assess baseline equivalence (WWC, 2021).

A few quasi-experimental studies found some positive effects of the leadership development program. For example, studies of the New Leaders Program (Gates et al., 2014) found that students in schools led by New Leaders principals saw statistically significant larger achievement gains on average than their counterparts in schools led by non-New Leaders principals; however, the effects varied significantly across districts. It is noteworthy that this study was evaluated and rated as Tier 2 research by WWC. In a follow-up evaluation, Gates et al.
(2019) reported that (a) K-8 students in schools led by New Leaders principals outperformed students in comparison schools led by new principals trained through other avenues, (b) the attendance rates in elementary and middles schools with New Leaders principals were higher, and (c) New Leaders principals were more likely to stay at their schools for a second year as principals than other new principals.

Similarly, Steinberg and Yang (2020) evaluated the Pennsylvania’s Inspired Leadership (PIL) induction program and reported that (a) PIL introduction program improved student achievement in math (0.10 $SD$) but not in reading, (b) the effects were concentrated among low-achieving and economically disadvantaged schools, and (c) PIL introduction had no significant effect on teacher turnover. Steele et al. (2021) tested the first three years of implementation of Pathways to Leadership in Urban Schools residency program in an urban school district, and they found positive effects in high schools on student math achievement, graduation rate, suspension rate, but results were sensitive to school level, residents’ placement, and model specification (Steele et al., 2021).

Compared with quasi-experimental design, randomized controlled trials on the effect of leadership development programs have been more limited (Camburn et al., 2016). In a cluster-randomized trial of 126 economically disadvantaged rural schools in Michigan, Jacob et al. (2015) examined whether the Balanced Leadership Program (BLPD, which offers 10, two-day on-site professional development sessions for school leaders in treatment schools) impacts leadership, principal efficacy, instructional climate, teacher turnover, and student achievement. This study meets WWC group design standards without reservations, but results suggest the BLPD program only has potentially positive effects on teacher retention and principals’ self-reported measures (Jacob et al., 2015; WWC, 2020). Freyer (2017) also conducted a randomized
controlled trial in Texas to estimate the causal impact of leadership training on student achievement. Participants were provided training on lesson planning, data-driven instruction, and teacher observation and coaching across two years. Results showed positive impacts on student achievement in the first year but no statistically significant effects in the second year. Moreover, in a randomized trial of 100 elementary schools from eight districts in five states, Herrmann et al. (2019) indicated that although the program provided about 200 hours of professional development over two years for principals, the program did not affect student achievement nor most teacher or school outcomes such as teachers’ perception of school climate, or teacher and principal retention.

The literature review on experimental studies on leadership development programs tends to offer a contrast with the findings from correlational studies. Generally speaking, experimental studies tend to have much fewer statistically significant effects; the few effects found tend to be related to principals themselves, not school process and student achievement; and the effect sizes tend to be much smaller. Why do the experimental studies on leadership development programs reveal so few effects beyond principals themselves? Jacobs et al. (2015) argue that substantial changes on the part of principals without a larger, whole school effort, will not be enough.

**Summary for the Literature Review and Justification for the Study**

The above literature review indicates that although there is much research on principal leadership and teacher leadership, these two lines of inquiry are, mostly, parallel to each other. It is time to integrate teacher leadership and principal leadership and to focus research and advocacy on school leadership, i.e., the integration of principal and teacher leadership throughout the school. The advocacy for school leadership is particularly important given the bifurcated nature of the education system with a fault line between the classroom and the rest of the system.
It is time for studies in situations where bridging the bifurcation of leadership and creating integrated school-wide leadership between principals and teachers is the focus. Furthermore, there are few randomized controlled trials on the effect of leadership development programs. Our study is an effort to assess the effect of an integrated principal/teacher leadership approach to leadership development (i.e., school leadership) via a randomized controlled trial.

**Description of the Rationale and Implementation of “High Impact Leadership (HIL) for School Renewal” Project**

**School Renewal as the Underlying Construct for the HIL Project**

Underlying the HIL project is the construct of school renewal. The project addresses a persistent issue for schools attempting to achieve transformative change resulting in significantly improved school and student outcomes. Principals are expected to lead teachers and others to sustain second-order (transformative) change (Starratt, 2011) and address a wide range of issues related to student achievement. Principals and teachers work in a complicated policy environment (O’Day, 2002) that requires strategic and systemic responses (Lemke & Sabelli, 2013). Yet, studies also show that transformative change happens at the school-level (Ma et al., 2020) and school principals play a significant role in shaping and leading that change (Wallace Foundation, 2013) with leadership practices that are highly distributed and inclusive (Heck & Hallinger, 2010). Therefore, based on our team’s previous funded projects and research, the fundamental idea underlying the HIL project is school renewal, a construct that emphasizes the collective role of the principal and teachers in balancing internal and external influences, using a “dialogue, decision, action, and evaluation” process for change initiative in the school with a focus on student achievement, implementing the change initiative with both integrity and fidelity, and engaging in a continuous renewal process as part of the intrinsic responsibility and
professionalism for both principals and teachers.

Table 1 illustrates the characteristics of the renewal model (vs. the reform model) (adapted from Shen & Burt, 2015; Shen et al., 2020; Shen, Ma, Mansberger, Bierlein Palmer, et al., 2021). As illustrated in Table 1, reform and, in most cases, state and district driven school improvement, are often (a) grounded in assumptions of deficiency and failure, (b) focused on “fixing” what is deficient or broken, (c) complicated by competing agendas, and (d) overly prescriptive and technical. By contrast, school renewal is (a) grounded in assumptions of strength and capacity, (b) focused on growth toward a desired state, (c) simplified by identifying priorities among competing agendas, and (d) adaptive and responsive to the school context. In other words, school renewal is an organic, whole-school approach that capitalizes on positivity, optimism, and collectivism, especially collective ownership and shared leadership and responsibility around the co-creation of school change.

**HIL Principles and Practices and the Renewal Cycle**

To operationalize the construct of school renewal, HIL’s four principles and sixteen practices were framed to grow a school’s capacity and motivation for sustained, strategic, and systemic change (Figure 1). To further guide the school renewal process in each school, Figure 2 was developed to coach school leadership teams to adopt specific leadership behaviors associated with the 16 HIL leadership practices and complete a full HIL School Renewal Cycle to implement evidence-based literacy practices. HIL facilitators trained principals and teacher leaders to guide, engage, and support their schools through ongoing cycles of school renewal to identify, progress monitor, and achieve priority growth targets for student literacy success and produce critical deliverables associated with implementation integrity and fidelity, including artifacts for each phase of the school renewal cycle as follows:
1. Student performance profile including both post hoc and real-time data to identify student strengths and growth edges (i.e., zones of proximal development).

2. School performance profile including real-time data to describe the current state of school practices and conditions to support student growth targets and determine growth opportunities for classroom, leadership, and school-wide support.

3. Priority student learning and classroom, leadership, and school-wide support practice growth targets. Priority growth targets (PGTs) for students are based on student zones of proximal development. Priority growth targets (PGTs) for teachers, school leaders, and other support personnel are based on student priority growth targets.

