

# **The Four P's of Increasing Math Achievement: Building Teacher Leadership through Partnerships, Pedagogy, Practice, and Professional Development**

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## **Introduction**

School districts struggle to find appropriate and effective professional development in order for teachers to better meet the diverse academic needs of students. To address the challenges of improving teacher practice in order to increase student math achievement, building teacher leadership capacity is imperative. The Metropolitan School District of Pike Township in Indianapolis, Indiana, has addressed this challenge by focusing on teaching and learning through the development of teacher leaders. Investing in their talents and expertise, district staff (through an instructional coaching model) has built sustainability to withstand staffing changes. Once in place, coaches created a comprehensive, innovative, intensive professional development plan for K–12 teachers. The district collaborated with teachers to define best practices and communicate expectations to create a systemic framework for ongoing reflection and improvement of instruction.

## **Demographics**

The MSD of Pike Township is one of the largest school communities in the metropolitan Indianapolis area, with 10,567 students, from kindergarten to high school with fourteen schools. It offers a wide variety of educational programs to support the varied needs of its growing student population. The MSD of Pike Township represents a district rich in racial, cultural, ethnic, and socio-economic diversity. Pike schools have an 84% percent population of multi-ethnic students. The district has more than 851 international students, who represent 64 countries and speak 68 languages. A current breakdown of district population is listed in Figure 1.

**Figure 1.** 2007–08 Demographic Data

African American	Caucasian	Hispanic	Multiracial	Asian	ENL	Special Education	Free/Reduced
58%	17%	15%	8%	3%	14%	16%	40%

## **History**

In 2001, the MSD of Pike Township and other Indianapolis School Districts were challenged by the Lilly Endowment Inc. to create a proposal to transform teaching and learning in their districts. Pike identified these key challenges for improvement:

- Decreasing standardized test scores,
- Ineffective use of current assessment data,
- Lack of a unified “best practice” approach to classroom instruction.

The Lilly Endowment Inc. awarded the district \$3.8 million dollars to meet and address the key challenges through a comprehensive K–12 professional development program. This program focused on improving the professional practice of teachers by identifying district best practices, by gathering data to make instructional decisions, and by implementing an instructional coaching model. The intended outcome was, and continues to be, improved student achievement.

The grant funding from Lilly allowed Pike to hire qualified educators to become instructional coaches. Through workshops, coaching, model teaching, planning meetings, book studies, and facilitation, our professional development model was born. Moreover, this instructional coaching model was the key to unlocking the potential within Pike teachers to equip them to better meet the academic needs of Pike’s diverse students.

Through the years, this comprehensive professional development program has been funded through various sources, including, Lilly Endowment, Marion County Public Schools Initiative, Title I, II, III and High Ability Grants, along with math science grants through IMI (the National Science Foundation) and, most recently, through the Indiana Department of Education. In addition, local support was provided by the Pike Township School District General Fund and Pike Educational Foundation.

The partnership between the MSD of Pike Township and Indiana University began in 1997 and continues to positively impact student performance and teacher practice, thanks to the National Science Foundation Math and Science Partnership grant. The collaboration among the nine urban school districts in the Indiana Mathematics Initiative (IMI) consortium focused on increasing the capacity to deliver effective standards-based mathematics teaching to all students. The project emphasized improving student achievement through two key areas: 1) comprehensive professional teacher development in math content and pedagogy, and 2) support for strong teacher leadership in Pike schools. These key areas were a perfect match for the existing instructional coaching model.

## **Instructional Coaching Model**

Effective support for teachers is the key to enhancing professional practices and improving student achievement. An instructional coaching model using highly qualified teachers with a variety of levels of experience and expertise provided the framework for teacher support. Teacher leaders were selected for having the following:

- instruction and assessment skills,
- content knowledge and knowledge of data analysis,

- skill in differentiation,
- knowledge of district best practices,
- experience in working with adult learners,
- facilitation skills,
- experience in coaching.

And also for the following characteristics:

- collaborative,
- creative and energetic,
- confident initiators and team players.