4. Gold Standard Implementation Guides (GSIGs) for the classroom, leadership, and school-wide support practices to achieve student priority growth targets. GSIGs for each School Renewal Cycle include (a) the Student PGTs to be achieved; (b) the Adult PGTs to be achieved; (c) the critical features (i.e., the fidelity elements) of each evidence-based classroom practice; (d) the gold standard teacher behaviors (i.e., the fidelity behaviors) to implement each critical feature; (e) the integrity adaptations teacher teams develop to implement the evidence-based practice (first, in ways that make best use of school and classroom resources, and second, in ways that fit the background, circumstances, and learning characteristics of the students); (f) real-time measures of student growth on PGTs, and (g) measures of full, sustainable implementation of classroom, leadership, and school-wide support practices.

5. Implementation Monitoring Plans that provide the process, timelines, progress benchmarks, roles and responsibilities for data collection, analysis, and reporting for each School Renewal Cycle (based on the measures identified in the GSIGs).
6. Implementation Dashboards that provide school-wide and stakeholder access to the key indicators and measures of progress meeting student and adult PGTs for the focus area of school renewal over school renewal cycles. The dashboard includes post hoc and real-time data with progress monitoring benchmarks for sustainable growth over time.

Critical to completing each school renewal cycle is a high degree of shared leadership, responsibility, and interdependence between principals and teachers and among teachers as professional co-creators of the school renewal process. For the 2.5 years of intervention, each school team completed at least one full cycle with some schools having started a second cycle.

More Details on the Implementation Process

A HIL facilitator, trained on the HIL model, worked with a school leadership team (consisting of the principal and three teacher leaders) in each school, and worked with the school through the leadership team, for at least an equivalent of 32 full days a year, using a gradual release approach when interacting with the school team. With the start of the HIL project, a HIL facilitator began engaging with a school in the experimental group, with a focus on gaining understanding of the school context and building rapport with the principal and the teacher leadership team. Using an appreciative, strengths-based approach to engaging with the school’s leadership team and staff, facilitators met weekly with school leadership teams, organized School Renewal Rounds (an adaptation of the Harvard Instructional Rounds process), assisted staff in developing school performance profiles to identify student literacy and adult practice growth edges, and helped the principal and teacher leaders guide the school-wide decision-making process to determine priority growth targets for the school’s first school renewal cycle. From that point forward, facilitators guided school teams through the five phases of school renewal at a pace appropriate to the school to achieve their priority growth targets. A gradual release
an approach was enacted with the school team in order to achieve a high degree of shared
ownership and efficacy among principals and teachers for the school renewal process. During the
2.5 years, facilitators worked with schools in the experimental group, helping school leadership
teams learn and apply high impact leadership practices to (a) assess their current state of student
literacy development and classroom literacy practice, (b) target specific areas for growth, (c)
align school-wide leadership and resources to achieve growth targets, (d) monitor
implementation and student growth with real-time data (including additional sessions of school
renewal rounds), and (e) monitor changes in classroom and leadership practice to ensure
sustainability. In addition to the school-based renewal work, each spring, fall, and summer
through March 2020, all facilitators and school teams in the experimental group came together to
network around the work with other participating schools in progress monitoring and celebration
summits.

**Intervention Fidelity**

Intervention fidelity was monitored via both outputs and outcomes. Outputs included (a)
the amount of time each facilitator worked with each school and the focus of the interactions,
and (b) school teams’ participation in summits and follow-up activities. More importantly,
outcomes include (c) various artifacts produced along the five cycles of the school renewal cycle.
A database on work records was established and updated biweekly to monitor the outputs and
outcomes and ensure the intervention fidelity.

**Research Questions**

Based on the literature review and the characteristics of the HIL project, we formulated
three questions for the study. What is the HIL project’s impact on principal leadership? What is
the HIL project’s impact on school leadership? What is the HIL project’s impact on student achievement?

**Methods**

**Experimental Design and Empirical Data**

HIL started in October 2017 with the participation of 152 schools in a mid-western state. Schools were randomly and evenly assigned to the experimental group (with intervention) and the control group (business as usual), and baseline equivalence was assessed (Appendix A). The treatment lasted 2.5 years, from October 2017 to March 2020. All schools contained grades 3 to 5 and had a student free and reduced-price lunch rate higher than the state’s average. Most of these schools were in urban and rural areas. The first cycle of survey data collection was carried out in the spring semester of 2018 (as the baseline). We invited all principals and teachers in the experimental and control groups to complete principal and teacher questionnaires (see Appendices B and C for sample information). The second cycle of data collection was carried out in the spring semester of 2020 when experimental schools had been treated for 2.5 years. Again, we invited all principals and teachers in the participating schools to take part in the data collection (see Appendices B and C for sample information). Different sets of principals and teachers responded to questionnaires between the two cycles of data collection. Overall, 144 (unique) principals and 2,866 (unique) teachers participated in the experiment, with the overall return rate as 47.7% for principals and 45.2% for teachers as well as acceptable differential attrition rates between the experimental and control groups for principals and teachers (Appendices B and C), meeting WWC’s standards for “tolerable threat of bias”. We obtained public, school-level achievement data and student individual achievement data from the Michigan Department of Education (MDE) on the Michigan Student Test of Educational
Progress (M-STEP). We focused on state testing data (measuring student academic achievement) as well as data on school contextual characteristics. M-STEP took place in Spring 2017, 2018, and 2019. The sample on M-STEP data also met WWC’s standards for “tolerable threat of bias” (See Appendix D for more details).

**Outcome Measures**

Established principal and teacher questionnaires were used to measure various aspects of principal leadership and school leadership. Principals responded to issues of leadership including, in three scales, (a) principal’s leadership, (b) principal’s data-informed decision-making, and (c) school’s orientation to school renewal (representing the effect on principal leadership and school leadership, see Appendix E). Teachers responded to issues of leadership in three scales: (a) principal leadership, (b) school’s orientation to school renewal, and (c) learning-centered school leadership (representing effect on principal leadership and school leadership, see Appendix F). All of these scales were well-established instruments. For example, numerous studies have been published that successfully validated the scales of (a) Data-Informed Decision-Making (Shen, Cooley, et al., 2012; Shen et al., 2016), (b) Learning-Centered School Leadership (Shen et al., 2018), and (c) Orientation to School Renewal (e.g., Ma et al., 2020; Shen et al., 2020; Shen, Ma, Mansberger, Bierlein Palmer, et al., 2021). The scale of (d) Principal Leadership came from the Programme for International Student Assessment (PISA).

The measures we established for student academic achievement came from M-STEP, a computer-based student assessment program designed to measure the extent to which students are mastering statewide (curriculum) content standards. These standards are developed for educators by educators and aim to ensure that students are prepared for workplace, career training, and higher education, with a detailed prescription on what students need to know and be
able to do in certain school subjects across grade levels. M-STEP covers English Language Arts (ELA), Math, Science, and Social Studies. For each school subject, M-STEP produces for each school (by grade) a measure of proficiency rate defined as the proportion of students within a school who achieve (or perform) at or beyond the highest academic level (i.e., the proficient level). In our case, we focused on ELA because the project partnered with the Reading Now Network and schools focused on literacy-related school renewal initiatives during the HIL intervention. M-STEP provided three waves of data on school proficiency rate. The baseline data were calculated for the spring semester of 2017, the second wave of data were calculated for the spring semester of 2018, and the final data were calculated for the spring semester of 2019. We originally aimed to utilize data to be calculated for the spring semester of 2020 as our final wave to align with data on principals and teachers and the end of the randomized trial, but MDE did not conduct state testing due to COVID-19.

The randomized trial went from October 2017 to March 2020 (2.5 years of treatment) and the student achievement data were for Spring 2017, 2018, and 2019. The test on student achievement captured the effect of 1.5 years of treatment (from October 2017 to March 2019 as the treatment period, with Spring 2017 M-STEP assessment as the baseline and Spring 2019 M-STEP assessment as the end point). As to effect on principal leadership and school leadership, the study was able to capture the effects of 2.5 years as designed because the second cycle of survey of the principals and teachers in both experimental and control groups was conducted in Spring 2020.

**Control Variables**

When we assessed the intervention effects on student outcomes (based on M-STEP data), we adjusted the intervention effects for time-varying characteristics of schools that students
attended. These school characteristics, functioned as control variables, included school (enrollment) size, proportion of male students, proportion of minority students, and proportion of students eligible for free or reduced-price lunch. They are often considered as the essential school contextual variables (see Ma et al., 2008). This information pertaining to school context is publicly available from MDE. To align with M-STEP data in our case (i.e., 2017, 2018, and 2019), we utilized school contextual information from the same years. Obviously, because school contextual characteristics may change from year to year (e.g., school size), the above school-level variables are time-varying.

**Statistical Analysis**

As discussed earlier, the principal instrument (questionnaire) contained three scales—(a) Principal Leadership and (b) Data-Informed Decision-Making for measuring principal leadership, and (c) Orientation to School Renewal for measuring school leadership—with a number of subscales for each scale. For each principal, the score for each subscale was computed using the method of valid average. There was also a total score for each scale. Therefore, the intervention effects were evaluated in terms of the three outcome measures reported by principals. Analysis of covariance (ANCOVA) was performed by means of multiple regression analysis to compare experimental schools with control schools on each outcome measure. In such a model, Cycle 2 data were used as the posttest measures and Cycle 1 data were used as the pretest measures.

Meanwhile, the teacher instrument (questionnaire) contained three scales—(a) Principal Leadership for measuring principal leadership, and (b) Orientation to School Renewal and (c) Learning-Centered School Leadership for measuring school leadership, with a number of items for each scale. For each teacher, the score for each subscale was computed using the method of
valid average. There was also a total score for each. Therefore, the intervention effects were evaluated in terms of the three outcome measures reported by teachers. Because a number of teachers might come from the same school, hierarchical linear modeling (HLM) was applied to address the data hierarchy of teachers (at level 1) nested within schools (at level 2). In our HLM model (which was a multilevel ANCOVA model), the teacher-level model adjusted the posttest measures with the pretest measures; and the school-level model compared experimental schools with control schools on each outcome measure.

We used the three waves of data on school proficiency rate to compare between the experimental and control as a way to evaluate the intervention effects on student outcome measures. Analytically, a two-level HLM growth model was developed with repeated measures (at level 1) nested within schools (at level 2) to examine the differences between experimental and control schools in the rate of growth in school’s ELA academic achievement. This analysis was based on Grade 3 data (in Spring 2017), Grade 4 data (in Spring 2018), and Grade 5 data (in Spring 2019). This design as such closely resembled a panel. The repeated-measures model (at the first level) set up the growth model (i.e., initial status and rate of growth) with adjustment over time-varying (by year) school characteristics of school (enrollment) size, proportion of male students, proportion of minority students, and proportion of students eligible for free or reduced-price lunch. At the school (second) level, the model compared experimental and control schools in terms of the rate of growth (and also the initial status) on each of the student outcome measures (i.e., school’s ELA proficiency rate on M-STEP).
Results

Results Based on Data Collected from Principals

When examining the intervention effects of the HIL project based on data collected from principals, we focused on principals who had both pretest and posttest measures, as required in a randomized pretest-posttest experiment (see Appendix B). Table 2 presents descriptive information of these principals on pretest (Cycle 1) and posttest (Cycle 2) measures on the three instruments administered to principals: (a) Principal Leadership (with a measurement scale of 1 to 6), (b) Data-Informed Decision-Making (with a measurement scale of 1 to 4), and (c) Orientation to School Renewal (with a measurement scale of 1 to 6).

Table 3 presents comprehensive information about the intervention effects of the HIL project on all three instruments and on the subscales under each instrument. All effects were positive, indicating that principals in experimental schools reported more improvement than principals in control schools (or the control schools) across all scales and across and the subscales under each scale. Some of these advantages reached statistical significance (\( p < .05 \)). Hedge’s \( g \) was used as a measure of effect size to quantify the magnitude or strength of the intervention effects. The criteria are small = .20, moderate = .50, and large = .80.

Based on data collected from principals, principals in the experimental group reported statistically significantly more improvement than principals in the control in Principal Leadership (effect = .44 on a 6-point scale). This intervention effect was nearly large (effect size = .73), thus bearing important practical importance. Specifically, principals in the experimental group reported statistically significantly more improvement than principals in the control group in three out of four aspects of Principal Leadership (effect size ranging from .55 to .70). These
specific intervention effects were either moderate or nearly large (effect size = .70 for curriculum development).

Principals in the experimental group reported statistically significantly more improvement than principals in the control group in their leadership in data-informed decision-making, with a nearly moderate effect size of .46. Specifically, principals in the experimental group reported statistically significantly more improvement than principals in the control group in four out of 11 aspects of data-informed decision-making (effect size ranging from .48 to .86). These specific intervention effects were either moderate (nearly moderate in the case of .48) or large (effect size = .86 for instructional strategies).

Meanwhile, principals in the experimental group reported statistically significantly more improvement than principals in the control group in two out of seven aspects of orientation to school renewal (with nearly moderate effect sizes of .43 and .49). Orientation to School Renewal is an instrument measuring school leadership. Overall, all of the statistically significant intervention effects among principals were at least moderately important practically.

Finally, Table 3 also provides information about model performance ($R^2$ = proportion of variance in posttest measures explained by pretest measures and intervention conditions of the experimental or control group. For example, in the case of principal leadership, 44 percent of the variance in posttest measures was accounted for. Based on the 10 percent standard in evaluating $R^2$ in social sciences, almost all estimates of $R^2$ were considered acceptable (see Gaur & Gaur, 2006).