The coaching model included co-lesson planning, modeling and debriefing, classroom instruction, team teaching, one-on-one targeted assistance, data analysis, resource gathering, new teacher support, differentiation support, and ongoing feedback to teachers through dialogue and reflection. The IMI partnership brought a new source of teacher leadership to the district by training interested Pike teachers in math content, instructional strategies, and leadership. IMI provided Pike with well-trained math coaches, select cadre (elementary classroom teachers trained in effective math instruction), and middle and high school liaisons to direct professional math development and provide teacher support throughout the district and within individual schools. These experts provided a wealth of knowledge and experience by guiding district workshops, staff meeting presentations, book studies, team and grade-level meetings, and data analysis work sessions. The IMI partnership brought a new dimension to Pike’s instructional coaching model that strengthened not only teacher practice and content knowledge but was the impetus for adding an instructional coach with expertise in math. In addition, the IMI partnership empowered teacher leaders through its leadership transfer training. This training provided the opportunity to increase teacher leadership capacity by helping teachers develop confidence in their math content knowledge. Also, this training offered teachers strategies to support and guide their fellow colleagues in strengthening their own instructional practice.

The most popular professional development event offered in Pike is the annual *Best Practice Institute*, which highlights the talents of educators and leaders throughout the school district, allowing teachers to select the session that best meets their professional learning goals. At each *Best Practice Institute*, the math coaches, select cadre, and middle and high school liaisons share their expertise with colleagues by presenting a variety of best instructional math practices and math content knowledge workshop sessions.

### **Indiana Math Initiative Contributions**

From the beginning, the IMI consortium focused on the development of strong teacher leaders. The project started with elementary classroom teachers who as “select cadre” 1) were trained in effective math instruction and methods to effectively design curriculum based on the Indiana Academic Standards, and 2) became knowledgeable about how the learning of math concepts takes place. Since research consistently supports the idea that skilled mathematicians are the most effective teachers of mathematics, throughout the project, teachers spent time improving their content knowledge. They had access to and support from experts in the field of mathematics through face-to-face contact, site visits, and on-line math logs and forums. Through quarterly weekend meetings and summer institutes, teachers received a multitude of resources to support them in improving their instruction. Leadership transfer sessions were held to assist teachers in

taking their new knowledge back to their schools and districts. Training on mentoring, coaching, modeling, and presentation skills were critical pieces in giving teacher-leaders the confidence to share their knowledge, skills, and expertise with their colleagues back at school. Figure 2 depicts the number and type of trainings offered.

**Figure 2.** Professional Development

Year	# mentors trained	# of content building trainings	# of content district trainings
05–06	11	10	8
06–07	9	18	5
07–08	6	12	15

Pike Township benefited greatly from the newly empowered and well-equipped teacher-leaders. Teachers at all nine elementary schools participated in this leadership training and over the course of the grant, 48 Pike teachers took advantage of some portion of the IMI professional development. These teachers returned to the district and mentored their colleagues to assist them in improving their skills in math education. They served as teacher leaders on the math textbook adoption committee, helping to select the *Everyday Mathematics* series for elementary schools. They then provided important professional development that allowed for the effective implementation of this reform math series. During the 2007–2008 school year, these teacher leaders hosted numerous content workshops in the district with 335 participants. One of the teacher leaders was selected to serve the district as a full-time instructional coach for math. This coach coordinated the efforts of the elementary teacher leaders, holding monthly support meetings, offering on-going professional development, and supervising the district math substitute.

One of the coach’s most vital roles was to provide administrative professional development to district principals and assistant principals. This training provided school leaders with a deeper understanding of the components of effective mathematics instruction. This knowledge equipped building administrators to better support teachers and increased accountability for full implementation of effective math instruction with increased fidelity.

In subsequent years, IMI added middle school liaisons to bridge the gap between elementary and middle school teaching of reform mathematics. These middle school math teachers became a part of the summer trainings and quarterly meetings to equip them in sharing the new algorithms, strategies that students would bring from elementary to middle school math classrooms. As middle school liaisons learned the effectiveness of using games to aid students in computation at the elementary level, these games were shared with colleagues. Liaisons became teacher leaders in middle school, preparing their colleagues with deeper knowledge to ensure successful student articulation from elementary to middle school and from *Everyday Mathematics* to more traditional mathematics.

The Indiana Mathematics Initiative provided annual summer math modeling classes for secondary teachers, along with other professional development. Recently, however, IMI intensified the focus on secondary education. The consortium met with administrators and department chairs in math and recruited secondary liaisons from among the ranks of high school math teachers. The project provided professional development to increase awareness of the elements of effective reform mathematics, including increased attention to the Indiana Academic Standards and increased student engagement in mathematics.

By leveraging the momentum of the Indiana Math Initiative, MSD of Pike Township was awarded an additional National Science Foundation Math and Science Partnership grant in 2006. The purpose of this grant aligned well with IMI goals and focuses on algebra readiness. This grant made it possible for the district to hire a half-time math instructional coach from the high school. This coach has expanded the impact of reform mathematics on middle and secondary teachers through coaching, modeling, team teaching, and monthly meetings. The coach has worked to replicate and sustain the strong support provided by the Indiana Math Initiative Project.