**Results Based on Data Collected from Teachers**

Similarly, when we examined the intervention effects of the HIL project on outcomes based on data collected from teachers, we focused on teachers who had both pretest and posttest
measures (see Appendix C). Table 4 presents descriptive information of these teachers on pretest (Cycle 1) and posttest (Cycle 2) measures on the three scales of the teacher questionnaire (and Principal Leadership, Orientation to School Renewal, Learning-Centered School Leadership), all three with a measurement scale of 1 to 6). Table 5 presents comprehensive information about the intervention effects on all three instruments and on all subscales under each instrument. All effects were positive, indicating that teachers in experimental schools reported more improvement than teachers in control schools for all three instruments. These advantages for teachers in the experimental group over teachers in the control group all reached statistical significance except one subscale. It should be noted that Principal Leadership measured principals’ leadership while Orientation to School Renewal and Learning-Centered School Leadership measured school leadership. In other words, teachers perceived that the intervention made a statistically significant positive impact on both principal leadership and school leadership.

Based on data collected from teachers, teachers in the experimental group reported statistically significantly more improvement than teachers in the control in Principal Leadership, with a small effect size of .23. Specifically, teachers in the experimental group reported statistically significantly more improvements than teachers in the control group in all but one aspect of principal leadership (effect size ranging from .22 to .24). These specific intervention effects were small.

Teachers in the experimental group reported statistically significantly more improvement than teachers in the control group in Orientation to School renewal (effect = .42). This intervention effect was moderate (effect size = .53), thus bearing important practical importance. Specifically, teachers in the experimental group reported statistically significantly more
improvement than teachers in the control group across all subscales of orientation to school renewal (effect size ranging from .41 to .48). These specific intervention effects were nearly moderate.

Teachers in the experimental group reported statistically significantly more improvement than teachers in the control group in Learning-Centered School Leadership, with a moderate effect size of .58. Specifically, teachers in the experimental group reported statistically significantly more improvement than teachers in the control across all aspects of Learning-Centered School Leadership (effect size ranging from .23 to .60). Most of these specific intervention effects were either moderate or nearly moderate, with only one small intervention effect (effect size = .23 for safe and orderly school operation).

Overall, most of the statistically significant intervention effects among teachers were moderately important practically. Finally, Table 5 indicates that all estimates of $R^2$ for the models examining the intervention effects among teachers were considered acceptable. For example, in the case of Orientation to School Renewal, 26 percent of the variance in posttest measures was accounted for.

**Student Outcomes**

Based on school-level student academic achievement data for the (pseudo) panel of the 3rd grade in the Spring 2017, to the 4th grade in the Spring 2018, and to the 5th grade in Spring 2019, we compared schools in the experimental group with schools in the control group in terms of the rate of growth in school proficiency rate across Grades 3 to 5 in ELA. Table 6 presents descriptive information on student outcome measures across the three time points.

Table 7 presents the intervention effects of the HIL project on student outcomes in ELA. Experimental schools grew statistically significantly more in school proficiency rate than control
schools in ELA. Annually, the experimental schools grew 2.05 points more than the control schools in percentage of students who were proficient in ELA.\textsuperscript{3} Overall, the experimental schools grew 4.10 percentage points more than the control schools in school proficiency rate in ELA for the 1.5 years of duration of intervention under the HIL project. Finally, 24 percent of the variance among schools in the rate of growth in school proficiency rate across Grades 3 to 5 in ELA was accounted for.

**Summary and Discussion**

The randomized controlled trial of the HIL project resulted in positive effects for principal leadership, school leadership, and the ELA proficiency rate. Specifically, principals in the experimental group reported statistically significantly more growth in two out of three instruments than their counterparts in the control group—more growth in their leadership in general and in data-informed decision-making in particular, but no difference in the growth of school leadership as measured by School Orientation to Renewal. Teachers in the experimental group reported statistically significantly more growth in all three instruments—more growth in principal leadership as well as in school leadership as measured by both Orientation to School Renewal and Learning-Centered School Leadership. The above results based on data collected from principals and teachers captured the effect of the whole duration of 2.5 years of treatment as designed. In addition, annually the school-level ELA proficiency rate as measured by M-STEP increased 2.05 percentage points more for schools in the experimental groups than those in the control group, a result that was statistically significant. The result on the school-level ELA proficiency rate captured the effect of 1.5 years of treatment because the administration of M-STEP at the end point of design (Spring 2020) was canceled due to COVID-19.
In this study, we have found HIL’s positive effects on principal leadership, school leadership, and student achievement. In previous studies in the literature, the effects of leadership development programs tended to be limited to principals’ self-reported data. In the current study, we have found positive results on both principal leadership and school leadership based on data collected from teachers; we also found positive effects on school-level ELA proficiency rate based on a pseudo panel of the students who went from the third to the fifth grades. The design of the study and the overall findings provide some insights on effective leadership development programs. The following are among the learnings for using school leadership development programs as a vehicle to improve our schools.

**First, the bifurcation theory and the importance of going beyond principal leadership and teacher leadership in isolation or in parallel to focus on integrated school leadership.** As mentioned in the literature, one of the challenges in educational improvement is that the reform initiatives stop at the classroom door. The theory of bifurcated educational systems points to the importance of bridging the fault line between the classroom and the rest of the system. Unique features of the HIL project included training and coaching a team consisting of the principal and three teacher leaders in each school, and the team’s leadership in working with school stakeholders in planning, enacting, and reflecting on school renewal initiatives. These features of the HIL School Renewal process are all designed to integrate the motivation and the professional expertise within the school. This integration is focused on bridging the gap or fault line that traditional school improvement or reform systems have deepened. The intervention to the team, as opposed to the traditional approach of conducting either the principal leadership development program or a teacher leadership development program, put the construct and practice of school leadership at the forefront and focused that leadership on strengthening the
positive core, collective ownership, evidence-based decision-making, and organizational learning systems of the school.

The school leadership team in the HIL project appeared to be a mechanism to integrate principal and teacher leadership to address the challenge of the fault line associated with the bifurcated educational system. During the collective visioning, discovery, designing, enactment, monitoring, and reflection processes, both perspectives from the principal and the teachers were elicited and utilized to select and implement evidence-based (literacy) renewal initiatives with growth in evidence-based classroom instruction aligned with a school-wide leadership and support system, thus, creating a way to bridge the classroom and the rest of the educational system. The school leadership team in HIL also had the political power to lead the planning, enactment and reflection of the school renewal initiatives. The results indicated that principals reported positive effects on their leadership, that teachers reported positive effects on, not only the principal leadership, but also the school leadership after 2.5 years of treatment. The project had a positive effect on ELA proficiency rate, even after only 1.5 years of treatment. To integrate the teacher leadership and principal leadership with a focus on school leadership appears to be an effective strategy.

**Second, school as the unit for change.** Identifying the critical unit for educational change is a classic topic. The concept and practice of school leadership indicate the need to transcend the individual principal or individual teachers, and emphasize school as the unit for change. This point is similar to Jacob et al.’s (2015) randomized trial on Balanced Leadership where they discussed their finding of the lack of effects based on teachers’ perceptions and student achievement and argued that even if principals changed their practices substantially,
without the larger efforts of the whole school including involving teachers, it was not enough for improving school leadership and student achievement.