The impact of the IMI partnership has been far reaching and will be sustainable long after the grant funds are expended due to a well-defined structure for building leadership capacity among teachers. Teachers now have a deeper understanding of the importance of keeping their content knowledge sharp and their instructional practice engaging. Teachers have developed skills to support one another in strengthening their math pedagogy. In addition to building relationships with colleagues within the district, Pike teachers have also built a statewide support network of committed math educators, particularly with colleagues in the surrounding urban school districts, which will serve them well as they continue to improve their practice.

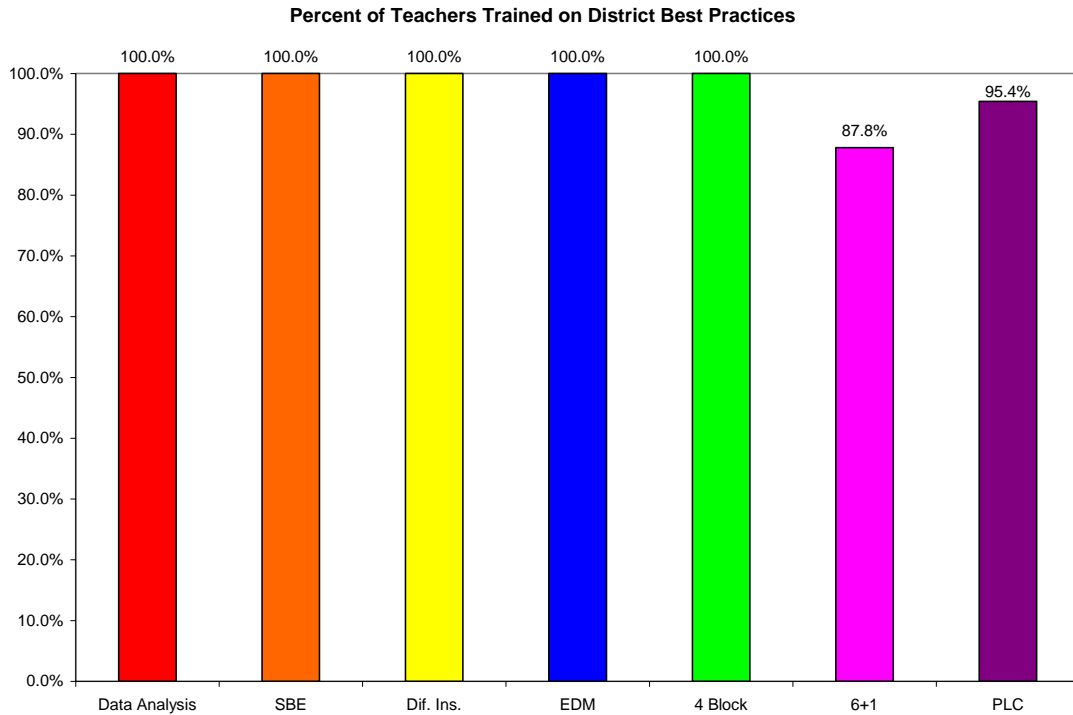
The IMI partnership has also made it possible for teachers to have access to a professional mathematician and math educators who provided professional development beyond math content that equipped teachers to become teacher leaders, mentors, and coaches. Because of the tremendous training offered at conferences, the time and energy focused on strengthening their math content knowledge, and the stipends they received for their time and commitment, these teachers felt honored and valued. In addition, they felt tremendous support from their administrators on account of the on-going attention and professional development for principals stressing the importance of administrative leadership. These newly confident and highly trained teachers will continue their leadership roles to guide colleagues as well as new teachers in the area of math instruction.

Ongoing review of data is critical to assess the effectiveness and successful implementation of the instructional coaching model. In order to collect data with which to create teacher-driven professional development sessions, an instructional audit was developed. A collaborative process involving teachers and administrators was used to design the audit tool to address teacher needs. Teachers anonymously complete this audit annually, marking how often a particular strategy is used. Since this tool is based on teacher perception, several other sources of data have been collected to make these decisions and to track the frequency, number and types of training as well as participants. Some additional pieces of evidence include:

- workshop evaluations (Workshop evaluations provide instructional coaches with specific feedback on presentation content and facilitation skills so on-going refinements can be made to strengthen the presentation);
- workshop calendars;
- teacher pre-post test data (math content);
- teacher focus groups;
- input from principals.

The chart in Figure 3 shows the percentage of Pike teachers trained as of June 30, 2008, in the identified best practices as part of Pike's district initiatives.