The argument for “school as the unit for change” does not negate the roles of the state department of education and school district. For example, school districts play an important role in providing the financial and human resources for change, as well as helping schools craft coherence regarding external demands (Honig & Hatch, 2004). However, a school is an organic whole, and it is the unit for a fundamental transformation (Goodlad, 2010; Ma et al., 2020; Marzano et al., 2014, 2018; Shen, 1999). Furthermore, as part of the research work to further validate the instrument on Orientation to School Renewal, we tested various measurement models and generated a valid and highly reliable measure or estimate of school renewal at the school level (Ma et al., 2020), a finding that also supports the thesis “school as the unit for change”.

Third, the power of inter-school relationships. “School as the unit for change” does not mean that each school works alone. Just like the ideas of inter-organizational relationship (Shen et al., 2004) and networked improvement community (Bryk et al., 2015), the HIL project facilitates inter-school relationships. During the HIL project’s sharing and learning sessions, schools were encouraged to share their best practices and learn from each other. Additional research during the HIL project indicates that the inter-school relationship—both the quantity and quality of the relationship (i.e., moving from one way resource dependence theory to two-way resource exchange theory, and to the even higher level of two-way relationship of simultaneous renewal) as measured by various network indices—are positively associated with not only the school’s current achievement level, but also the year-by-year growth of the school’s achievement level (Zheng et al., under review). The reciprocal relationship, a particular form of
the inter-school relationship with an emphasis on bi-directionality, is even more positively associated with not only the school’s current achievement level, but also the year-by-year growth of the school’s achievement level (Wu et al., 2021). The experience with the HIL project indicates that it is the emphasis on school as the unit for change that makes the inter-school relationship more meaningful because it transcends the individual-level network relationship and focuses more on the school-to-school relationship.

**Fourth, the simultaneous emphasis on both the “content” and “process” of school leadership.** The HIL project emphasized both the “content” (i.e., the four high impact leadership principles (Positive Core, Collective Ownership, Evidence-Based Decisions, and Organizational Learning) and 16 practices, the seven dimensions of learning-centered school leadership, and best practices in literacy instruction), and the “process” (the “school renewal” process and the five phases of the school renewal cycle). Most of the leadership development programs tend to focus either on the content (such as a set of leadership practices) or the process (such as a model of implementation). However, on the one hand, an emphasis on content without process would lead to an increase in knowledge, but the effect on practices and school outcomes would be limited. On the other hand, an emphasis on process without content tends to treat process for the sake of process and does not have the substance for the implementation.

In the literature, there are some instances of the emphasis on both the content and process for a leadership development program. For example, although Vanderbilt Assessment of Leadership in Education is an instrument for assessing principal leadership rather than school leadership, it has, in its six by six framework, six dimensions of core components and six dimensions of processes (Porter et al., 2010a, b). Similarly, based on the results of their randomized controlled trial, Jacob et al. (2015) also discussed that leadership training for
principals without contextual and sustained implementation, including involving teachers, is not enough, a comment indicating that the training on the content (i.e., the 21 responsibilities embedded in the Balanced Leadership Framework) without the contextual and sustained implementation by working with teachers, among others, was not enough to lead to positive effects as perceived by teachers and at the student level. The thesis on the dual emphasis on both the content and process is also consistent with the meta-analysis finding that leadership’s effect is primarily indirect and moderated (Shen & Wu, under review). Therefore, principals and teachers must learn to have their effects via various school processes and by taking into account the contextual variables such as the school’s demographic and economic factors. Therefore, school leadership development programs must pay simultaneous attention to both the content and process of the school renewal.

**Fifth, the balance between implementation fidelity and integrity based on data-informed decision-making.** This discussion point is related to the previous one. In the process of planning, implementing and reflecting upon school renewal initiatives, it is important to base the implementation process on data-informed decision-making and a balance between implementation integrity and fidelity. The dominant paradigm in the change literature is implementation fidelity, with an assumption that once a practice or program has been developed and validated, all that matters is to implement the practice or program with fidelity. In the HIL project, both implementation integrity and fidelity are emphasized. First, based on the analysis and discussion of data (such as the school renewal rounds during the phase 1 of the renewal cycle), the principals, teachers and other stakeholders decide what is most important for the school to do at this time point, i.e., an issue of implementation integrity. Second, research-supported elements of a change initiative are then adopted and adhered to with observably
aligned behaviors to address the most important issues for the schools, i.e., an issue of implementation fidelity. Finally, implementation fidelity does not mean mechanical implementation. Contextual adaptations must be made in how actors in the school environment carry out those fidelity behaviors in ways that are sustainable, appropriate and responsive to the context of the school, i.e., another aspect of implementation integrity. Therefore, the implementation process is an interaction between integrity and fidelity that is sustained and enhanced by data-informed decision-making.

Finally, the school renewal model and “an image of the possible” for improving our schools. Underling the HIL project is the construct and practice of school renewal. Our previous scholarship on developing and validating the instrument titled Orientation to School Renewal distilled the seven characteristics of school renewal as opposed to school reform (Shen & Burt, 2015; Shen et al., 2020; Shen, Ma, Mansberger, Bierlein Palmer, et al., 2021). The HIL project generated more learnings as illustrated in the above discussion points, including (a) advocate for school leadership by integrating teacher and principal leadership, (b) use data as the entry point and for decision-making, (c) emphasize both implementation integrity and fidelity, (d) focus on both “content” and “process” of school renewal, (e) use school as the unit for change, (f) harness the power of the social network in education via interschool-school relationships, and (g) engage in school renewal as a sustained process. These learnings substantiate the renewal model which illustrates an image of the possible for improving our schools.

Limitation of the Study

The study has its limitations. First, the intervention period was for 2.5 years, from October 2017 to March 30, 2020. However, due to COVID-19, the end-point testing for student achievement, originally scheduled for April 2020 per Michigan Department of Education’s
guideline, was canceled. Therefore, the testing for the effect on student achievement used the data up to April 2019; we were not able to capture the effect on student achievement up to the end of the project. Second, the findings in the manuscript were the effects on (a) principal leadership, (b) school leadership, and (c) school-level student achievement. In the near future, we will model how a principal's change in leadership is related to the change in school leadership and to the change in student achievement, so that we move from the research question of what happened to how it happened. Third, given the State’s and key partners’ emphasis on literacy, the project focused on literacy. Therefore, the application of HIL was toward literacy. For future research, it would be important to extend the application of HIL to other subjects. Much work is needed in finding effective leadership development programs to improve our schools and student achievement.

Footnote

1. The collection and application of all data were approved by the Institutional Review Board (IRB).

2. M-STEP calculates a proficiency rate on each school subject for each school and stores the information in a public database on Michigan schools referred to as MI School Data.