**Figure 3. Teachers Trained**



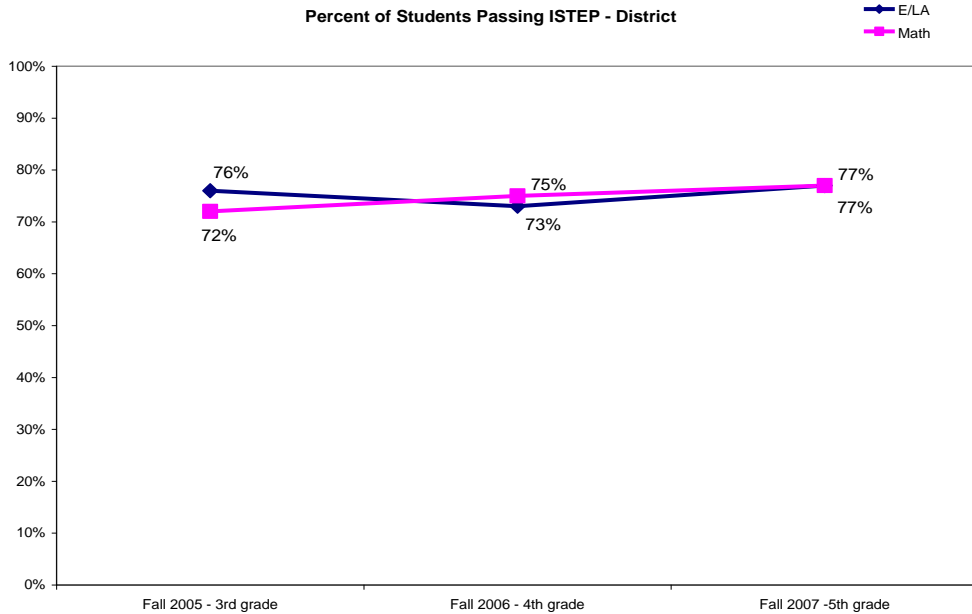
*Legend for acronyms used in categories for Figure 3 above:*

- SBE: Standards-based Education
- Dif. Ins.: Differentiated Instruction
- EDM: *Everyday Mathematics*
- 4 Block: Balanced Literary Instruction that integrates reading, writing, grammar, spelling, speaking and listening
- 6 + 1: Writing process that includes ideas, organization, voice, word choice, sentence fluency, conventions, and presentation
- PLC: Professional Learning Community

To measure the impact and effectiveness of the IMI partnership and the use of the *Everyday Mathematics* curriculum, an analysis of Indiana Statewide Testing for Education Progress Plus (ISTEP+) was completed. The following graphs represent the percent of students passing ISTEP+ over a period of time as a cohort group. The findings from the data indicated

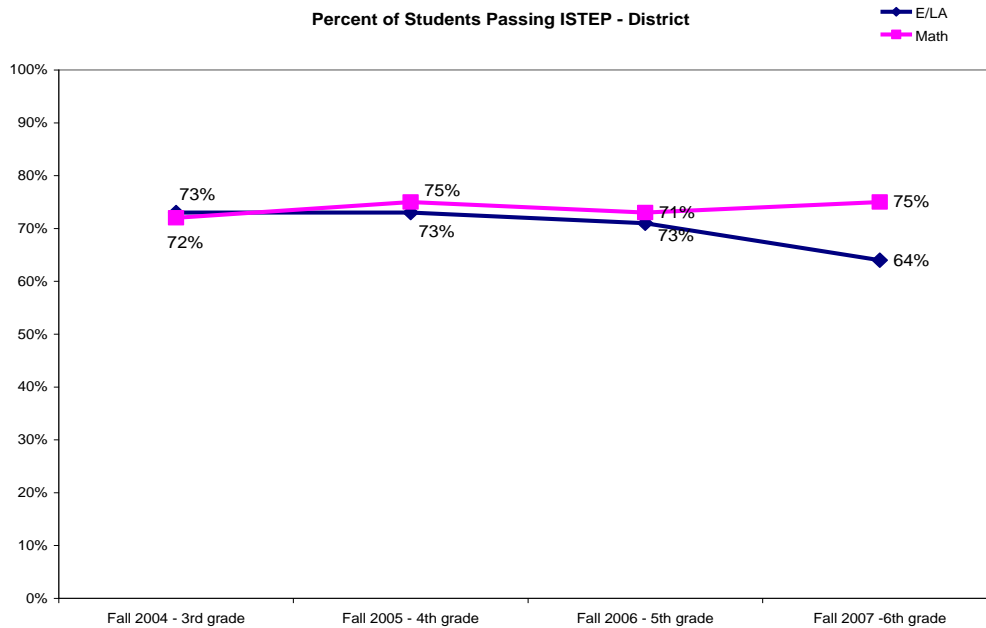
that as a cohort group of students received mathematics instruction from teachers using the *Everyday Math* curriculum, there was an increase in the percent of students passing the math portion of ISTEP+ in that cohort. Three cohort groups of students were followed for over a period of at least three years. One graph (Figure 6) indicates that as students move on to a different mathematics curriculum in grade 7, the increase in the percent of students passing the math portion of ISTEP+ no longer increases.