3. Because percentage is usually considered a measure of effect size by itself, we did not covert the intervention effects to measures of effect size in the case of student outcomes.
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Figure 1. The HIL Model for School Renewal: Principles and Practices
Figure 2. The HIL School Renewal Cycle
Table 1

*School Reform Model versus School Renewal Model*

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<thead>
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<th>The “Reform” Model</th>
<th>The “Renewal” Model</th>
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</thead>
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<td>Driven by the reform agenda</td>
<td>Driven by continuous growth toward a desired state</td>
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<tr>
<td>Externally driven</td>
<td>Balance between internal and external influences</td>
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<tr>
<td>The research, development, dissemination and evaluation (RDDE) process</td>
<td>The dialogue, decision, action and evaluation (DDAE) process</td>
</tr>
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<td>Implementation fidelity</td>
<td>Implementation integrity and fidelity</td>
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<td>Implementers as passive receivers</td>
<td>Implementers as active co-developers</td>
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<tr>
<td>External accountability</td>
<td>Intrinsic responsibility and professionalism</td>
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Table 2

Descriptive Statistics on Outcome Measures Reported by Principals, Cycles 1 and 2

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<td>4.87</td>
<td>.51</td>
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<td>4.44</td>
<td>.68</td>
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Note. Descriptive results are based on 71 schools (principals) with two cycles of data.

Experimental group = 36 schools. Control group = 35 schools.
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<td>.65</td>
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<tr>
<td>Focus on students and their achievement</td>
<td>.29†</td>
<td>.16</td>
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Continuous school improvement    .17    .17    .23    .20
Balance between the internal and external influences    .11    .17    .15    .09
The dialogue, decision, action and evaluation (DDAE) process    .37*    .18    .49    .15
Implementation integrity    .18    .20    .22    .10
Implementers as active developers    .12    .20    .14    .09
Internal responsibility and professionalism    .26    .20    .29    .19

Note. * p < .05. † p < .07. Analytical results are based on 71 schools (principals) with two cycles of data. Experimental group = 36 schools. Cohort group = 35 schools. SE = standard error. ES = effect size (Hedge’s g). $R^2$ = proportion of variance in each measure explained by the regression model including posttest scores as the dependent variable and pretest scores and intervention condition (Experimental vs Control) as the independent variables.
Table 4

*Descriptive Statistics on Teacher Outcome Measures, Cycles 1 and 2*

<table>
<thead>
<tr>
<th>Measure</th>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>3.75</td>
<td>1.08</td>
<td>4.18</td>
<td>1.08</td>
</tr>
<tr>
<td>Control</td>
<td>3.74</td>
<td>1.18</td>
<td>3.89</td>
<td>1.15</td>
</tr>
<tr>
<td>School’s Orientation to School Renewal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>4.42</td>
<td>.77</td>
<td>4.87</td>
<td>.71</td>
</tr>
<tr>
<td>Control</td>
<td>4.47</td>
<td>.88</td>
<td>4.45</td>
<td>.88</td>
</tr>
<tr>
<td>Learning-Centered School Leadership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>4.08</td>
<td>.75</td>
<td>4.59</td>
<td>.73</td>
</tr>
<tr>
<td>Control</td>
<td>4.17</td>
<td>.80</td>
<td>4.18</td>
<td>.81</td>
</tr>
</tbody>
</table>

*Note.* Descriptive results are based on 1,250 teachers with two cycles of data. Experimental group = 648. Control group = 602.
### Table 5

*Intervention Effects on Gains between Cycles 1 and 2 Based on Teacher Data*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Effect</th>
<th>SE</th>
<th>ES</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Leadership</td>
<td>.26*</td>
<td>.12</td>
<td>.23</td>
<td>.18</td>
</tr>
<tr>
<td>Curriculum development</td>
<td>.25*</td>
<td>.11</td>
<td>.24</td>
<td>.16</td>
</tr>
<tr>
<td>Instructional leadership</td>
<td>.32*</td>
<td>.13</td>
<td>.24</td>
<td>.17</td>
</tr>
<tr>
<td>Teacher participation in leadership</td>
<td>.27*</td>
<td>.12</td>
<td>.22</td>
<td>.14</td>
</tr>
<tr>
<td>Instructional improvements and professional development</td>
<td>.18</td>
<td>.15</td>
<td>.12</td>
<td>.16</td>
</tr>
<tr>
<td>Orientation to School Renewal</td>
<td>.42*</td>
<td>.08</td>
<td>.53</td>
<td>.26</td>
</tr>
<tr>
<td>Focus on students and their achievement</td>
<td>.33*</td>
<td>.08</td>
<td>.41</td>
<td>.18</td>
</tr>
<tr>
<td>Continuous school improvement</td>
<td>.37*</td>
<td>.07</td>
<td>.47</td>
<td>.20</td>
</tr>
<tr>
<td>Balance between the internal and external influences</td>
<td>.40*</td>
<td>.08</td>
<td>.43</td>
<td>.20</td>
</tr>
<tr>
<td>The dialogue, decision, action and evaluation (DDAE) process</td>
<td>.49*</td>
<td>.10</td>
<td>.48</td>
<td>.19</td>
</tr>
<tr>
<td>Implementation integrity</td>
<td>.51*</td>
<td>.10</td>
<td>.48</td>
<td>.21</td>
</tr>
<tr>
<td>Implementers as active developers</td>
<td>.41*</td>
<td>.08</td>
<td>.42</td>
<td>.15</td>
</tr>
<tr>
<td>Internal responsibility and professionalism</td>
<td>.41*</td>
<td>.08</td>
<td>.44</td>
<td>.22</td>
</tr>
<tr>
<td>Learning-Centered School Leadership</td>
<td>.45*</td>
<td>.07</td>
<td>.58</td>
<td>.32</td>
</tr>
<tr>
<td>Data-informed decision-making</td>
<td>.52*</td>
<td>.08</td>
<td>.55</td>
<td>.25</td>
</tr>
<tr>
<td>Safe and orderly school operation</td>
<td>.22*</td>
<td>.10</td>
<td>.23</td>
<td>.21</td>
</tr>
<tr>
<td>High, cohesive, and culturally relevant expectations for all students</td>
<td>.35*</td>
<td>.07</td>
<td>.43</td>
<td>.25</td>
</tr>
<tr>
<td>Distributive and empowering leadership</td>
<td>.53*</td>
<td>.09</td>
<td>.53</td>
<td>.28</td>
</tr>
<tr>
<td>Coherent curricular programs</td>
<td>.63*</td>
<td>.09</td>
<td>.60</td>
<td>.31</td>
</tr>
<tr>
<td>Real-time and embedded instructional assessment</td>
<td>.41*</td>
<td>.07</td>
<td>.48</td>
<td>.27</td>
</tr>
</tbody>
</table>
Commitment and passion for school renewal

|               | .40* | .08 | .45 | .27 |

Note. * p < .05. Analytical results from hierarchical linear modeling (HLM) are based on 1,250 teachers from 127 schools with two cycles of data. Experimental group = 648 teachers from 62 schools. Control group = 602 teachers from 61 schools. SE = standard error. ES = effect size (Hedge’s g). R² = proportion of overall variance in each measure explained by the HLM model with posttest scores as the dependent variable, pretest scores as the independent variable at Level 1, and intervention condition (experimental vs control) as the independent variable at Level 2.
Table 6