**Figure 4.** 5th Grade *Everyday Mathematics* Cohort



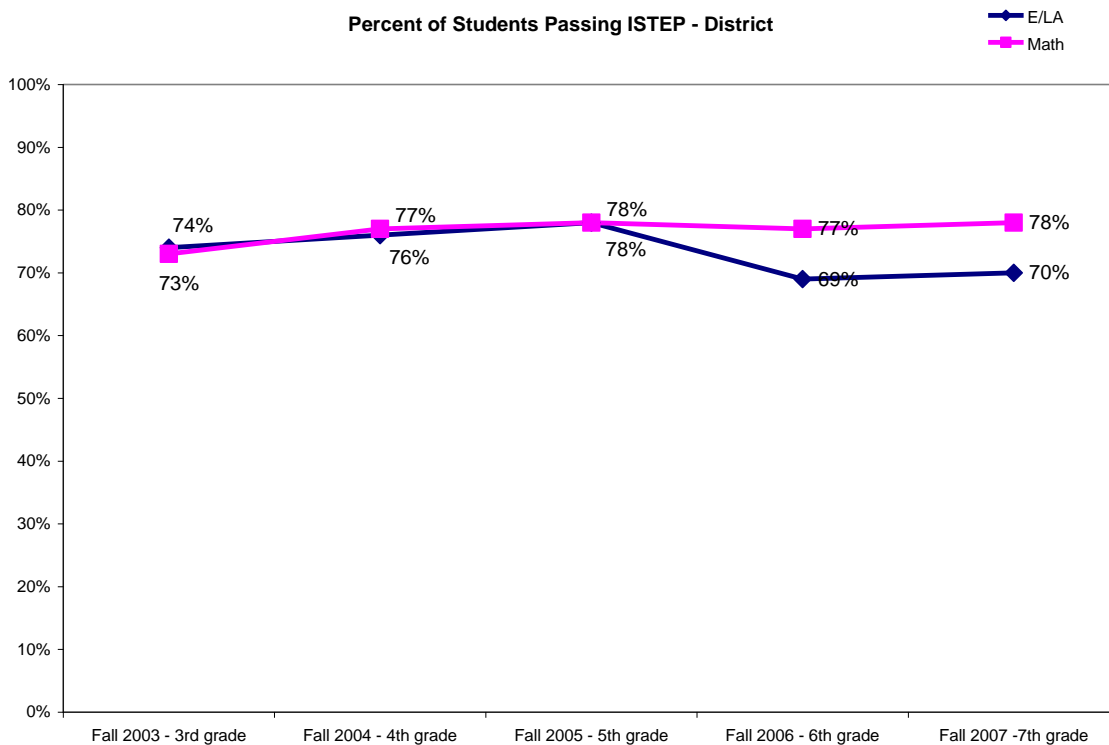
This graph indicates the performance of the cohort group of 2007–08 5th grade students as they have participated in ISTEP+ testing for the past three years while receiving *Everyday Math* instruction.

**Figure 5.** 6th Grade *Everyday Mathematics* Cohort



This graph indicates the performance of the cohort group of 2007–08 6th grade students as they have participated in ISTEP+ testing for the past four years while receiving *Everyday Math* instruction.

**Figure 6.** 7th Grade *Everyday Mathematics* Cohort



This graph indicates the performance of the cohort group of 2007–08 7th grade students as they have participated in ISTEP+ testing for the past five years while receiving *Everyday Math* instruction at the elementary level.

Through a strong partnership between the Indiana Math Initiative and the MSD of Pike Township, emphasizing pedagogy, enhanced instructional practice, and ongoing professional development, Pike has developed teacher leaders and improved student math achievement. The nine urban school districts have forged a strong statewide network that will continue to offer support for colleagues as well as their students in future years. The MSD of Pike Township is greatly appreciative of the opportunities made available through the Indiana Mathematics Initiative and looks forward to continuing our journey of strengthening math instruction, while building teacher leaders and increasing student math achievement.

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