*Descriptive Statistics on Student Measures (School-Level ELA Proficiency Rate), 2017 to 2019*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2017</td>
<td></td>
<td>2018</td>
<td></td>
<td>2019</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>18.95</td>
<td>7.38</td>
<td>19.69</td>
<td>7.21</td>
<td>25.95</td>
<td>9.65</td>
</tr>
<tr>
<td>Control</td>
<td>20.77</td>
<td>7.96</td>
<td>19.71</td>
<td>7.75</td>
<td>21.34</td>
<td>8.84</td>
</tr>
</tbody>
</table>

*Note.* Descriptive results are based on school proficiency rate calculated from M-STEP data.
### Table 7

*Intervention Effects on Rate of Growth in School ELA Proficiency Rate across Years from 2017 to 2019 (Grade 3 in 2017, Grade 4 in 2018, and Grade 5 in 2019)*

<table>
<thead>
<tr>
<th></th>
<th>Effect</th>
<th>SE</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Status (in 2017)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental vs Control</td>
<td>-1.52</td>
<td>1.06</td>
<td>.03</td>
</tr>
<tr>
<td><strong>Rate of Growth (from 2017 to 2019)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental vs Control</td>
<td>2.05*</td>
<td>.80</td>
<td>.24</td>
</tr>
</tbody>
</table>

*Note.* *p* < .05. Estimates are adjusted for time-varying (by year) school characteristics of school (enrollment) size, proportion of male students, proportion of minority students, and proportion of students eligible for free or reduced-price lunch. $R^2 = $ proportion of variance in each parameter explained by the HLM model with repeated measures as the dependent variable and grade level as the independent variable at Level 1, and intervention condition (experimental vs control) as the independent variable at Level 2.
### Appendix A

#### Baseline Equivalence

<table>
<thead>
<tr>
<th>Group</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>EXP</td>
<td>76</td>
<td>22.33</td>
<td>27.43</td>
<td>.16</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>76</td>
<td>18.08</td>
<td>25.22</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>EXP</td>
<td>76</td>
<td>55.93</td>
<td>32.50</td>
<td>.19</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>76</td>
<td>62.04</td>
<td>33.24</td>
<td></td>
</tr>
<tr>
<td>Free Lunch</td>
<td>EXP</td>
<td>76</td>
<td>72.03</td>
<td>16.02</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>76</td>
<td>69.89</td>
<td>15.98</td>
<td></td>
</tr>
<tr>
<td>ELA Gr3 Prof. Rate</td>
<td>EXP</td>
<td>62</td>
<td>18.95</td>
<td>7.38</td>
<td>.24</td>
</tr>
<tr>
<td></td>
<td>CON</td>
<td>60</td>
<td>20.77</td>
<td>7.96</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Means are in the form of percentage for all variables. For each variable, Effect size (ES) is calculated as difference in means between EXP and CON divided by pooled standard deviation.
### Appendix B

**Principal Questionnaire Sample Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Common</th>
<th>Return Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>76</td>
<td>67</td>
<td>36</td>
<td>47.4%</td>
</tr>
<tr>
<td>Control group</td>
<td>73</td>
<td>72</td>
<td>35</td>
<td>47.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>149</td>
<td>139</td>
<td>71</td>
<td>47.7%</td>
</tr>
</tbody>
</table>

*Overall attrition rate = 52.3%; attrition rate for experimental group = 52.6%; attrition rate for experimental group = 52.1%; differential attrition rate = 0.5%. The combination of the overall attrition rate and differential attrition rate meet the WWC standards for “tolerable threat of bias.”*
### Appendix C1

Teacher Questionnaire Sample Statistics (Teacher as the Unit)

<table>
<thead>
<tr>
<th></th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Common</th>
<th>Return Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>1,447</td>
<td>1,288</td>
<td>648</td>
<td>44.8%</td>
</tr>
<tr>
<td>Control group</td>
<td>1,318</td>
<td>1,313</td>
<td>602</td>
<td>45.7%</td>
</tr>
<tr>
<td>Total</td>
<td>2,765</td>
<td>2,601</td>
<td>1250</td>
<td>45.2%</td>
</tr>
</tbody>
</table>

*Overall attrition rate = 54.8%; attrition rate for experimental group = 55.2%; attrition rate for experimental group = 54.3%; differential attrition rate = 0.9%. The response patterns are similar to teachers in the experimental and control groups for both cycles 1 and 2. Much of the attrition was exogenous to the intervention. Therefore, the combination of the overall attrition rate and differential attrition rate met the WWC standards for “tolerable threat of bias” under optimistic assumptions.*
Appendix C2
Teacher Questionnaire Sample Statistics (School as the Unit)

<table>
<thead>
<tr>
<th></th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Common</th>
<th>Return Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>76</td>
<td>68</td>
<td>62</td>
<td>81.6%</td>
</tr>
<tr>
<td>Control group</td>
<td>72</td>
<td>72</td>
<td>61</td>
<td>84.7%</td>
</tr>
<tr>
<td>Total</td>
<td>148</td>
<td>140</td>
<td>123</td>
<td>83.1%</td>
</tr>
</tbody>
</table>

*Overall attrition rate = 16.9%; attrition rate for experimental group = 18.4%; attrition rate for experimental group = 15.3%; differential attrition rate = 3.1%.
Appendix D
School Sample Statistics for School-Level ELA Proficiency

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of schools with 3rd grade Prof. rate in Spring 2017</td>
<td>62</td>
<td>60</td>
<td>122</td>
</tr>
<tr>
<td>No of schools with 4th grade Prof. rate in Spring 2018</td>
<td>60</td>
<td>56</td>
<td>116</td>
</tr>
<tr>
<td>No of schools with 5th grade Prof. rate in Spring 2019</td>
<td>34</td>
<td>32</td>
<td>66</td>
</tr>
<tr>
<td>Retention rate</td>
<td>45.2%</td>
<td>46.7%</td>
<td>45.9%</td>
</tr>
</tbody>
</table>

*Overall attrition rate = 54.1%; attrition rate for experimental group = 54.8%; attrition rate for experimental group = 53.3%; differential attrition rate = 1.5%. MDE did not publish proficiency rates for all grades tested for all years due to its administrative rules. Much of the attrition was exogenous to the intervention. Therefore, the combination of the overall attrition rate and differential attrition rate met the WWC standards for “tolerable threat of bias” under optimistic assumptions.
Appendix E
Principal Questionnaire (Including Three Instruments)

Scale 1: Principal Leadership. Below are statements about your management of this school. Please indicate the frequency of the following activities and behaviors in your school during this academic year.

1. I use student performance results to develop the school’s educational goals.
2. I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school.
3. I ensure that teachers work according to the school’s educational goals.
4. I promote teaching practices based on recent educational research.
5. I praise teachers whose students are actively participating in learning.
6. When a teacher has problems in his/her classroom, I take the initiative to discuss matters.
7. I draw teachers’ attention to the importance of students’ development of critical and social capacities.
8. I pay attention to disruptive behavior in classrooms.
9. I provide staff with opportunities to participate in school decision making.
10. I engage teachers to help build a school culture of continuous improvement.
11. I ask teachers to participate in reviewing management practices.
12. When a teacher brings up a classroom problem, we solve the problem together.
13. I discuss the school’s academic goals with teachers at faculty meetings.

(Response: Did not occur, 1-2 times during the year, 3-4 times during the year, Once a month, Once a week, More than once a week)

Scale 2: Data-informed Decision-making. Please indicate to which extent you engage in the following activities.

1. Tracking the identification, organization, and sequencing of the district essential curriculum
2. Monitoring communication of the district essential curriculum expectations
3. Tracking allocation of time for students to learn the essential curriculum
4. Monitoring alignment of classroom instruction to the district essential curriculum
5. Establishing specific goals for individual students
6. Providing timely feedback on student progress through aligned classroom assignments
7. Developing specific, challenging school goals
8. Frequent monitoring on progress toward school goals
9. Monitoring frequency of communications between school and parents
10. Monitoring quality of communication between school and parents
11. Tracking parent and community involvement in school activities
12. Tracking parent and community involvement in school governance
13. Tracking student behavior patterns to establish school-wide behavior expectations
14. Early detection of violent and extreme behavior
15. Monitoring effectiveness of consequences for inappropriate student behavior
17. Tracking teacher collegiality and professionalism
18. Monitoring teacher involvement in school decision-making processes
19. Tracking teacher engagement in and effectiveness of professional development
20. Monitoring the development of a shared professional vocabulary for teaching and learning
21. Monitoring units of instruction for employment of research-based strategies
22. Monitoring adaptation of classroom instruction to meet individual student needs
23. Monitoring teacher utilization of instructional strategies that work
24. Monitoring the establishment of consistent classroom rules and effective classroom routines
25. Monitoring the effectiveness of classroom behavior interventions with diverse students
26. Monitoring the quality of teacher/student relationships
27. Tracking teacher clarify on the goals of instruction
28. Monitoring the presentation of new content in multiple learning modes
29. Tracking teacher organization of knowledge, skills, and content to facilitate learning
30. Tracking engagement of students in complex tasks involving higher cognitive processes
31. Tracking parent communication with their children about school
32. Tracking parent support for learning in the home environment
33. Tracking evidence of parent supervision
34. Tracking parent communicated expectations for their children
35. Tracking student experiences in and out of school
36. Tracking student reading patterns for breadth and depth
37. Tracking student vocabulary development
38. Monitoring direct instruction on vocabulary and phrases important to specific subject matter
39. Monitoring feedback to students on learning achievements
40. Tracking learning activities for levels of student engagement
41. Tracking student opportunities to construct and work on long-term projects of their own design
42. Tracking student understanding of personal motivation and efficacy

(Response: Not at all, Very little, Somewhat, To a great extent)

**Scale 3: Orientation to School Renewal.** Please indicate the extent to which you agree with the following statements regarding the current status of your school.

1. Our school improvement process is guided strongly by the goal of improving student achievement.
2. Our school truly has high expectations for all students.
3. All teachers have a clear, shared vision about expectations for all students.
4. Our school has a continuous focus on teaching and learning.
5. All our teachers continuously seek ways to enhance the teaching and learning processes.
6. Our school consistently uses a continuous improvement process/strategy, rather than starting from scratch for each initiative.
7. We openly welcome ideas and input on school improvement from all stakeholders.
8. We successfully balance external pressure and internal initiative for school improvement.
9. We successfully prioritize our school improvement efforts despite competing priorities.
10. We consistently dialogue in our school about our school improvement priorities.
11. Our school improvement strategies are well coordinated within the school.
12. Our school successfully monitors the progress of our school improvement initiatives with data.

13. We consistently monitor our data and develop school improvement initiatives accordingly.

14. We have a clear process in place to continuously generate new ideas for school improvement.

15. We consistently re-prioritize school improvement efforts based on continuous data updates.

16. Our school really decides our school improvement priorities.

17. We usually develop our own programs for school improvement (rather than buying from an external vendor).

18. We consistently adapt and adjust existing programs based on our outcome data.

19. We all hold ourselves and each other accountable.

20. We all hold our students accountable for their own achievement.

21. Continuous reflection on school improvement is part of our professional culture.

(Response: Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)
Appendix F
Teacher Questionnaire (Including Three Instruments)

**Scale 1: Principal Leadership.** Same as in Principal Questionnaire.

**Scale 2: Orientation to School Renewal.** Same as in Principal Questionnaire.

**Scale 2: Learning-Centered School Leadership.** Please indicate the extent to which you agree with the following statements regarding the current status of your school.

1. We consistently analyze student achievement to establish school improvement goals.
2. We collaborate with each other across grade levels to conduct inquiry using school-wide data.
3. We have received adequate professional development on analyzing and interpreting data.
4. We have strong support from the central office administration for using data for decision-making.
5. We have sufficient technology to utilize the data we need.
6. We consistently use data from multiple sources to monitor student learning.
7. We have comprehensive safety policies and procedures in place.
8. We have a positive school climate conducive to student learning.
9. We have good policies to protect students from cyber and other bullying.
10. We consistently monitor and work to reduce student behavior referrals.
11. Our building overall is in good physical condition.
12. We have policies that effectively promote respect for differences in our school environment.
13. We have an effective process for students to set learning expectations for themselves.
14. Our teachers design learning activities that are relevant to our students’ personal backgrounds.
15. We consistently share specific learning goals with our students.
16. Our school activities engage students and their families in ways that relate to their family circumstances and cultures.
17. We regularly monitor and address student achievement gaps.
18. We utilize strategies to engage parents fully as instructional partners.
19. The majority of our teachers are involved in school leadership activities via committees or other organizational structures.

20. We have an environment in which teachers feel very comfortable in offering input on needed improvements.

21. The majority of our teachers engage in peer observations and feedback.

22. We have an environment in which teachers work together closely on school improvement activities.

23. We have one or more fairly strong professional learning communities in place within our school.

24. We have a culture of collective responsibility among all teachers and staff within our school.

25. Our curriculum is well aligned horizontally and vertically across grades in our school.

26. Our teachers regularly meet to discuss how they are interpreting the curriculum and building lessons/units.

27. Our teachers regularly meet to share and evaluate instructional strategies for teaching the curriculum units and lessons.

28. Our teachers consistently meet to design student work and formative assessments.

29. Our teachers consistently communicate the key curriculum performance standards to students and parents.

30. Our students consistently track their own progress in mastering key curriculum performance standards.

31. We consistently implement biweekly or more frequent assessments in each subject at each grade level.

32. Our teachers consistently use data from formative assessments to inform further instruction.

33. Our teachers meet with students on a regular basis to review their formative assessment data.

34. All our teachers understand and utilize formative assessments.

35. We consistently use different feedback strategies depending on the needs of the students.

36. Our students understand what they are to learn on a daily basis.
37. We have a culture in which teachers hold themselves accountable for student achievement.
38. We have a school culture where teachers learn from each other.
39. We regularly celebrate our successes.
40. All of our teachers and staff are continuously seeking ways to enhance the teaching and learning processes in our school.
41. We have a clear, shared vision about what we want and expect for all students.
42. We have a positive school environment in which student learning is the primary focus.

(Response: Strongly disagree, Moderately disagree, Slightly disagree, Slightly agree, Moderately agree, Strongly agree)